

power of various amino acids using this peptide system and to examine whether the tendency of the amino acids to promote α -helix formation is consistent with that in protein.³ At this stage of the study, we have found that L-leucine (a strong α -helix former) and L-phenylalanine (an α -helix former) can promote α -helix formation but L-valine (an α -helix former) cannot.

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Book Reviews*

The Peptides. Analysis, Synthesis, Biology. Volume I. Major Methods of Peptide Bond Formation. Edited by Erhard Gross and Johannes Meienhofer. Academic Press, New York. 1979. xvii + 435 pp. \$39.50.

The recent explosive interest in the synthesis of biologically active peptides has led to the publication of several series of books on the topic, most of which are the result of recent symposia. The present editors are to be congratulated on the publication of a really superior first volume of a new series. This book gives the reader a thorough and critical review of the most useful methods presently used in the synthesis of peptide bonds. The first chapter, written by the editors, gives an overview of the structure, reactions, and synthesis of amide linkages while the last chapter carefully describes the omnipresent racemization problem encountered in peptide synthesis.

If the quality of the present volume can be maintained in those that follow, we can anticipate publication of a very excellent and useful series. The chapter titles (authors) are: 1. The Peptide Bond (E. Gross and J. Meienhofer); 2. The Formation of Peptide Bonds (J. J. Jones); 3. Active Esters in Peptide Synthesis (M. Bodanszky); 4. The Azide Method in Peptide Synthesis (J. Meienhofer); 5. The Carbodiimide Method (D. H. Rich and J. Singh); 6. The Mixed Carbonic Anhydride Method of Peptide Synthesis (J. Meienhofer); 7. Racemization in Peptide Synthesis (D. S. Kemp). This is clearly a book written for practitioners (or aspiring practitioners) by experts in the field of peptide synthesis.

While there may be some overlap between Chapters 1 and 2, this does not detract seriously because of the difference in viewpoints of the authors. Chapter 3 is written by one who can be considered the prime advocate of the active ester method in peptide synthesis. It is therefore blessed by a depth and attention to detail which would be difficult to attain by another author. The personal involvement of the authors directly in their topics shows up again in the following four chapters. Chapters 4 and 6 show an extreme attention to detail which makes these true reference works, obviating the need to search for further information on these subjects. Chapter 5 is an admirably written discussion of what is, perhaps, the most commonly used coupling method today, but also the one most likely to cause problems. Again, the chapter is very well written, thorough, and complete. The last chapter on racemization was, quite possibly, the most difficult to assemble because racemization crosses the boundaries of all peptide coupling methods and its causes are difficult to sort out and organize. The author succeeds, I believe, in describing the present "state of the art" very clearly by organizing the information beautifully and the hard data in table form.

This book is a very useful addition to the practicing peptide chemists' bookshelf, but is so well written throughout that the uninitiated will also find it useful for breaking into the art of peptide synthesis. It may serve to invite organic chemists to join the quest for the perfect amino acid coupling method and should certainly be in every science library.

Charles H. Stammer, *University of Georgia*

Synthetic Gems Production Techniques. Edited by L. H. Yaverbaum. Noyes Data Corp., Park Ridge, N.J. 1980. ix + 353 pp. \$39.00.

This book is a review of the patent literature and is "a continuation and updating" of the book "Synthetic Gem and Allied Crystal Manufacture", published in 1973. The title has been changed because of the decision to omit crystals used only in making semiconductors for the electronics industry. It is a pity that such an awkward wording for the unpunctuated title was chosen.

The largest part of the book is concerned with synthesis of diamond, but there are substantial sections on garnets, titanates, rutile, and corundum, as well as miscellaneous others. The chapters begin with a historical overview of the patent literature in some detail; these parts can be quite interesting to the general reader. One learns, for example, that the first practical synthesis of a gemstone was accomplished in 1900 by

Auguste Verneuil, who grew crystals of corundum. The first patent for synthetic diamonds was issued in 1960 for a process announced in 1955.

The value of this book lies not only in the fact that patents on a single subject have been brought together, but also in the detailed information that has been extracted from the patents and presented in detail with a description of the experimental procedures. To obtain this sort of information independently would require an enormous amount of searching as well as digestion. Since in the technology of gem synthesis, most of the significant literature is in patent form, this volume is an important work of reference.

Rodd's Chemistry of Carbon Compounds. Second Edition. Volume IV. Part L. Edited by S. Coffey. Elsevier Scientific Publishing Co., Amsterdam and New York. 1980. xxii + 552 pp. \$126.76.

This book completes Volume IV, Heterocyclic Compounds. It contains four chapters, each of which is largely devoted to compounds involved with the control of biochemical processes. The chapter by G. Shaw covers Purines and Related Ring Systems, including thiazolopyrimidines, pyrazolopyrimidines, and triazolopyrimidines. The chapter by D. Jones is devoted to Nucleosides, Nucleotides, and Nucleic Acids. A chapter by Ohta, Wrigglesworth, and Wood describes Pteridines, Alloxazines, Flavins and Related Compounds. Biosynthesis of Plant Alkaloids and Nitrogenous Microbial Metabolites, by R. B. Herbert, closes the text and is followed by an index of nearly 100 pages.

The style of this series and its plan, emphasizing synthesis, structure, and properties (physical and chemical) about evenly, is well known. The quality of the reviews remains high, as does the reference value. The countless citations (they are included in the text, unnumbered) include many to the patent literature. Unfortunately, the contributors still do not generally tell the reader at what date their surveys of the literature ceased, and only one chapter (Herbert) informs us of this valuable piece of information (June 1976).

The special emphasis on matters of interest to biochemists and medicinal chemists should justify consideration for purchase by individuals or libraries not subscribing to the entire series, for this volume can be used independently.

Spectres d'Absorption Ultraviolets de Composés Organiques Azotés et Correlations Spectrochimiques. Volume 2: Bases Aromatiques. By P. Grammaticakis. Technique et Documentation, Paris. 1979. 132 pp. Fr. 150 (paperbound).

The first volume of this work appeared in 1977. As in that volume, this one consists of a large number of UV spectra (over 1300) in graphic form. They are rather small (up to nine layouts per page), but they have the useful feature of showing several closely related compounds superimposed (such as ortho, meta, and para isomers), and of being reliably comparable, since they all came from the author's own laboratory. A second section is devoted to commentary, in which the author elaborates the method of "naive spectroscopy", a method he has devised for correlating the form of UV spectra with structure. The relationships that he thereby generates are very interesting and should be useful for empirical correlations. There is an alphabetical index to compounds by name.

Proteoglycans-Biological and Chemical Aspects of Human Life. By John F. Kennedy. Elsevier Scientific Publishing Co., Amsterdam, and New York, 1979. xxi + 493 pp. \$80.50.

This book describes a complex class of compounds that has not been commonly recognized in the scientific community. The lack of recognition of proteoglycans has probably been due to their structural complexity and to experimental difficulties in characterizing them. Their function in mammals and other living organisms is just beginning to be understood. This book therefore addresses a need to bring together information now available for this important class of compounds.

Proteoglycans consist of polypeptide chains to which long linear chains

*Unsigned book reviews are by the Book Review Editor.

of carbohydrates known as glycosaminoglycans are attached. The linearity of the carbohydrate chains in proteoglycans distinguishes this class of compounds from the glycoproteins in which the carbohydrate chains are branched. Glycosaminoglycans are often made up of repeating sequences. Some of the common constituents are hexuronic acids and aminohexoses, as well as sulfate groups attached to hydroxyl and amino groups. Typical glycosaminoglycan chains have molecular weights in the range of 1000–10000, and 100 or more glycosaminoglycan chains may be attached to a single polypeptide chain.

Proteoglycans occur widely in mammals, especially in connective tissue where they form side-by-side complexes with collagen. Lesser quantities of proteoglycans have been reported in fish and bacteria. One biochemical function appears to be to serve as a lubricant for joints. The glycosaminoglycan heparin is known to be an anticoagulant and also to inhibit the initiation of protein synthesis. Abnormalities in glycosaminoglycan metabolism have been observed in arthritis, Niemann-Pick disease, and in some corneal diseases.

This book is an encyclopedic presentation of what is known about proteoglycans and also gives methods for their study. Over 1500 references through 1976 are given, as well as a very complete index. The book is organized into 20 chapters dealing with: the nomenclature of proteoglycans; their biological occurrence; methods for isolation, separation, and characterization of proteoglycans and glycosaminoglycans; methods for chemically modifying these compounds; their biosynthesis, and their role in disease. While the book is quite complete, the information within each chapter is somewhat difficult to follow due to the lengthiness of the presentation, a shortage of subheadings in some chapters, and the lack of summaries at the end of each chapter. The inclusion of religious quotations was somewhat surprising and slightly distracted from the scientific aspect of the book.

This book is highly recommended for persons having a research interest in proteoglycans. However, its rather high cost will probably preclude purchase by students.

Janet M. Cardenas, *University of North Carolina*

Molecular Structure by Diffraction Methods. Volume 6. Senior Reporters: L. E. Sutton and M. R. Truter. The Chemical Society, London. 1978. x + 338 pp. (Available from the American Chemical Society for \$90.75.)

The format of this book differs somewhat from that of its predecessors in this series of annual volumes. The practice of attempting to mention all structure determinations within the year, and arranging them according to diffraction method and chemical nature or elemental composition, has been considerably relaxed. Structure reporting is still the main theme of the volume, but a tendency toward more discussion and analysis and less straight reporting and attempted comprehensiveness is evident. These changes are likely to be welcomed by most readers.

A chapter on gas-phase electron diffraction structures, largely in tabular form, is followed by two chapters on molecular mechanics (energy minimization) calculations and results of such calculations. The useful chapter Chemists' Guide to Discovering Information about Molecular Structures in Crystalline Solids by Truter explains how existing data files can be accessed via telephone and searched for specific structural features by any chemist with a computer terminal. Chapters on neutron diffraction (Speakman) and silicates (Glasser) are followed by one on molecular interactions (Murray-Rust). The latter chapter examines intermolecular forces in crystals through correlation with molecular parameters in a series of related compounds. Other chapters cover mono-, oligo-, and polysaccharide crystal structures (Jeffrey and French), nucleic acids and their constituents (Neidle), globular proteins (Bedarkar and Blundell), and pharmaceutically active small molecules (Duax).

The molecular structure literature is covered to October 1977. There is an author index, but unfortunately no subject or compound index. Another drawback is the price, which, per page, is maintaining a steady exponential growth of about 25% per year in this series.

Christer E. Nordman, *The University of Michigan*

Polysaccharides in Food. Edited by J. M. V. Blanshard and J. R. Mitchell. Butterworths, Boston. 1979. iv + 368 pp. \$55.95.

This well-organized and generally well-written text provides an up-to-date account of research on various aspects of polysaccharides that are important in food processing and development. Included in the 21 chapters are in-depth discussions of their fundamental properties that are important in food development (structure, solution structure, rheology), their enzymatic degradation, their chemical modification, aspects of their processing, potential new polysaccharide food sources and legislative aspects regarding their use, and finally a discussion of their importance in global nutrition. These subjects are, in most cases, covered in considerable depth and numerous references are given to the original research literature. The text can be highly recommended to the research

worker in the area of food technology or to those contemplating research in this field; however, it is of less interest to the chemist.

Gary R. Gray, *University of Minnesota*

Organic Syntheses. Volume 59. Edited by Robert M. Coates. John Wiley & Sons. New York, 1980. xvii + 267 + 20 unnumbered pp. \$17.50.

This volume begins appropriately with appreciations of the late William Sheppard, former Editor and member of the Board of Organic Syntheses, of the late Reynold Fuson, another Editor and member of the Board, and the late C. F. H. Allen, who was the first Secretary to the Editors and later served "Organic Syntheses" in virtually all capacities and was a major contributor of syntheses.

There are 29 checked preparations in this volume, which includes several organometallic preparations, various preparations of carbocyclic and heterocyclic compounds, examples of the use of phase-transfer catalysis, etc. The series thus continues to provide reliable procedures for both useful and important compounds and new synthetic methods. As is customary, a group of procedures as yet unchecked is listed in equation form as an appendix.

Beilsteins Handbuch der Organischen Chemie. Fourth Edition, Supplement 3/4. Volume 21 (in seven parts). Edited by R. Luckenbach. Springer-Verlag, Berlin-Heidelberg-New York. 1978–1979. Part 1: 1054 pp. \$771.00. Part 2: 940 pp. \$678.00. Part 3: 1143 pp. \$915.20. Part 4: 885 pp. \$712.80. Part 5: 953 pp. \$753.50. Part 6: 1038 pp. \$814.00. Part 7: 1080 pp. \$844.80.

At one time, it would have seemed quite unnecessary to review such a well-known and perennial work as "Beilstein". The original goal of compiling all the published information on each organic compound in succinct form must have been set with no concept of the enormous growth of organic chemistry and the explosive increase of published information, and Friedrich Beilstein probably never imagined that the work he founded would be going strong a century later. It seems suitable to look at what has happened by focussing attention on Volume 21 of the 3/4 supplement, for that volume has recently been completed.

Volume 21 covers the hydroxy-, oxy-, and hydroxyoxo- derivatives of rings containing one nitrogen atom for the period 1930–1959. This subject matter was easily contained between one set of covers in the original work (677 pp) and in the first and second supplements. The great increase is due in part to a longer span of time (the first two supplements covered 10 years each), and very much to the increasing productivity of individual chemists and the larger number of them. It is a tribute to the foresight of the founders that the system developed so long ago still works.

The cost has also increased impressively, but it is inappropriate to compare the cost to that of ordinary books, which Beilstein is not; one is paying for a service. It would be fairer to compare the cost with "Chemical Abstracts", in which case the result is much more favorable. Even so, the effect of the devaluation of the dollar against the D-Mark cannot be overlooked. The Beilstein Institute must be supported, for the work that could be handled on a volunteer basis when organic chemistry was young and small now requires a large, full-time staff.

It is appropriate to examine the changes from earlier supplements to "Beilstein". The table of abbreviations is now defined in both English and German. Stereochemical notation is explained in nine forepages. The list of literature sources, and the abbreviations used for them, has expanded enormously and is now 55 pp long. The only thing which has been made smaller is the Table of Contents, which has been reduced to about a quarter of a page per Part, compared to six pages in the Second Supplement. This is deplorable, for it is now nearly useless, whereas it used to be a great aid to experienced users of "Beilstein", enabling them to quickly find closely related compounds when a specific compound was not apparent in the index. The content of the individual entries remains much the same, with notes on structure, formation, occurrence, preparation, properties, reactions, biological effects, and derivatives. The problem of conveying spectrographic information has been met by specifying the kind of spectrum, the range, whether it is the continuous spectrum or principal bands, and the medium, followed by the reference.

Potential users will obviously be concerned about whether "Beilstein" continues to provide benefits commensurate with the cost, and particularly about the comparison with "Chemical Abstracts". The great advantage of "Beilstein" is that it provides all essential information for a period under one integrated entry, instead of scattered through a number of abstracts, which for important compounds may be large. This is a significant saving of time. Furthermore, since the entries are for single compounds rather than for articles that deal with many compounds, it is much easier to find the information one seeks in such entries than to sift through long and cryptic abstracts. On the other hand, "Beilstein" suffers in comparison to CA in lack of timeliness, and if one needs

information published in the last decade, only CA can provide it. The two works deal with information in different ways for different purposes, and the chemist is best served by being able to make use of both: "Beilstein" up to the latest year covered, and CA for the most recent years.

Finally, the organization and indexing should be mentioned. The arrangement by structure in "Beilstein" allows one to find a compound efficiently without ever having to name it. If, however, one prefers to use the index, a pleasant surprise is in store, for the nomenclature used is distinctly more traditional, and so similar to English that the English-speaking user will not find the German a significant barrier. The level of pain is markedly lower than that caused by the computer-oriented code names adopted in the more recent CA indexes.

Spectroscopy, Luminescence, and Radiation Centers in Minerals. By A. S. Marfunin (translated by V. V. Schiffer). Springer-Verlag Publishers, New York. 1979. xii + 352 pp. \$49.80.

This book is a recent translation of a monograph written in Russian by Marfunin in 1975, and as a result, the topics discussed are somewhat out of date. However, the theoretical discussions are quite clear and lucid, and do serve as valuable expositions of physical phenomena familiar to chemists and spectroscopists. At the same time, the focus of these discussions takes the reader to systems not ordinarily considered since the book is concerned with processes taking place in mineral systems.

The book is divided into seven chapters, each dealing with a different instrumental technique. The topics covered are: Mossbauer Spectroscopy, X-ray and X-ray Photoelectron Spectroscopy, Electron Paramagnetic Resonance, Nuclear Magnetic and Nuclear Quadrupole Resonance, Luminescence, Thermoluminescence, and Radiation Electron-Hole Centers in Minerals. The writing is of uniform quality throughout, and is of a fairly high quality.

This book should be of great interest to spectroscopists of all types who work in the solid-state realm. The only drawback to the book is the lack of updated references, but the very extensive nature of the referencing presented (1023 references are presented) makes this text a valuable record of the almost-recent literature.

Harry G. Brittain, *Seton Hall University*

Bibliography of *ab initio* Molecular Wave Functions: Supplement for 1974-1977. By W. G. Richards, P. R. Scott, E. A. Colbourn, and A. F. Marchington (Oxford University). Oxford University Press, Oxford. 1978. xxxiv + 526 pp. \$45.00.

This is the second supplement to the widely-used volume "A Bibliography of *ab initio* Molecular Wave Functions", published in 1971, which surveyed all computed results from the beginning of molecular quantum theory to the end of 1969. The first supplement was almost identical to the original volume in format and covered the period 1970-1973.

The format of this most recent bibliography differs from that of the earlier ones in several respects. The tables summarizing calculations on each molecule in terms of electronic states, geometry, basis set, energy, etc. are no longer included. This omission is undoubtedly due in part to the rapidly increasing number of relevant papers; this volume contains approximately 5600 citations, or nearly four times the number in the original bibliography. However to a greater extent the changes in format reflect the maturity *ab initio* molecular calculations have attained. Since calculations now use standard computer program packages, the technical details are generally of little interest compared to the authors' final conclusion about the properties and systems in question. Most of the references contain a few words summarizing the subject matter of the paper. However many entries contain no such supplemental information at all. Since no tabular material is included, the addition of a few more descriptive words would have been particularly useful.

The references cover a variety of molecular systems, from species as small as H_2^+ to those as large as ethyl chlorophyllide a (62 atoms). A number of interacting pairs of molecules are also included. This makes the organization of the entries particularly important. References are grouped by molecule, with diatomic, triatomic, and tetraatomic compounds followed by polyatomic species. Within each of these groups, molecules are ordered alphabetically by their characteristic elements as well as, for polyatomics, by chemical structure. A key to the ordering of the larger polyatomic species is included. There is also an index that essentially follows the ordering used by Chemical Abstracts. This makes finding references to a particular compound fairly straightforward.

Probably no two chemists would agree on a unique definition of "*ab initio*". A few citations refer to calculations employing perturbation theory, the molecular fragment approximation, and other techniques not usually considered in this category. The majority of the cited works are based on the output of a few standard SCF and CI programs. However papers reporting such calculations that did not feature an appropriate acronym or the term "*ab initio*" in their titles are often not included.

Even though this bibliography does not appear to have been prepared as carefully as earlier versions, it nonetheless remains an indispensable tool for researchers in theoretical chemistry and related areas. It provides an introduction to the recent literature pertaining to fundamental properties of individual molecules, and hence should be useful to experimentalists as well. It is to be hoped that at the end of this year, the authors will begin work on yet another volume of this series.

Carl S. Ewig, *Vanderbilt University*

NMR and Biochemistry. A Symposium Honoring Mildred Cohn. Edited by S. J. Opella and P. Lu (University of Pennsylvania). Marcel Dekker, Inc., New York. 1979. xii + 434 pp. \$45.

As indicated by the subtitle, this book provides a record of the proceedings of a Symposium, held at the University of Pennsylvania in June of 1978, in honor of Dr. Mildred Cohn. Each of the 28 scientific papers presented at the meeting is reported in the book in the format of a chapter. The various chapters are then organized in four main sections according to topics: Proteins and Nucleic Acids (8); Strategies for Biological NMR (5); Membrane and Intact Cells (3); Enzymes (10). A brief presentation by Carl E. Cori of the earlier scientific works of Dr. Mildred Cohn, and a paper on "Nuclear Probes of Biochemical Mechanisms", contributed by the honored guest, play the role of an introductory section for the entire volume. Most of the papers collected in the book describe the results of NMR—and/or, in a few cases, EPR—studies of biochemical and biological systems or deal with the multifarious aspects of the problems and limitations that may be encountered in the application of the NMR techniques to the study of such systems. A few chapters of the last section are somewhat out of tune with the main title of the book, but cover areas of research within the realm of Dr. Cohn's scientific interests.

The reader of a volume of this format must be prepared for some dissonances and a kaleidoscope of emphases and styles. There are chapters featuring review articles of general interest and others that dwell on detailed accounts of ongoing researches. There are lengthy chapters and brief ones. The lengthiest article of the book is written in the style of a progress report to a granting agency at renewal time, while the briefest one is almost synoptic in style. However, one may also enjoy a delightfully brief lecture which explains, with simple and terse arguments, the negative results of some NMR experiments still poorly understood among the nonspecialists.

The list of the contributors is impressive and the references, at the end of each chapter, numerous. One suspects that the book should provide an excellent up-to-date source of bibliographic information. At least one editorial flaw has caught the eye of this reviewer: a figure, mentioned at page 182 of the text, is missing.

Salvatore M. Castellano, *Carnegie-Mellon University*

Organometallic Photochemistry. By Gregory L. Geoffroy (Pennsylvania State University) and Mark S. Wrighton (Massachusetts Institute of Technology). Academic Press, Inc., New York. 1979. 335 pp. \$39.50.

In recent years photochemical investigations of organotransition metal compounds involving catalytically and synthetically useful transformations have emerged as important areas for basic research. The stated goal of this book is "to provide a firm basis from which investigators can conduct these studies." The first chapter contains brief reviews of bonding and the nature of excited states in organometallic chemistry, along with the principles of photochemistry. The remaining seven chapters comprehensively survey the photochemical behavior of organotransition metal complexes and are divided according to classes of ligands, including carbonyls, olefins, arenes, cyclopentadienyls, isocyanides, hydrides, and alkyls. A given chapter furnishes concise introductory remarks and is further subdivided into metal groups. Chapter 2, which deals with metal carbonyls, is by far the most extensive, reflecting the preponderance of work carried out on this important group of complexes. The literature coverage is rather complete through 1978, with some select coverage into 1979 of the authors' work. A notable deletion which would have been beneficial to prospective researchers in this area is a chapter dealing with the practical aspects of carrying out photochemical studies, e.g., types of light sources and filters, methods for determining quantum yields, etc.

Throughout the volume numerous tables, spectra, and molecular orbital diagrams and exposition of the subject through equations and compound formulations aid the presentation. The text is very well produced, clearly written, and relatively free of errors. The index, which covers subjects and compounds, would have been enhanced in its usefulness had it additionally covered authors.

Overall this book is a very welcome addition to the organometallic literature and should serve as an excellent text for a special topics course (or a selection of an inorganic or organometallic course) at the advanced undergraduate or graduate level, as well as a reference for researchers

or prospective researchers in this field. Indeed I thought highly enough of this text to buy a copy (darn) prior to receiving it for review.

Donald J. Darensbourg, *Tulane University*

Positronium and Muonium Chemistry. By Hans J. Ache (Virginia Polytechnic Institute and State University). American Chemical Society, Washington, D.C. 1979. vii + 376 pp. \$41.00.

The Proceedings of the "Positronium and Muonium Chemistry" symposium held at the Second Joint Conference of the Chemical Institute of Canada and the American Chemical Society, May 29–June 2, 1977 are reported. Of the 14 contributions, 12 are related to positronium chemistry and 2 to muonium chemistry, and there is a chapter on line-shape analysis. Positronium, the short-lived bound state of an electron and its antiparticle, and muonium, the combination of an electron with a positive muon, are increasingly being used as viable research tools by physicists, chemists, and biochemists. Positronium is particularly attractive since it is neutral and nondestructive and the equipment necessary is relatively inexpensive. The "state of the art" in positronium and muonium chemistry are admirably summarized in up-to-date reviews by Ache and Fleming, Garner, Vaz, Walker, Brewer, and Crowe in Chapters 1 and 13. Applications to different fields are detailed in the remaining chapters. Thus, Chapter 2 provides examples on the physical properties of organic compounds using positronium as a probe (by W. W. Walker), Chapter 3 details biochemical applications (by G. Graf, E. D. Handel, P. L. McMahon, and J. C. Glass), Chapter 5 focusses attention on solid state polymerization (by Y. Ito and Y. Tabata), Chapter 6 discusses positron annihilation in irradiated polystyrene and polyethylene (by F. H. Hsu and J. H. Hadley, Jr.), Chapter 7 deals with positron annihilation processes in diatomic and polyatomic gases (by J. D. McNutt and S. C. Sharma), and Chapter 8 related positronium and positron reactions to hot radical reactions in the radiation spur (by S. J. Tao). Werner Brent provides a lucid description of the positron annihilation effects (Chapter 4) and current theories on positronium formation are discussed in Chapters 9 and 10 (by Yu. N. Molin, O. A. Anisimov, and D. M. Schrader). Chapter 14 summarizes the muonium research performed at the Swiss Institute for Nuclear Research (by P. W. Percival, E. Roduner, and H. Fischer). This compilation provides an easy entry and essential background to anyone interested in using positroniums or muoniums in their research. The individual chapters are well presented, clearly written, and provide a wealth of information.

Janos H. Fendler, *Texas A&M University*

Organic Compounds of Sulphur, Selenium, and Tellurium. Volume 5 (Specialist Periodical Reports). Senior Reporter: D. R. Hogg (University of Aberdeen). The Chemical Society, London. 1979. xxv + 523 pp. \$100. Available also from Special Issues Sales, A.C.S.

In his "Life of Johnson", Boswell recounts how Johnson when visiting a friend ran eagerly to examine the books in the library. "Knowledge is of two kinds", Johnson explained. "We know a subject ourselves, or we know where we can find information upon it. When we enquire into any subject, the first thing we have to do is to know what books have treated of it. This leads us to look at catalogs, and the backs of books in libraries". Were Johnson still on the scene and had he the connection with sulfur chemistry so nearly inescapable today, Volume 5 of this comprehensive series surely must have excited his special attention.

Volume 5 extends the review of publications on the organic chemistry of sulfur, selenium, and tellurium, which began with 1969, from April of 1976 to March of 1978. All aspects are covered: synthetic, structural, physical characteristics, natural occurrence, mechanistic, theoretical, or whatever. Coverage of biological aspects may be a bit sparse, but one cannot expect everything, especially after such prefatory phrases as "economic pressure", "further reduction in length", and "increased selectivity". Each of 480 pages is crammed with information, many pages citing a dozen or more references (in convenient footnote format). A spot check for coverage of papers about a variety of sulfur functions affirmed the outcome predictable from Volumes 1–4—virtually all were cited.

In the Johnsonian sense, no chemist can afford to be unaware of this powerful resource. Nor can any organic chemist with more than casual interest in sulfur, selenium, or tellurium afford to lack ready access to it. The series is indispensable for a good library. Although valuable for current awareness, the importance of the series for retrospective searches must increase more than proportionately as the number of volumes increases. Despite absence of a subject index, significant background readily can be assessed before one embarks on envisioned research, merely by judicious scanning of well-organized chapter headings and subheadings in the 18-page table of contents, and of the author index. Reasonable effort thus usually should obviate the duplications seen all too frequently these days that proudly announce equivalents to rediscovery of the wheel. It should be added that Volumes 1–4 still are

available (and perhaps also that a softcover edition of Volume 5, well-made and well-adapted to hard use, is available to members of the Chemical Society for £ 15.50).

For those familiar with Volumes 1–4, it suffices to say that Volume 5 meets the same exemplary standards. A search for typographical or other errors became something of a challenge, but only a single trivial one was seen! Volume 5 may be a rare choice for light recreational reading, because the style is the necessarily terse one of *Annual Reports on the Progress of Chemistry*; nonetheless, the reporters have succeeded beyond reasonable expectation in making the text coherent, graceful, and readable.

For those unfamiliar with the series, a synopsis of the coverage of Volume 5 may appeal to their Johnsonian instincts. The first 69 pages treat aliphatic compounds (especially thiols, sulfides, di- and polysulfides and their *S*-oxides, sulfonium salts, sulfuranes, thioacetals, sulfoxides, sulfones, thiocyanates and isothiocyanates, sulfenic, sulfinic, and sulfonic acids, and their derivatives). Ylides and carbanionic compounds of S, Se, and Te, and related structures, occupy the next 48 pages, followed by thio- and selenocarbonyls, sulfines, and sulfoxides (21 pages) and thio- and seleno acids and derivatives (48 pages). The remaining 294 pages deal with heterocycles, covering ring sizes from three-membered to macrocyclic. Separate chapters review thiophenes and Se or Te analogues, dithioles, thiopyrans, thiopins and dithiins, isothiazoles, thiazoles, and thia- and selenadiazoles. The last chapter covers β -lactam antibiotics and other sulfur-containing natural products. Every section scrupulously cites relevant reviews. With well over 4000 references in toto, surely little can have been missed. The reporters deserve the congratulations and gratitude of the chemical community for this major contribution.

Lamar Field, *Vanderbilt University*

Spin Eigenfunctions. By Rubin Pauncz (Technion-Israel Institute of Technology). Plenum Press, New York. 1979. xv + 370 pp. \$35.00.

"Spin Eigenfunctions" is a comprehensive treatment of the methods that have been developed to construct many-electron wave functions which are simultaneous eigenfunctions of S^2 and S_z . The author both develops the techniques and evaluates the connections between the various methods. He also discusses ways of evaluating matrix elements over the spin eigenfunctions. The book is written at a level appropriate for advanced graduate students or those who might wish to do research in quantum chemistry. The reader is expected to be familiar with quantum mechanics and group theory.

The first five chapters cover a large number of methods to construct eigenfunctions of the spin operators. The symmetric group is introduced in Chapter 6, and the application of the symmetric group to the spin problem is discussed in Chapters 7 and 8. In Chapters 9–11 the author presents methods for calculating matrix elements over general operators and the Hamiltonian. The development covers nonorthogonal as well as orthogonal functions. In Chapter 12 spin free quantum chemistry is presented. Application of the unitary group to the spin problem is given in Chapter 13. The discussion given in Chapter 13 is particularly timely owing to the large amount of current research using the unitary group approach.

"Spin Eigenfunctions" is well written and self contained. An outstanding feature of the book is the large number of examples introduced to illustrate the methods. These examples are very helpful in understanding the details. The book would be a useful addition to the personal library of quantum chemists.

David L. Freeman, *University of Rhode Island*

Advances in Experimental Medicine and Biology. Volume 105. Nutritional Improvement of Food and Feed Proteins. Edited by Mendel Friedman. Plenum Press, New York. 1978. xiii + 882 pp. \$69.50.

This is a collection of 40 papers presented at a symposium of the American Chemical Society at Chicago in 1977. The collection comprises an excellent review of currently important research areas in protein utilization. Several papers discuss the problem of accurate measurements of protein quality and the practical problems of producing foods with improved protein quality that will be acceptable to consumers in various cultures. The importance of avoiding imbalances that involve either excesses or deficits of essential amino acids is shown. The report by Monckeberg and Chichester on the introduction of fortified children's formulas into Chile illustrates the interaction of political, ethical, and technological constraints in such a project.

Researchers in photosynthesis have been motivated to try to make practical improvements in the efficiency of plant growth and protein synthesis, but so far this has led only to suggestions for growing crops in atmosphere enriched in carbon dioxide and the stimulation of protein synthesis by the addition of ammonia. In the meantime an increasing number of plant breeders are turning their attention to the improvement of amino acid balance, removal of toxic factors, and increasing protein

percentage in our major food plants. These efforts have been partially successful, often, but not always, at the expense of yields. The strategies for these breeding programs are still being developed.

Strategies for improving the nutritional quality of proteins by mixing various types, supplementation, and treatments to increase availability are discussed. Amino acids may be attached to proteins via succinimide esters and the plastein reaction, and the degradation of amino acids may be prevented by formation of derivatives. Fermentation has considerable potential for producing the amino acids needed in protein supplementation. The nutritional quality of many seeds is improved by germination.

The problem of extraction of proteins with desirable functional and nutritional properties from various sources is examined.

The book closes with the report of an improved micromethod for amino acids and with a glossary of terms compiled by the editor. The book also includes a rather extraneous, but nonetheless interesting, review of the role of dietary fiber in human nutrition and the problems of classifying various fiber types.

The papers are well written, and I recommend this book to food technologists, nutritionists, and chemists interested in proteins.

Earl G. Hammond, Iowa State University

Topics in Carbon-13 NMR Spectroscopy. Volume 3. By F. W. Oehme. John Wiley, New York, 1979. \$35.00.

This volume differs from previous volumes in the series in that it begins with a multisectioned, multiauthored chapter under the general heading of Experimental Techniques in ^{13}C NMR Spectroscopy. Although the various sections are not necessarily related, they aim to give an overview of recent and anticipated advances in experimental methods. Spin decoupling methods in ^{13}C NMR (L. F. Johnson) are discussed with particular emphasis on the value of successive selective proton decoupling experiments as an aid to spectrum interpretation. The effects of coil design and tuning on the sensitivity of the NMR probe (D. I. Hoult) are explained and the construction of a high sensitivity 22 mm ^{13}C probe for an iron magnet system (A. P. Zens and D. M. Grant) are described. The benefit of using small diameter sample tubes with closely fitting receiver coils for obtaining spectra on small amounts of material (J. N. Shoolery) is also clearly demonstrated. Problems of measuring the temperature of a sample in the NMR probe (F. A. L. Anet) are considered and systems with temperature-dependent chemical shifts which can be used as NMR thermometers are reviewed. The theory and application of Two-Dimensional F.T. ^{13}C NMR (D. Terpstra) are explained and a realistic assessment of the value of this technique is given. The way in which data is handled in certain F.T. systems is outlined (D. L. Dalrymple) with the aim of showing how the software is an important component in the total spectrometer system. The theory and potential of tailored selective excitation techniques in F.T. NMR are also discussed (H. Hill) and are shown to provide a complementary approach to that employed in the normal pulsed F.T. experiment. In general the aspects covered in this first chapter are written with the aim of providing some practical guidance to the reader and therefore enable a realistic assessment to be made of likely developments in these areas.

Chapter 2 (D. A. Wright, D. E. Axelson, and G. C. Levy) is concerned with ^{13}C spin relaxation measurements and their application to physical chemistry problems, in particular the study of molecular dynamics in simple and complex liquids. Theoretical and experimental studies of cross-correlation effects and of the various relaxation mechanisms are discussed as are models for molecular motion. The chapter ends with a short survey of recent studies of relaxation parameters in polymers for those systems where spectra can be obtained without the need for high power dipolar decoupling.

Chapter 3 (E. L. Eliel and K. M. Pietrusiewicz) provides a comprehensive discussion of the ^{13}C NMR spectra of saturated heterocyclic compounds based largely on a survey of the literature from about 1970 until early 1977. Due to the extent of the data available, the discussion and referencing of natural products are not considered unless illustrating general principles. The data are presented systematically starting with the monocyclic systems. Each ring size is considered in turn and this approach enables the carbocyclic system to be compared with the corresponding systems containing one or more heteroatoms. Where possible the available information is correlated and shift parameters are obtained and general trends discussed. The review deals largely with chemical shift data but where available the stereochemical dependence of coupling constants is considered. This review will be of great value to those interested in reduced heterocyclic systems and highlights the need for a greater theoretical understanding of the factors which influence chemical shifts.

Chapter 4 (J. Schaefer and E. O. Stejskal) is concerned with high-resolution ^{13}C NMR studies of solid polymers. The value of dipolar decoupling and magic-angle spinning for producing dramatic reductions in the line widths of the observed resonances is explained clearly as is the

concept of sensitivity enhancement by cross-polarization techniques. At the same time the reader is made aware of some of the potential problems which may arise in this area. The authors then briefly discuss some of the problems associated with the construction of a cross-polarization spectrometer before considering the potential application of NMR for studying solid polymers. Examples are given of the type of information which can be obtained from both high-resolution and low-resolution spectra.

Chapter 5 (D. A. Torchia and D. L. Vanderhart) continues the theme of NMR studies on solid samples and describes how high power double resonance ^{13}C spectra can provide information about molecular dynamics and structure in complex biological solids. Studies of elastin, collagen, cartilage, Hemoglobin S, and model membranes are discussed in some detail showing the value of comparing scalar decoupled and dipolar decoupled spectra. Varying the contact time in cross-polarization experiments is also shown to provide valuable information about the less mobile regions of these biological macromolecules. Although this area is of a somewhat specialized nature the results given indicate, even to the nonspecialist, how these studies can give valuable information which would be difficult to obtain by other means.

Chapter 6 (W. B. Moniz, C. F. Poranski, Jr., and S. A. Sojka) considers the potential of ^{13}C CIDNP for use in mechanistic and kinetic studies. Both types of application are illustrated by considering examples from the literature. In particular the discussion deals with the potential problems of using F.T. NMR for obtaining reliable kinetic data from ^{13}C CIDNP studies. Some guidance is given on how such data can be obtained and analyzed.

In conclusion, this volume provides a valuable reference source for those working in the areas covered and in addition it provides the nonspecialist with an insight into work being carried out in other areas of NMR. Those with a general interest in NMR will therefore be sure to find some aspects of interest to them within this volume.

D. V. Griffiths, University of Keele

The Hypercycle. By M. Eigen (Göttingen University) and Peter Schuster (Vienna University). Springer-Verlag, Berlin, Heidelberg, and New York, 1979. viii + 92 pp. \$9.50.

When Darwin completed his *Origin of Species*, he left to the future the problem of the origin of life. Reproduction, variation, and Natural Selection could explain the variety of living organisms. He then concluded his masterpiece with the following sentence. "There is grandeur in this view of life, with its several powers, having been originally breathed by the creator into a few forms or into one; and that, whilst this planet has gone cycling on according to the fixed law of gravity, from so simple a beginning endless forms most beautiful and most wonderful have been, and are being evolved".¹

The study of heredity led to the gene, which in turn led us to the Watson-Crick model of DNA (1953). This posed the problem of the genetic code: how to read a sequence of nucleotides into a sequence of amino acids (proteins). From 1953-1963 Francis Crick led the molecular biologists through the biochemical desert in search of the genetic code. When it was found and the central dogma (e.g., DNA \rightarrow RNA \rightarrow Protein) affirmed, the problem of the origin and evolution of the genetic code became the deepest enigma in the origin of life.

Eigen, a student of chemical kinetics, has formulated his hypercycle hypothesis in the hope of attacking this problem.

A hypercycle is a system of autocatalysts connected through a cyclic linkage—a cycle of cycles. A "realistic hypercycle" is a cycle of replicating nucleic acids (the autocatalysts) coupled through translation polypeptides (linkages). The kinetic equations in mathematical form are a set of coupled nonlinear ordinary differential equations. This leads to the usual search for limit cycles and other attractors.

What makes this attempt to provide a deeper understanding of the origin of life a failure lies in the assumptions of the model. "Let us for the time being assume that a crude replication and translation machinery, functioning with adequate precision, and adapted to a sufficiently rich alphabet of molecular symbols, has come into existence by some process not further specified, e.g., by self-organization or creation, in Nature or in the laboratory".²

These assumptions are as useful as Darwin's creator breathing life into a few forms or into one. The complicated mathematics and the many extra molecular biological assumptions which account for the size of this book do not make up for its weak foundations. The hypercycle may, like

(1) Darwin, C. (1872) "The Origin of Species"; a mentor book from New American Library, New York, 1958; p 450.

(2) Eigen, M.; Schuster, P. "The Hypercycle"; Springer-Verlag, Berlin, 1979; p 60.

the Lotka-Volterra equations, give the theoretical ecologist a field of endless speculation. It leaves the mystery of the origin and evolution of the genetic code intact.

H. Hartman, *Massachusetts Institute of Technology*

Fundamental Research in Homogeneous Catalysis 3. Edited by Minoru Tsutsui (Texas A&M University). Plenum Press, New York and London. 1979. xx + 1052 pp. \$75.00.

This volume is devoted entirely to the proceedings of the 1st International Conference on Homogeneous Catalysis, held in Corpus Christi, Texas, November 29–December 1, 1978. It includes the complete Keynote Lecture, 17 invited papers, and 51 contributed papers. A very wide range of topics are discussed. The major categories were Mechanism and Theoretical Treatises, Activation of Small Molecules (carbon monoxide, carbon dioxide, hydrocarbons, polymerization, metathesis, oxidation, reduction), Metal Cluster Catalysis, Asymmetric Catalysis, Hybrid (Anchored or Immobilized) Catalysts, Biomimetic Catalysis, Photocatalysis, and Catalytic Synthesis and Characterization. Many very prominent research workers have contributed to the volume. The Keynote Lecture was delivered by Günther Wilke, Director of the Max-Planck-Institut für Kohlenforschung in Mülheim on the subject "Basic Concepts of Homogeneous Catalysis with Metal Complexes." This paper examines a variety of catalysts mainly from the author's laboratory with respect to turnover number, reaction mechanism, influence of changing the metal in the catalyst, and ligand effects. This paper gives an excellent illustration of the major value of the book. Many topics are reviewed and much unpublished information is included to exemplify the points discussed.

Richard F. Heck, *University of Delaware*

Chemical Thermodynamics. Volume 2 (Specialist Periodical Reports). Senior Reporter: M. L. McGlashan (University College). The Chemical Society, London, 1978. ix + 544 pp. \$48.00.

Both the preceding Volume 1 and the present Volume 2 are truly *specialist* reports. The Senior Reporter's Forward offers the following concise summary: "The present volume is entirely devoted to the thermodynamic properties of fluid mixtures of non-electrolytes." It is my opinion that the first eight chapters (pp 1–274) contain a good balance of well-presented material about experimental methods and results, along with pertinent theory. Although most readers would probably like to have more discussion of some subject of particular personal interest, the coverage of various subjects within the area under consideration fairly reflects average research activity of the past two decades.

The only deficiency or limitation of consequence that I can identify in the first eight chapters can be illustrated by reference to the generally excellent chapter on "Specific Interactions in Nonelectrolyte Mixtures" that happens to be of particular interest to me. The most recent reference cited in this chapter is to a paper that appeared early in 1975, with only four references to papers published in 1974. At least a partial explanation for the absence of reference to "recent" publications is provided by a note (p 270) saying that the typescript for another chapter was submitted in 1974 and updated with an addition 3 years later.

The ninth and last chapter is a computerized bibliography of thermodynamic properties of binary mixtures, for which the literature has been "covered" to the end of 1974, with "some" 1975 publications also included. This chapter occupies 49 percent of the pages in the main body of the present volume. Maybe because I am not yet used to the format used, I am finding it difficult to locate papers of interest to me. Further, the print in this chapter of my copy (others?) is *very* difficult for me to read.

This book is highly recommended for specialists in the field of thermodynamics of nonelectrolyte mixtures.

Loren G. Hepler, *University of Lethbridge*

Solvent Effects in Organic Chemistry. By Christian Reichardt. Verlag-Chemie, Weinheim and New York. 1979. \$63.50.

As stated in the preface, "The book is directed both toward the industrial and academic chemist and particularly the advanced student of chemistry, who on the one hand needs objective criteria for the proper choice of solvent but on the other hand wishes to draw conclusions about reaction mechanisms from the observed solvent effects." This monograph presents an in-depth treatment of solvent effects which, in many instances, determine the success or failure of a particular reaction. The literature up until December 1977, with a few 1978 papers, has been considered.

Following a brief, mostly historical introductory chapter Reichardt presents a description of the intermolecular interactions between dissolved molecules and solvent in Chapter 2, Solute-Solvent Interactions. It is in this chapter that the principles so important to an understanding of the rest of the book are introduced.

Chapter 3, entitled Classification of Solvents, is an attempt to collect the multitude of organic and inorganic solvents into recognizable classes. Classifications of solvents according to (1) chemical constitution, (2) physical constants, (3) acid-base behavior, and (4) solute-solvent interactions are considered.

Chapter 4, Solvent Effects on the Position of Homogeneous Chemical Equilibria, compares solution acid-base equilibria with gas-phase acidities and basicities. Solvent effects on tautomeric equilibria are represented with numerous examples. Rotational and conformational equilibria are considered briefly along with a few examples of valence isomerization equilibria.

The heart of the book is Chapter 5 in which Solvent Effects on the Rate of Homogeneous Chemical Reactions are treated. Following a brief theoretical consideration of the fundamentals of solvent interactions in terms of transition state theory a who's who of reaction types is considered in detail, using example after example to illustrate points to be made. This chapter is excellent and should become required reading for every chemistry graduate student.

In chapter 6 we find a treatment of Solvent Effects on Absorption Spectra of Organic Compounds. Every chemist who has occasion to determine a spectrum will find much useful information in this chapter.

Empirical Parameters of Solvent Polarity (Chapter 7) illustrates the many linear free-energy relationships related to solvent effects and the use that can be made of them.

The book concludes with ten useful appendices and twelve tables which collect a significant amount of information about solvents that one will find frequent need to consult.

This is an extremely useful book which is well referenced (Chapter 5 alone lists 451 references) and it should find a place in the library of every practicing chemist who has occasion to call upon solvents to facilitate his reactions. Within hours of the book's arrival on my desk it had been confiscated by two of my students who have found it extremely useful.

John L. Hogg, *Texas A&M University*

Organofluorine Chemicals and Their Industrial Applications. Edited by R. E. Banks (University of Manchester Institute of Science and Technology). Ellis Horwood Ltd., Publishers, Chichester, U.K. 1979. 255 pp. \$49.95.

In 1978, the Society of Chemical Industry organized a symposium to honor four decades of Professor J. C. Tatlow's work in fluorine chemistry. The lectures presented at this symposium form the basis of a book "Organofluorine Chemicals and Their Industrial Applications". As stated in the Preface, two chapters (on fluorinated dyes) were added, and one chapter (on fluoroelastomers) has not been written.

There are altogether 12 chapters in the book, which cover the following topics: "Aspects of Organofluorine Chemistry" (J. C. Tatlow) is an exquisite overview of laboratory successes in this field. "Industrial Aspects of Fluorine Chemistry" (A. K. Barbour) contains data on the production of bulk fluorochemicals such as hydrogen fluoride, fluorine, chlorofluorocarbons, inhalation anaesthetics, fire extinguishers, polymers, and fluoroaromatics, and evaluates different methods of fluorination. Chlorofluorocarbons are the subject of two more chapters, one by B. D. Joyner, discussing their production, properties, and applications, and the other by R. J. Hodson, who concentrates on applications of aerosol propellants. A special chapter (C. R. Patrick) is devoted to the "Effects of Chlorofluorocarbons on Ozone in the Stratosphere". This meticulously compiled article discusses surprising and sometimes controversial contributions to this problem and shows that the panic leading to the ban on chlorofluorocarbons in the U.S. might have been somewhat premature. In the chapter on "Fluorine-Containing Drugs", R. Filler describes successful applications of fluorine chemistry in cancerostatics, steroidal, and nonsteroidal anti-inflammatory agents, antibiotics, central nervous system agents, and other fields. Among many drugs, some new aspirin-type anti-inflammatory agents look very promising. Although Halothane accounts for most anaesthesias (some 500 000 000 world-wide, so far), efforts are made to find inhalation anaesthetics which would suppress some of the undesirable features of Halothane. These attempts are described by W. G. M. Jones, "Fluorinated Heterocycles as Inhalation Anaesthetics". Quite a few applications of fluorinated compounds are in agronomy as evidenced by G. T. Newbold's chapter on Fluorine-Containing Pesticides. Two chapters (by W. Harms and G. Wolfrum, respectively) are devoted to fluorinated dyes. Some of them (i.e., those containing fluorine in reactive positions in the aromatic rings) are superior to other dyestuffs in fixation on cellulose and polyamide fibers. A chapter on Organofluorine Surfactants and Textile Chemicals (H. C. Fielding) shows usefulness of surface energy-lowering properties of fluorinated compounds not only in imparting hydrophobic and oleophobic properties to textile and paper but also in forming impressive fire-fighting foams. The final chapter on Poly(tetrafluoroethylene) and Related Fluoroplastics (R. F. Anderson and J. O. Punderson) describes some

spectacular accomplishments in thermoresistant plastics.

Like any critical survey, the selection of the presented material is subjective. Some chapters screen the available data more severely than others, but all contain an enormous amount of information. Of special value are data extracted from relatively inaccessible periodicals, monographs, and company bulletins. The number of important omissions, inaccuracies, and printers' errors is negligible. However, the book would deserve a somewhat more comprehensive subject index. The editor (R. E. Banks) did an excellent job in converting proceedings of a meeting into a lovely readable book which gives an all around picture of practical fluorine chemistry and forms, thus, a suitable complement to R. D. Chamber's theoretically oriented "Fluorine in Organic Chemistry". Finally, both the editor and the publisher (Ellis Horwood Ltd.) should be congratulated on producing, within a period of less than 1 year, a nice-looking publication which reads like a novel.

M. Hudlicky, *Virginia Polytechnic Institute and State University*

Fundamentals of Analytical Flame Spectroscopy. By C. Th. J. Alkemade (University of Utrecht) and R. Herrmann (University of Giessen). John Wiley and Sons, New York. 1979. xii + 442 pp. \$64.95.

This book treats the three analytical techniques—flame emission, atomic absorption, and atomic fluorescence spectroscopy—in an integrative and comparative manner. Each chapter treats a separate aspect of flame spectroscopy (e.g., Chapter 3, The Flame) and how that aspect influences each of the three methods. The methods are described and compared in an introductory chapter. Chapter 2 treats the historical development of the methods. Chapters follow on: Flame chemistry and dynamic function, Chapter 3; pneumatic nebulization, desolvation, and volatilization of the analyte, Chapter 4; dissociation and ionization of the analyte, Chapter 5; emission, absorption, and fluorescence, Chapter 6; background emission and absorption in flames, Chapter 7; the shape of analytical curves, Chapter 8; and interferences, Chapter 9.

None of the topics are presented in a highly mathematical way and none are exhaustively treated. The tone of the presentations is more like that of a discussion.

Probably the strongest point of this book is the fact that it is a good state of the art of review covering important work through 1978. Some 937 references are used to support the discussions of the various functional aspects of flame spectroscopy. Those seeking details of analytical procedures will be disappointed as none are presented. Nevertheless, those in practical applications of the methods can use the book as a reference to aid in problem solving. The book will be useful to those doing fundamental research in the area of flame spectroscopy. It is not intended to be a textbook but would be an excellent reference text. Only the first 193 pages of the book treat the chapter subjects. The balance of the book has 28 pages of an excellent glossary of terms and abbreviations, 49 spectra of various elements in flames, and a table of 7000 wavelengths of spectral lines and bands presented in numerical sequence and also listed separately by element.

Robert S. Braman, *University of South Florida*

The Nature of Enzymology. By R. L. Foster (Birmingham Polytechnic). John Wiley and Sons, New York. 1979. xii + 383 pp. \$39.95.

This book is a survey of enzymology which introduces both traditional and developing areas in the field. The first four chapters deal with traditional subjects. Chapter 1 on the "character" of enzymes gives a general background on protein structure. Chapter 2 is a concise and well written treatise on enzyme kinetics and the measurement of enzyme activity. Chapter 3, on the modification of enzyme activity, includes sections on the effects of temperature, pH, and inhibitors on enzyme activity. An unfortunate error on page 102 gives the value of the maximum k_{cat} as $10^{-12} s^{-1}$ instead of $10^{+12} s^{-1}$. The discussion of inhibition includes well-presented sections on both reversible and irreversible inhibition with several specific examples of transition state analogues, site specific inhibitors, and affinity labels. The final section in this chapter is on regulation of enzyme activity. The discussion of regulation of protein synthesis and hormonal regulation is unfortunately sketchy and misleading. While the discussion of allosterism in this chapter is reasonably clear, the section on covalent modification is unclear and deals only with adenylation and proteolysis. One expects at least a mention of phosphorylation-dephosphorylation in a section with this heading. Chapter 4 on the mechanism of catalysis gives a brief introduction to this subject with several examples.

Chapters 5, 6, and 7 are less traditional in approach and content. Chapter 5, titled Enzyme Physiology, emphasizes the localization of enzymes within cells. Following a brief section on subcellular fractionation there is an extensive section which describes some of the enzymes of each major subcellular compartment. The emphasis shifts from highly detailed descriptions of certain enzyme structures to outlines of metabolic pathways. A student who has not previously taken an introductory

biochemistry course may be confused by this section while one who has had such an introduction may find much of this material redundant. Chapter 6, on medical enzymology, provides an interesting survey of some of the applications of enzymology in medical diagnosis and treatment. Some confusion may arise over the use of the term "parental" in place of "parenteral" in several instances. Also there are significant errors in the representation of the enzymology of blood coagulation. Chapter 7, titled Enzyme Technology, proves a survey of some of the applications of enzymology. The section on immobilized enzymes is particularly timely and well done.

Mary E. Kirtley, *University of Maryland School of Medicine*

Review of "Coal Conversion Technology". Edited by C. Y. Wen and E. S. Lee. Addison-Wesley, Reading, PA. 1979. \$29.60.

The book is titled correctly, its subject is the technology of coal conversion and not the chemistry of coal conversion. The editors obviously assume that the chemistry and technology are sufficiently independent to permit adequate treatment as independent subjects. There is little here for the reader interested in the chemistry of coal conversion process and/or combustion, unless it is an understanding of how far chemical based technology can be developed with little knowledge or understanding of the underlying chemistry. There is a good discussion of the thermodynamics of coal gasification in Massey's chapter and a very brief treatment of some basic liquifaction chemistry in Lee's chapter. The overall tone is set by the first chapter which covers coal classification and characterization from a geological and physical viewpoint, and discusses chemical structure only in terms of elemental composition.

This book does cover coal conversion technology reasonably well. It is weak on developments which have occurred in the last 2 or 3 years. Essenhigh's chapter on coal combustion is the most complete short treatment of this subject of which I am aware. Massey's chapter on gasification is not only complete but beautifully written in a clear, crisp style. The chapter on liquifaction is an attempt to do the impossible. The subject is too vast to be treated in 120 pages. In many areas, the treatment is so cursory as to be of little value except to inform the reader that work has been done in those areas. The chapter is useful as a brief, broadly sketched introduction which mentions most of the important areas and topics, even if it does not treat them in much detail. It is a good starting place for those unfamiliar with the technology.

The book is presented as a graduate textbook, but reads more like a series of independent reviews on closely related topics. Only the chapter on gasification has any exercises for the student. Commentary on and evaluations of the relative merits of various technologies are rare. The book does not quite succeed as a text, even though Massey's and Essenhigh's chapters are excellent. An overall unifying viewpoint or approach is missing.

For all its flaws, this book is a reasonable introduction to the engineering side of coal conversion technology. The reader will miss some recent developments and most of the chemistry, but the principal technical approaches are covered.

John W. Larsen, *University of Tennessee*

Reactive Intermediates in the Gas Phase. Edited by D. W. Setser (Kansas State University). Academic Press, New York. 1979. x + 358 pp. \$38.50.

This monograph sticks closely to its subtitle, "Generation and Monitoring", for it deals thoroughly but exclusively with the production, detection, and determination of concentration of the most important reactive gaseous intermediates. Although the authors show regret over this restriction, they seldom give way to the temptation to show the roles that such intermediates play in reaction mechanisms or other such more glamorous topics. The uniformity of style, the framework of organization, the continuity of the writings, and the adequate picturization of experimental detail make the book quite readable as well as highly useful.

The first three chapters deal with flow systems and make up two-thirds of the book. Chapter 1 (M. A. A. Clyne and W. S. Nip) reviews the techniques for generation (largely discharge flow) and measurement of atoms and radicals in flow systems at moderate temperatures. Chapter 2 (A. Fontijn and W. Felder) deals with particles produced from more refractory species in high-temperature systems. Chapter 3 (J. H. Kolts and D. W. Setser) covers electronically excited long-lived atomic and diatomic states.

Chapter 4 (M. C. Lin and J. R. McDonald) discusses the production and detection of reactive species with lasers in static systems. Chapter 5 (L. I. Bone) is limited to small positive ions produced in mass spectrometers. The final chapter, Chapter 6 (N. Djeu), presents a technique that is barely 5-years old, the use of discharge-excited rare gas halide lasers as coherent ultraviolet sources of excitation.

The rapidity of development of the field covered by this book is shown by the large number and recent dates of the articles quoted as references.

A very large fraction of them have been published in the last 12 years. It is also interesting that a much greater number of them have been published in *J. Chem. Phys.* or *J. Phys. Chem.* than in *J. Am. Chem. Soc.*

John G. Miller, *University of Pennsylvania*

Terpenoids and Steroids. Volume 9. By J. R. Hanson (University of Sussex). The Chemical Society, London. 1979. xii + 352 pp. \$72.00.

This volume in the Specialist Periodical Reports series reviews the literature in this field between September 1977 and August 1978. As such, the coverage is of necessity episodic and fragmentary, but the book contains a wealth of information for the informed reader.

Organization within the book is by increasing complexity of the carbon skeleton within the families of terpenes and steroids. Emphasis is on physical methods, structure determination, biosynthesis and total synthesis, with very little on biological properties.

The section on monoterpenoids (R. B. Yeats) contains, among other things, a summary of all structures done by X-ray methods from 1946 to 1978 and a section on general synthetic methods applied to these compounds. The long sesquiterpenoid section (T. Money) emphasizes many of the elegant total syntheses this class of compounds has inspired recently. The diterpenoid (J. R. Hanson), triterpenoid (J. D. Connolly), and carotenoid and polyterpenoid (G. Britton) sections cover the many aspects of the chemistry of these classes.

The steroids are covered from the viewpoint of physical methods (D. N. Kirk) and reactions and partial syntheses (B. A. Marples).

The book abounds in structural formulas for easy visual retrieval in browsing. There is a complete author index. It is unfortunate that there is no subject index, though this would doubtlessly add more to the price and delay in getting the book published.

John N. Marx, *Texas Tech University*

Recent Developments in Mass Spectrometry in Biochemistry and Medicine. Volume 2. Edited by Alberto Frigerio (Mario Negri Institute). Plenum Press, New York. 1979. x + 492 pp. \$45.

This volume is a collection of 35 papers presented at the 5th International Symposium on Mass Spectrometry in Biochemistry and Medicine, held at Rimini, Italy, in June 1978. The first third of the book contains reports of applications of mass spectrometry to drug metabolism. The need for powerful separation techniques in this area is particularly well illustrated in one paper in which 17 urinary metabolites were identified by gas chromatography/mass spectrometry. The utility of mass spectrometry and GC/MS for study of physiologically important compounds such as steroids, polyamines, catecholamines, bile acids, and prostaglandins is illustrated in a second group of papers. Several articles emphasize the techniques themselves, including four about respiratory mass spectrometry, but in general this volume is oriented toward applications and results. Many European countries are represented by the contributors to this volume. That English is not the native language of the majority of these authors is evident from numerous problems with wording in the text. However, with only a couple of exceptions, meanings are not obscured and the interested reader should remain so while perusing this volume.

David J. Miner, *Eli Lilly and Company*

Acid-Base Balance, A Manual for Clinicians. By Jorge A. Quintero (Universidad del Zulia). Warren H. Green, Inc., St. Louis, Mo. 1979. xiii + 128 pp. \$10.50.

This book is aimed at the practicing physician, treating acid-base reactions in the context of the Henderson equation, and emphasizing the diagnosis and treatment of acid-base disorders.

Eugene D. Olsen, *University of South Florida*

Hormonal Proteins and Peptides, Hypothalamic Hormones. By Choh Hao Li (The Hormone Research Laboratory, University of California). Academic Press, New York. 1979. xvi + 306 pp. \$32.50.

Ever since I heard G. W. Harris some 20 years ago give an exhilarating talk on the neuroendocrine control of reproductive function, I have followed with interest the explosion in the amount of information in the area of hypothalamic hormones which has been pouring out of many laboratories. All of the articles included in this volume are extensive, well-written, and should provide a wealth of knowledge to the uninitiated. The first chapter on Hypothalamic Peptide Hormones: Basic and Clinical Studies by Schally et al. is concise but excellent in its coverage of all aspects of these hormones. This brief coverage lays the foundation for more extensive discussions on two of the more intensively investigated hypothalamic hormones, gonadoliberin by Jutisz et al. and somatostatin by Muller. Since the title of the chapter by Muller is The Control of somatotropin Secretion it also includes a great deal of information on the more complicated role played by the central nervous system and other factors in the regulation of growth hormone secretion. It is apt to point

out that the initial excitement as to the predominant part played by growth hormone-releasing hormone (GH-RH) and growth hormone-release inhibiting hormone (GH-RIH or somatostatin) has not been sustained. This is due to the fact that GH-RH has not been identified and synthesized (inspite of contrary claims) and GH-RIH is distributed in many parts of the body in addition to the hypothalamus. Chapter 4 by Labrie et al. deals with the Mechanisms of Action of Hypothalamic and Peripheral Hormones in the Anterior Pituitary. The discussion not only includes the effects of TRH (thyrotroph releasing hormone), LH-RH (luteinizing hormone-releasing hormone), and somatostatin on the release or inhibition of the release of the respective pituitary hormones but also the mediating role played by prostaglandins and cyclic AMP in such hormone release. The modulating role played by steroid hormones and thyroid hormones is covered in detail also. The use of in vitro methods to delineate hypothalamic vs. pituitary sites of action of modulatory factors certainly clarifies results of in vivo experiments. The last chapter by Berta Scharrer brings into focus and puts in proper perspective much of the antecedent information and current progress that has been made in the field of neurosecretion and neuroendocrinology. Lastly, some of the articles included in this book have been published within the last 2 years in the "Annual Review of Physiology and Recent Progress in Hormone Research" in identical form. I am not sure whether the purpose of publication of the same information is to disseminate knowledge to a larger audience. If it is, then some way has to be found to publish these hard cover volumes at a lower cost, especially when one considers the rapid and explosive progress that is being made in this field.

K. V. Prahald, *Northern Illinois University*

Organics Analysis Using Gas Chromatography Mass Spectrometry. By W. L. Budde and J. W. Eichelberger (U.S. Environmental Protection Agency). Ann Arbor Science, Ann Arbor, Mich. 1979. xxvii + 242 pp. \$20.00.

This book is subtitled "A Techniques and Procedures Manual" and this subtitle is more accurately descriptive of the content than the more general full title.

The primary purpose of the book is to present a detailed description of the techniques and experimental procedures needed to identify and measure organic compounds in environmental samples by GC/MS. Detailed procedures are given for the operation and maintenance of Finnigan Corporation's Model 1015 and 3000 series GC/MS with a data system based on a DEC PDP-8 minicomputer.

Jon F. Parcher, *University of Mississippi*

Rheological Techniques. R. W. Whorlow. John Wiley & Sons, Somerset, N.J. 1980. 447 pp. \$77.95.

This volume surveys the major classes of rheological apparatus (tube viscometers, rotational viscometers, and instruments for studying creep, stress, dynamic compliance, and wave propagation) and the parameters which they measure. The orientation is largely experimental, with substantial emphasis on significant details of instrumental design and on effects which yield artifacts in non-ideal systems. Of especial note is an appendix listing tabulating data on rheological instruments which were commercially available in 1979. The text is at a level suitable for graduate students of highly diverse backgrounds, with emphasis on physical concepts and necessary results rather than on mathematical rigor.

George D. J. Phillis, *The University of Michigan*

Substituent Constants for Correlation Analysis in Chemistry and Biology. By Corwin Hansch and Albert J. Leo (Pomona College). John Wiley and Sons, Inc., Publishers, Somerset, N.J. 1979. vii + 339 pp. \$24.95.

To one involved with biological structure-activity relationships, this book represents a timely gathering of the myriad of substituent constants useful in correlation analysis. It will surely be of value also to those with interests in substituent effects on physical relationships. The authors have documented in a convenient format the thousands of electronic, steric, and hydrophobic constants and partition coefficients which have found their way into the literature over the past half-century or so. Also included are the hydrophobic fragment constants which have more recently been applied as an alternative to the π system of calculating partition coefficients. The fragment constants, which permit the calculation of partition coefficients "from scratch", were the outgrowth of the recognition that the intrinsic hydrophobicity of the hydrogen atom is not zero (an assumption that is made in the π system formulation). Each method of calculation has its own advantages, and specific examples are presented for their appropriate use.

As stated in the Preface, "The purpose of this monograph is to provide a comprehensive listing of parameters of proven value for the correlation of structure with chemical or biologic reactivity". The authors "have been concerned more with listing as many constants as possible rather

than with attempting to assign degrees of reliability to the various values".

Concise summaries of the development and application of substituent theory precede the appendices which document the various parameters: Chapter I, Electronic Parameters (σ); Chapter II, Steric Parameters (E_s); Chapter III, Hydrophobic Parameters ($\log P$, π); Chapter IV, The Fragment Method of Calculating Partition Coefficients; Chapter V, Molar Refractivity and Parachor; and Chapter VI, Cluster Analysis and the Design of Congener Sets. The latter chapter deals with an economical statistical method for recognizing multiple independent variables upon which a defined activity might depend. The reviewer is indebted to Dr. Gary Jones of Texas College of Osteopathic Medicine for his comments and evaluation.

Charles G. Skinner, North Texas State University/
Texas College of Osteopathic Medicine

Application of Zeolites in Catalysis. Edited by G. K. Boreskov and Kh. M. Minachev. Heyden & Sons, Inc., Philadelphia, PA. 1979. viii + 179 pp. \$17.00.

This book contains material from eight plenary lectures delivered by Soviet scientists at the First All-Union Conference on the Application of Zeolites in Catalysis held in 1976. The publication is intended for use by researchers interested in zeolites as catalysts in the oil-refining industry. An introductory report provides a general overview of zeolite catalysts, mainly types X and Y, in a variety of organic reactions. Two subsequent reports focus mainly on the acidic properties of zeolites and their use as cracking catalysts. Three reports are devoted to the state of catalytically important transition metals in zeolite frameworks as studied by chemical and spectroscopic (IR, ESR, and XPS) methods. The final report is concerned with the problem of internal diffusion in biporous zeolite granules. Although no attempt has been made to update the rapidly expanding topics for the 3-year period preceding publication, the book will have limited utility as a reference text.

Thomas J. Pinnavaia, Michigan State University

Protein Methylation. By W. K. Paik and S. Kim (Fels Research Institute, Temple University School of Medicine). John Wiley and Sons, New York. 1980. xvi + 282 pp. \$27.50.

This volume provides a comprehensive review of various chemical and biochemical aspects of protein methylation. The initial part of the book provides chapters on the chemical synthesis of methylated amino acids and methods for their separation and identification. Also included are chapters on chemical and biochemical properties of S-adenosyl-methionine, the universal biochemical methyl donor, and a list of proteins which are known to contain methylated amino acids. The subsequent chapters of the book provide a detailed description of the enzymology of protein methylation, including methods for purification of the enzymes involved, discussion of the physicochemical effects, and the factors controlling methylation and demethylation.

The book is well written, is complete in its coverage of the topic, and contains detailed indexes. It belongs on the shelf of everyone working on any aspect of methylation.

J. Donald Smith, Miami University (Ohio)

Radioactivity, A Science in its Historical and Social Context. By E. N. Jenkins (Anglican Diocese of Liverpool). Wykeham Publications Ltd., London. 1979. viii + 197 pp. \$13.50.

This little book provides an unusually thorough, interesting, and accurate account of the history of what is now called nuclear chemistry. From the discovery of radioactivity to the present utilization of radioactive isotopes and the biological effects of radiation, it traces developments in the perspective of the personalities involved, the problems they faced, and how they solved them. Sufficient detail is provided in a coherent and readable exposition so that the developments can be followed by a reader with minimal scientific background. It provides an excellent foundation for an understanding of the nature of radioactivity and a meaningful assessment of nuclear power as an energy alternative, a topic of major current interest.

The book opens with a discussion of the discovery of radioactivity and follows with chapters describing α and β particles and γ rays and the laws of radioactive decay. The chemical aspects of radioactive change are illustrated in a chapter describing the discovery of radon and its radioactive daughters and leads to the concept of isotopes. The basic ideas of atomic and nuclear structure are briefly, but effectively, treated, as are the developments leading to the production of artificial radioactivity and the discovery of the neutron. A discussion of the discovery and the basic physics of nuclear fission is followed by an excellent chapter on the applications of this unusual and important nuclear reaction for power generation and for weapons. The author's background as a nuclear chemist shines through in brief, but surprisingly detailed, chapters on the

chemistry of the fission products and the transuranium elements. The former provides information on the chemical separation of the fission products and touches on the problem of waste isolation and storage. The latter gives an up-to-date survey of transuranium chemistry and the search for "superheavy" elements. The utilization of radioactivity in science, industry, and medicine is described in principle and illustrated with several examples. Finally, the biological effects of radiation are described and doses from various sources compared.

This book is the best general survey of the field of nuclear chemistry I have seen. It is broad in coverage, accurate in content, and well written. Anyone who wants to gain background and perspective in this field should read it.

Ellis P. Steinberg, Argonne National Laboratory

Nucleic Acid-Metal Ion Interactions. Edited by T. G. Spiro (Princeton University). John Wiley & Sons, New York. 1980. 256 pp. \$24.50.

This is the first volume of a series entitled "Metal Ions in Biology". This is a rather timely publication as the field of metal-nucleic acid research is growing rapidly together with the growth of research in the role of metal ions in the biological system. This can be witnessed by the mushrooming of many books and monographic series on metal ions in biology. Several reviews on metal ions-nucleic acid interaction appeared as chapters of several books. In 1979 the whole volume of "Metal Ions in Biological Systems" (Vol. 8, edited by H. Sigel, Marcel Dekker) was devoted to metal ions-nucleic acid. There is little overlap between Spiro's and Sigel's books but the two volumes rather complement each other. Scientists who are interested in this field should welcome Spiro's new book as it enlarges the source of information. One characteristic of Spiro's book is readability as the book is designed for a wide audience of scientists and not necessarily for specialists in this field. The content of each chapter is well digested and well organized making reading enjoyable. The book consists of 5 chapters and each chapter was written by authors who are active in the field. The first chapter discusses the well-known anticancer drug *cis*-dichlorodiamineplatinum complex from the biological viewpoint. The chapter is well written but unfortunately only 5 references were listed making this chapter less useful as a source of references for serious scientists. Chapter 2, Heavy Metal Interactions with Nucleic Acid, describes more the chemical and structural aspects. The third chapter describes the role of metal ions in genetic miscoding. The chapter is short but well stocked with authoritative information and should be useful as a primary source of information as well as being interesting reading. The fourth chapter is more of a specialized topic on metal ions and transfer RNA and discussion is heavily tilted on chemical and structural aspects. The last chapter is a summary of interaction of metal ions with nucleic acids and their components. The authors emphasize sites of complexing in this chapter. This chapter has the largest number of references of 227 up to the year 1978. However, considering the availability of vast literature in this field, the authors could double this chapter easily if they chose to do so. They resist making an exhaustive inclusion in order to make this chapter readable; on this account they are successful. It may be because of this objective that there is no compilation of stability constants of metal ion-nucleotides or nucleic acids. Such a table would be of immense use to scientists who are actively engaged in research. The publisher, contributors, and editor should be congratulated for making such a fine volume.

Anthony T. Tu, Colorado State University

Nuclear Magnetic Resonance Spectroscopy. Volume 10. Edited by J. W. Emsley, J. Feeney, and L. H. Sutcliffe. Pergamon Press, Oxford-New York-Toronto-Paris-Sydney-Frankfurt. 1978. vii + 766 pp.

Volume 10 of this series contains treatments of four diverse topics: spin-spin coupling via the through space mechanism, applications of density matrix theory to NMR line shape analyses, spin-spin coupling and peptide conformation, and ^{19}F coupling constants. Hilton and Sutcliffe have provided a nonmathematical review of the long-range through-space couplings between ^1H - ^1H , ^1H - ^{19}F , and ^{19}F - ^{19}F . The review is critical, gives the reader a good overview of the problem, and provides grist for the theory mill. Buckley, Jolley, and Pinder recount the density matrix in a careful, thorough, and informative style. It is unfortunate that the account is limited to line shapes in systems undergoing exchange. It would seem that the authors could extend their treatment to double resonance, and in the opinion of this reviewer should do so. The Bystrov review of peptide conformation completely covers the methodology of NMR analysis of peptides and will be useful to all workers in the field of peptide structure determination via NMR. Finally, Emsley, Phillips, and Wray have provided "all that you wanted to know about Fluorine coupling constants and were afraid to ask". The section runs over 673 pages, 8 of which are introductory text. This last section, even if of limited interest, should be a treasure trove for ^{19}F investigators.

There is some carelessness in the production. The table of contents has different page numbers than the articles. The copyright date of this book is 1978, but the dates of the contributions are 1975 (twice) and 1976 (twice). Delays of this magnitude in printing can only diminish the value of a timely set of reviews.

This book is not for every chemist, but any serious NMR researcher involved in line shape analysis, peptides conformation determination, or ^{19}F NMR studies should own a copy. Others might prefer examining a library copy.

M. R. Willcott, *University of Houston*

Around the World With Chemistry. By Kurt Lanz (Hoechst, A. G.). McGraw-Hill Book Co., New York. 1980. ix + 420, \$14.95.

I. G. Farben, the German cartel that monopolized chemical manufacturing between the two World Wars, was founded in 1925. According to the author, the political influence of the I. G. was greatly overestimated, and unlike some other German companies I. G. had not supported the Nazis before they took power.

After the war I. G. Farben was broken up and the successor companies started to work independently. The three major surviving companies, Hoechst, Bayer, and BASF, presently enjoy sales in excess of DuPont Company, the largest American chemical manufacturer. How this came about is the story of Kurt Lanz the Vice Chairman of Hoechst A. G., the largest chemical manufacturer in the world with 459 companies operating in 120 countries.

Kurt Lanz was born in Mannheim in 1919. He finished his secondary education in 1937 and has no formal education in chemistry, law, or business. Because of the death of his father he had to seek immediate employment. I. G. Farben was the first company that responded to his job application and placed him into its training program. He literally climbed to the top position through the ranks of I. G. and Hoechst. His knowledge of English and French, and the lack of political affiliation before World War II, was an asset during the post war years. He became the sales manager of Hoechst in 1953 and eventually was put in charge of world-wide sales at an age of 35.

The success of Hoechst is in part the success of West Germany and is described in the Lanz book. The company gradually accomplished operating independently of the occupational authorities and embarked on rebuilding domestic and foreign chemical manufacturing and sales. The latter was accomplished by contacting former I. G. representatives in foreign countries, many of whom became Hoechst employees. Joint ventures and mergers with smaller foreign manufacturers lead many times to the establishment of majority owned and operated plants. German speaking and Jewish refugees from Central Europe were also employed to start sales offices or manufacturing facilities.

Kurt Lanz deals with every country separately. He describes briefly the history of chemical manufacturing in each country and how Hoechst gained a foothold in the country in the postwar era. The short reviews are informative because they even describe countries in which Hoechst has no factories. The historical summaries also include considerations of raw materials and the political and economical climate of the country. Lanz does not hesitate to state his own free-enterprising opinions. He is in favor of free trade, an attitude well reflected by the European Council of Chemical Manufacturers' Federation of which he served as its President.

The book at times reads like some of Fielding's Travel Guide books. As a perpetual world business traveler he is mindful of the countries' scenic beauty, historical heritage, as well of the local gastronomy. Such descriptions are freely woven into the accounts of how Hoechst managed to secure a sales and manufacturing position. The book has special headings for many secondary topics but company receptions and parties gave the author a good excuse to mix descriptions of business with gourmet dishes.

The book is not serious history because it lacks the in-depth research and documentation. It is a lively, interestingly personal, and perhaps biased account of a star performer of the West German business miracle. Unfortunately the book is an eyesore. It includes numerous photographs, some in color, from the Hoechst files. Most of them are out of focus and off-color.

John H. Wotiz, *Southern Illinois University*

Laser and Coherence Spectroscopy. Edited by Jeffrey I. Steinfeld. Plenum, New York. 1978. pp 530.

This book contains five chapters on different topics. The first chapter by Steinfeld and Houston discusses the techniques of double resonance spectroscopy and their applications to specific molecules. Schmalz and Flygare concentrate on coherent transients and Fourier transform methods in the microwave region of the spectrum. Shoemaker's chapter discusses these transients in the infrared region. Coherent transients of spin transitions in electronically excited states is the subject discussed in

the chapter by Harris and Breiland. Finally, the book ends with the chapter by Novak, Friedman, and Hochstrasser on resonant light scattering by molecules.

Even though the "coherence" among the different chapters of the book is not perfect, the book contains some outstanding and useful chapters. The chapter by Shoemaker details thoroughly the concepts of coherent transients in general, and the application to infrared spectroscopy in particular. I liked the author's clarity and his efforts to avoid mistakes in such an article with numerous equations. The chapter by Schmalz and Flygare emphasizes the basic theory in a practical way but along the lines of their review article in 1974 in "Advances in Chemical Physics". The Harris-Breiland chapter provides a good description of some recent advances made in the field of spin coherence in excited states. The authors illustrate their discussion with numerous examples from their own work. Steinfeld and Houston provide a good reference for double resonance techniques observed in a variety of ways and systems. Their discussions are brief but give an idea of what has been accomplished. (I think the section describing lock-in's, box-cars, etc., could have been replaced with more on double resonance findings.) Finally, I found the chapter by Novak, Friedman, and Hochstrasser very educational. It is not written for quantum opticians, but for chemical physicists. I particularly liked their description of fluctuations in resonance and nonresonance "scattering", and the physical description of emission vs. scattering of light by molecules.

All in all, the book is useful and can provide the reader with a knowledge of the various uses of lasers and coherence spectroscopy to study certain problems in molecular physics.

Ahmed H. Zewail, *California Institute of Technology*

Liquid Crystals: The Fourth State of Matter. Edited by Franklin D. Saeva (Xerox Corp.). Marcel Dekker, Inc., New York. 1979. x + 491 pp. \$49.50.

This volume begins with an introduction to the classification scheme for mesophases, followed by four basic chapters devoted to nematics, cholesterics, smectics, and poly- γ -benzyl-L-glutamate liquid crystals. In addition to extensive descriptions of the types of mesophases, these chapters contain an introduction to the specialty topics which are covered in the last seven chapters. Two of these chapters deal with circular dichroism in and the rheology and structure of cholesterics. Other specialized topics about liquid crystals concern IR and Raman work, the correlation of chemical structure and the thermal properties of phase transitions, biological membranes, and the viscous crystalline phase of poly(diethylsiloxane). The volume concludes with a chapter about the applications of liquid crystals.

Generally, the organization of the chapters in this work is good, and the main theme is presented in a coherent, thorough manner. A descriptive approach to liquid crystals is used throughout the volume, as opposed to a fundamental theoretical one. In fact, much of the physics of liquid crystals is either neglected or unclear in their treatment of the subject. The authors emphasize instead the types of phases and structures of, the chemical structural aspect of, and X-ray, thermal, and optical information about, liquid crystals; their discussions of these areas are excellent.

This volume is intended primarily as an introduction to liquid crystals, and the extremely thorough discussion of classifications and structures can serve as both a good introduction to and a handy reference for the descriptive aspects of liquid crystals.

Bret Berner, *The Procter & Gamble Company*

New Concepts in Safety Evaluation, Part 2. Edited by M. A. Mehlman (Mobil Oil), R. E. Shapiro (NIEHS), and H. Blumenthal (FDA). Hemisphere Publishing Corporation, Washington D.C. 1979. xiii + 191 pp. \$24.50.

We live in a toxicological age. Recent increases in the sensitivity of methods to detect the presence and adverse affects of toxicants, particularly carcinogens, have moved toxicological studies from the quiet pages of scientific journals to the front pages of the daily news. Public interest and anxiety are at an all time high. The rapid development of, and demand for, scientifically valid approaches to risk assessment raise a host of exciting, unanswered questions. Is there any "safe" level (threshold) for carcinogens? What does a "zero" level of a contaminant mean in the face of rapidly improving detection methods? How can one validly extrapolate from high doses (typical of animal bioassays) to low doses (typical of human exposures) and from animal data to projected human hazard? How can benefit-risk analysis and decision theory help formulate appropriate responses to potential health problems raised by (perennially) incomplete data?

These are some of the issues the reader might expect to find discussed in a volume with the above title, and, indeed, several chapters (particularly Chapters 3, 5, 6) form a creditable nucleus for such an investigation.

Unfortunately, some presentations involve new (or at least recent) data rather than "new concepts" per se. As the Preface states, the latter half of the book undertakes only to "discuss areas of interest and problems to toxicologists," and several chapters would seem more appropriate to other volumes in this series. This gives the book a rather "grab bag" flavor. Internal cohesiveness could perhaps have been somewhat increased by grouping the presentations into such subsections as: threshold and extrapolation in risk assessment, toxicity of implanted materials, and special cases of interest (e.g., hormones, nitrosamines).

Some examples might be helpful. The book begins with a rather informal discourse on Environmental Carcinogenesis, which made a fine, highly personal oral presentation but should have been rewritten for print (and probably placed in Volume 3 of this series). The idea of using epidemiology (Chapter 2) is hardly a "new concept in safety evaluation," and the ambitious proposal for epidemiological surveillance would have benefited from more discussion of the existing, but thorny, methodological problems involved (e.g., synergy, long latency, dosage estimation, etc.). The chapter comparing methods for analyzing urine for narcotics would seem less crucial than a discussion of more general concepts and problems: QSAR the problems of special population subgroups, the relevance of new toxicological end points (e.g., immunotoxicity, neurotoxicity), etc.

In summary, the selectivity and editing of this volume could be improved, but at its best, it does provide useful insights into (and much of the flavor of) some of the existing problems and developments which characterize modern toxicology.

Irvin M. Asher

Developments in Food Carbohydrates. 2. Edited by C. K. Lee (Tate & Lyle, Ltd). Applied Science Publishers, Ltd., London. 1980. xii + 397 pp. \$75.00.

This excellent book presents the recent chemistry of important food-related oligosaccharides. Five chapters deal individually with the disaccharides trehalose, sucrose, maltose, cellobiose, and lactose while the trisaccharides raffinose and melezitose are the subjects of a sixth. Logical development and consistent presentation characterize these chapters. Each contains a detailed discussion of the chemistry of the subject sugar and its derivatives, which include ethers, esters, cyclic acetals, glycosides, and anhydro, deoxy, halo, nitrogen, and unsaturated compounds. Valuable analytical techniques for structural studies are discussed with special emphasis on nuclear magnetic resonance spectroscopy. Information pertinent to particular sugars is also included, e.g., trehalose and cord factor, sucrose structure and sweetness, and the biochemistry of raffinose. Tables presenting melting points and specific rotations for derivatives terminate each chapter.

A seventh chapter on surface active agents derived from disaccharides presents important aspects of development, manufacture, isolation, structure, analysis, properties, and application of these potentially valuable sugar derivatives.

The application of ^{13}C NMR spectroscopy to oligosaccharide structural studies is the subject of the final chapter. Spectral assignment by correlation of chemical shifts, by double resonance methods and by isotopic labeling is discussed. Determination of anomeric configuration from coupling constants and spectral assignments by comparison of relaxation times are methods exemplified with experimental results and tabular data.

This book is highly recommended as a valuable reference on the chemistry of oligosaccharides.

James W. Berry, *University of Arizona*

Organometallic Compounds. Volume 1. Part 2. 4th Edition. By B. J. Aylett (Westfield College, University of London). Chapman and Hall, London. 1979. (Distributed in the U.S.A. by Methuen, Inc., New York). x + 520 pp. \$87.50, hardcover.

This book is one-half of the fourth edition of "Organometallic Compounds: The Main Group Elements" originally authored by Coates and Wade. The complete third edition of "Organometallic Compounds" by Coates, Green, and Wade came in two volumes and is now 12-years old. The fourth edition of the books will appear as three volumes. Volume I, Part I deals with the main Groups I-III, and Part II with Groups IV and V. Volume II will cover transition elements and is scheduled for publication in 1982.

The third edition of these books was popular and made an important contribution to organometallic chemistry when it became available in 1967-1968. If this volume by Aylett is an indication of the other two, then organometallic chemistry will again be well-served by the series. Volume I, Part II provides both an historical record and a recent account of the synthesis, structure, spectroscopy, and chemistry of organometallics containing Si, Ge, Sn, Pb, As, Sb, and Bi. It bridges the gap between the pure textbook and a specialist's report. Aylett increased the number

of literature references to these elements more than threefold from the third edition in order to present a broad picture.

This book should be valuable to veterans of organometallic chemistry who want a broad overview with considerable detail. Newcomers will also find the book to be a readable account and an excellent stepping-stone to the research literature. However, the price will likely place it out of range of most personal libraries.

Thomas B. Brill, *University of Delaware*

Corrosion of Nickel and Nickel-Base Alloys. By Wayne Z. Friend (The International Nickel Co.). John Wiley and Sons, New York. 1980. viii + 459 pp. \$39.95.

This book is an authoritative and up-to-date compilation of the corrosion behavior of nickel (of various grades) and high-nickel alloys in a host of environments. It replaces the chapters (mostly by the same author) in the "Corrosion Handbook" edited by Uhlig and published in 1948.

Following two helpful chapters of introductory and general material, the remainder of the text is organized according to alloy families: Ni, Ni-Cu, Ni-Cr, Ni-Fe, Ni-Mo, Ni-Cr-Mo, Ni-Cr-Mo-Cu, Ni-Fe-Cr-Mo-Cu, and other Ni-base alloys. A final chapter on Ni-base superalloys was coauthored with Harold T. Michels. These chapters on alloy families include a section each outlining the physical metallurgy of that family.

The author's emphasis is on useful information usefully presented for the benefit of the practicing corrosion engineer or metallurgist. Temperatures are given in Celsius (not Kelvin) and Fahrenheit, and the familiar commercial names of the alloys are used throughout. Corrosion rates are given in mils per year, with metric equivalents parenthesized.

Within any chapter on an alloy family the material is organized according to corrodent. Running heads give the alloy family on the left-hand page and the principal category of corrodent on the right-hand page, a useful adjunct to the index. Each chapter is referenced liberally.

The index is a detailed one as far as corrodents are concerned. In the case of each corrodent, the alloy family is identified along with the page number entry. For example, one can see in the index that under Ammonia p 357 has information on Ni-Cr-Mo alloys.

Although the author disclaims comprehensiveness, no other publication known to this reviewer can compare with this book in breadth and depth of coverage. It will probably remain a standard for corrosion engineers and metallurgists particularly in the chemical industry (though not only there) for the rest of this century.

B. F. Brown, *The American University*

Glassblowing: An Introduction to Artistic & Scientific Flameworking. By Edward Carberry (Minnesota Southwest State University). MGLS Publishers, Marshall, Minnesota. 1977. x + 262 pp. Spiral bound \$12.45.

The author has recognized, probably through teaching glassblowing courses himself, the need for such a text as this one. A suggested syllabus is given for two types of courses, one for artists using mostly solid rod techniques, and another for scientific glassblowing that covers simple tubing manipulations as well. Compared to courses this reviewer has taught, the scientific syllabus may be light on actual construction of complex apparatus (though it analyzes it), but that can be remedied by adding several classes to the eleven-class syllabus suggested. It covers glass repair, perhaps actually more important for the science student than advanced construction. The art syllabus is a large improvement over forcing the inevitable art student through the scientific exercises.

The text is well written with detailed, accurate, stepwise instructions for each laboratory exercise accompanied by good sketches or pictures. There is a good glossary of terms followed by illustrated sections defining standard catalogue glassware parts and finished apparatus as well as a list of glassblowing equipment suppliers. The first quarter of the book is a quite good discourse on the requisite glass technology, although the significant references cited below might well have been included. Similarly, the mystery on p 27 of why scratched glass breaks easier when wet than dry can probably be explained adequately in physical chemical terms as the satisfaction of freshly broken bonds of the fracture by chemisorption of the water if it is there.

This laboratory text will be a valuable instructional guide alone or as part of a suitable course for both art and science students of glass.

(1) W. E. Barr and Victor J. Anhorn, "Scientific & Industrial Glass Blowing & Laboratory Techniques", Instruments Publishing Co., Pittsburgh, Pa. 1959.

(2) Dominick Labino, "Visual Art in Glass", Wm. C. Brown Co., Publishers, Dubuque, Iowa, 1968.

Bruce B. Graves, *Foundation for Instrument History & Research*

Photochemistry of Man-Made Polymers. By J. F. McKellar and N. S. Allen (University of Salford). Applied Science Publishers Ltd., London. 1979. x + 306 pp.

During the past 10 years a number of books dealing with the degradation and stabilization of polymers have appeared. One would not think that another would serve a useful purpose. However, the authors of this book appear to have been successful in filling a void as well as up-dating recent technology.

The book consists of seven chapters which, while being relatively brief, seem to cut to the heart of their respective topics. The discussion on the absorption and emission of light especially relating to polymers is by far the most direct and would appeal to those who are entering the field or who want the basic understanding without digging through a treatise on photochemistry. The chapters on photodegradation and photooxidation processes and photostabilization processes are quite complete yet stress the more recent findings in these areas. Photosensitized processes involving dyes and pigments are given importance by devoting a brief yet fundamental chapter to the subject. Two areas of growing importance, photodegradable plastics and polymer luminescence, are each discussed in their own chapters as concise reviews. As is routine with most books on the photochemistry of polymers, a chapter on the weathering of plastics rounds out the subject. Appendices on luminescence characteristics of polymers, commercial antioxidants and photostabilizers, and weather-testing equipment are in tabular form and give a nice readily accessible form to these areas.

Certainly, more in-depth treatises on the photochemistry of polymers have been published. The present authors, however, have reviewed the subject in a manageable way. While the photochemistry covers the gamut of man-made polymers, the emphasis certainly centers around polyolefins where most of the research efforts have been. The student interested in entering this active field or the casual observer who would need review would find this book appealing. Technical libraries would find it worthy as an addition to their shelves.

Dwight W. Chasar, *B. F. Goodrich Company*

Gel Chromatography. By T. Kremmer (Department of Biochemistry, National Oncological Institute, Research Institute of Oncopathology, Budapest, Hungary) and L. Boross (Jozsef Attila University, Szeged, Hungary). Wiley-Interscience, Chichester, UK. 1979. 299 pp. \$45.00.

Modern Size-Exclusion Liquid Chromatography. By W. W. Yau, J. J. Kirkland, and D. D. Bly (E. I. duPont de Nemours & Co.). Wiley-Interscience, New York. 1979. xiv + 476 pp. \$24.95.

Broadly speaking, the field of gel chromatography (a reflection of liquid chromatography in general) is now regarded with some justification as divisible into two separate and distinct methodologies. On the one hand, "classical" techniques encompassing large-diameter columns and gravity-feed flow rates persist because of the simplicity of the apparatus and the ease with which large amounts of sample can be injected and collected. This forms in general the basis of the first text, which is a translation of the version published originally in Hungarian by Akadémiai Kiadó (Budapest) in 1979. The translator, M. Gábor, is to be congratulated for a superb rendition: the text is virtually free of errors usually associated with efforts of these kinds, and the material is presented clearly and without ambiguity. A preface and historical survey give those interested in gel chromatography a concise and informative account of its development, while Part I, Chapter 1 offers an excellent introduction to the types (and respective structures) of gels. Chapter 2 (Theory) will be pleasurable reading for those who already possess a working knowledge of the physicochemical principles of chromatography, and will serve as a good introduction for those who do not. The only fault with this section worth mentioning is the brevity with which solute shape is treated. Part II, Chapters 1-3 (Materials and Techniques) offer many helpful and practicable hints for the beginner, such as selection and preparation of gels, (low-pressure) pumps and column thermostats, regulation of the flow rate, fraction collection, and so forth. Also included (Chapter 3) is a review of more specialized techniques such as recycling, complexation, and thin-layer gel chromatography. Part III (six chapters) is entitled Applications of Gel Chromatography and is concerned for the most part with separations of interest to biochemists (proteins, nucleic acids, carbohydrates). The one serious weakness of this text is the disappointingly brief coverage (eight pages) of the substantial import of the technique in polymer chemistry. The last chapter, however, offers an overview of a subject rarely discussed, namely, the gel chromatography of inorganic ions. The bibliography is extensive (ca. 1000 references), with the majority of citations dated prior to 1976-1977.

Contemporary developments have in the interim popularized the use

of small-diameter particles, narrow-bore columns, and pressurized solvent delivery systems, with concomitant increase in column efficiency at the expense (both literal and metaphoric) of preparative capability. The second text comprises a review of these topics. However, the first sentence of the Preface reads: "This book is concerned with high-performance size-exclusion column liquid chromatography (HPSEC), meaning high-performance gel permeation chromatography (HPGPC) and gel filtration chromatography (HPGFC)." A distinction is thus immediately drawn (which persists intermittently throughout the book) which is artificial, unnecessary, and confusing. HPGFC is, for example (p 3), said to concern the separation of water-soluble macromolecules of biological origin, while the term HPGPC (p 4) is reserved for small molecules, large molecules, or polymers (presumably originating from any source). The background/historical review presented in Chapter 1 is brief and incomplete, while the section on molecular-weight determination which follows would better have been placed in Chapter 9. The second chapter presents the usual retention equations where, however, the symbol K_{SEC} is used in place of that traditionally employed for the distribution coefficient, K_d . The section on theoretical descriptions of pore and solute shapes and sizes is useful, although hindered by the GFC/GPC distinctions drawn. The polemical section entitled, "Less Successful Attempts of SEC Retention Theory" would best have been incorporated into a comprehensive review of the theory of retention in gel chromatography, or deleted altogether. Chapter 3 presents a confusing blend of GC and LC plate and rate theories, wherein the authors have lost sight of their goal of elucidation of those aspects of liquid chromatography which pertain predominantly (or exclusively) to the use of inert and porous support material. Chapter 4, Resolution, corrects to some degree the above-mentioned faults but concludes inexplicably with examples of the practical implications of Chapter 3. The real value of the text is to be found in Chapters 5 (Equipment and Detectors), 6 (The Column), 7 (Operating Variables), and 8 (Laboratory Techniques). Chapter 9 (Calibration, i.e., for molecular-weight determinations) contains an excellent review of those factors which are relevant to the precision and accuracy of the technique, while Chapter 10 (Data Handling) is a logical extension of Chapter 9 and should have been incorporated as such. Chapter 11 discusses only briefly special techniques such as the separation of small molecules, preparative-scale LC, and recycled separations. Chapter 12 presents examples of chromatograms of a wide range of synthetic materials and should have followed Chapter 10 directly. The sections on physicochemical characterization (Branching, Chain Folding, etc.) of polymers could easily have been expanded into a separate chapter. Chapter 13 (Techniques of Modern Gel Filtration Chromatography) concludes the book with a discussion of those (few) details pertinent to aqueous systems which, however, had in most cases already been covered in the preceding 400 pages. Virtually all of the remaining material could easily have been incorporated into Chapters 1-12. An extensive and helpful list of symbols and abbreviations and a detailed subject index are included.

With the above-mentioned contextual limitations in mind, the first text can be recommended enthusiastically both as a sound introduction to classical gel chromatography and as a useful reference for those engaged in the separation of biomolecules. The second book offers little, however, that has not already been covered in contemporary works on LC and its usefulness must therefore be regarded as somewhat limited.

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Antibiotics. Volume V. Part 1. Mechanism of Action of Antibacterial Agents. Part 2. Mechanism of Action of Antieukaryotic and Antiviral Compounds. Edited by F. E. Hahn (Walter Reed Army Medical Center). Springer-Verlag, New York. 1979. Part 1: xii + 376 pp. Part 2: xiii + 470 pp. \$178.20.

These two volumes provide a timely review of the mechanism of action of a number of antibiotic substances. The treatment is selective rather than comprehensive and it includes a number of compounds such as synthetic drugs and alkaloids that are not antibiotics in the strict sense. Part 1 reviews the mechanism of action of 20 antibacterial agents or groups of agents including bicyclomycin, the ionophore antibiotics, nalidixic acid, nitrofurans, and the thiostrepton family of antibiotics. Part 2 reviews 21 antieukaryotic and antiviral agents and includes the anti-tumor platinum compounds, ellipticine, the polyene antibiotics nystatin, amphotericin 3, and filipin, and the *Vinca* alkaloids. Both volumes contain a wealth of information concerning a fascinating area of research and both will surely be of great value to investigators in the field. However, the high price of these volumes will no doubt limit their accessibility.

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