# Additions and Corrections

**Structure and Mechanism in the Photo-Retro-Aldol Type Reactions of Nitrobenzyl Derivatives. Photochemical Heterolytic Cleavage of C–C Bonds** [*J. Am. Chem. Soc.* **1988**, *110*, 4336–4345]. PETER WAN* and S. MURALIDHARAN

Reported quantum yields for photo-retro-aldol reaction of the alcohols and acetals (Figures 2 and 3) are in error and should be multiplied by a factor of 3 to give the correct quantum yields. The error arose from the failure to take into account the volume of the cuvette (3.0 mL) in calculating the quantum yields by UV spectrophotometry. This correction does not alter the mechanistic deductions of the paper.

# Book Reviews*

**Photophysics of Polymers. ACS Symposium Series 358.** Edited by Charles E. Hoyle and John M. Torkelson. American Chemical Society: Washington, DC. 1987. XI + 531 pp. $99.95. ISBN 0-8412-1439-5.

This compilation of a symposium sponsored by the Division of Polymer Chemistry is, according to the editors, "designed to provide scientists who are engaged in basic and applied polymer research with a clear status of polymer photophysics". This volume contains 36 contributions and is organized into seven sections: 1, Overviews; 2, Polymer Dynamics and Complexation; 3, Eximer Photophysics; 4, Energy Migration; 5, Photophysics of Polyelectrolytes; 6, Luminescent Polymerization Probes; 7, Photophysics of Silicon-Based Polymers. As to be expected in any symposium proceedings, there is a wide diversity in the quality of the contributions, both in scientific content and in presentation.

The inclusion by the editors of an Overviews section is commended, even though the implicit promise of providing a basic introduction to the photophysics of polymers is not realized. Of the four contributions, the presentations by Winnik (fluorescence quenching techniques) and by Frank and Zin (morphology in polymer blends) are the most useful didactically. In contrast, the introductory summation by Hoyle was disappointing in its brevity; however, the reader will find the bibliography useful in suggesting sources for study in this field.

The bulk of the contributions are contained in the sections on Polymer Dynamics and Energy Migration (10 each). Polymer dynamics encompass a variety of processes, ranging from local motion of the polymer chain and pendant groups to conformational changes and diffusion of solvents and small molecule reactants in polymers. Local dynamics of polymers are typically investigated using time-resolved fluorescence anisotropy measurements and the exposition of Monnerie et al. (local dynamics in polybutadienes) is a good example of this genre. Similarly, Waldow et al. utilize the picosecond holographic grating technique to monitor the anisotropy of polymer motion along the backbone of polyisoprene; this contribution conveys the excitement and potentiality of newer techniques derived from optical physics. In addition to probing molecular motion, fluorescence depolarization studies can also provide information on the dynamics of excitation transfer or migration between polymeric chromophores. The contribution of Phillips presents a lucid introduction to this important topic in polymer photophysics and emphasizes that the complex, multiexponential fluorescence decays observed in many polymeric systems may originate not only from heterogeneity in molecular motion, but also from complex formation or energy transfer. In a more practical contribution which amalgamates theory and experiment, Peterson et al. demonstrate that in well-characterized systems quantitative information concerning coil size of guest polymers in defined polymer blends can be extracted from excitation transfer experiments.

The predominant emphasis in this volume is on luminescence techniques, both fluorescence and phosphorescence. In this regard, the final section of this volume provides an interesting variation on this theme: the thermochromism of polyorganosilylenes.

As a composite portrait of the mainstream of polymer photophysics, this volume, though pedestrian, is useful for those researchers with interests in polymer structure, dynamics, and characterization. However, for insight into future directions of research and focus on topics at the leading edge of photophysical studies in polymer science, this book is not recommended. This reviewer was puzzled by the lack of coverage of photoactive polymers and photoresists, indeed emergent areas such as photophysical studies of biopolymers and nonlinear optical properties of polymers were excluded completely. As to whether the editors achieved their goal as stated above, the verdict is not conclusive.

**Joseph T. Warden,** *Rensselaer Polytechnic Institute*

**Advances in Magnetic Resonance. Volume 12.** Edited by John S. Waugh (Massachusetts Institute of Technology). Academic: San Diego and New York. 1988. vii + 438 pp. $88.00. ISBN 0-12-025512-x.

This volume of the *Advances in Magnetic Resonance* series consists of six chapters, all written by respected experts in the respective areas in magnetic resonance. The contents of the chapters range from the practical applications of $^1$H NMR thermal analysis in complex materials to the very basic descriptions of spin relaxation in mixtures of hydrogen isotopes and in pairs of spin-1/2 nuclei.

The first chapter, written by Jörg Kärger, Harry Pfeifer, and Wilfried Heink, describes the theory of NMR self-diffusion measurements. A detailed account of the various modifications of the basic field gradient spin–echo technique is given. Examples of applications of these measurements to systems such as polymer melts and solutions, liquid crystals, and molecules on surfaces and in porous solids are illustrated.

In Chapter 2 (James R. Gaines and P. C. Sauers), the theory of spin–lattice relaxation in solid $H_2$ is reviewed. The measurements of relaxation rates of the hydrogen isotopes and their mixtures and the use of these results to test the relaxation models are described.

Chapter 3, by C. von Borczyskowski, describes optical detection of nuclear spin alignment and NQR in organic molecular crystals. The basic principles of optical nuclear polarization (ONP) in general and its exploitations in NMR techniques are reviewed. The emphasis, however, is on the principles of optical detection of nuclear spin alignment and NQR (ODNQR). An extensive review of applications of the ODNQR is presented. This chapter also contains the discussions on the comparisons between the increased sensitivity of ODNQR and that of the conventional NQR, and between ODNQR in the ground state and the optical detection of ENDOR (ODENDOR) in excited states of the molecules.

Chapter 4, by Alexander Keller, examines the relaxation of dipolarly coupled pairs of spin-1/2 nuclei in terms of the spin-1 behavior. Both the theoretical and experimental aspects are discussed. In particular, the experimental procedures for preparing the spin system in any coherence states or quasi-invariants of the motion, and the monitoring of their time evolution are demonstrated. Some special techniques, such as selective excitation of single-quantum transitions with hard pulses, single-shot detection of double-quantum coherence evolution, and double-quantum line narrowing by multiple-pulse techniques are also discussed.

Chapter 5, written by Warren S. Warren and Michael S. Silver,

*Unsigned book reviews are by the Book Review Editor.

describes the theory and development of pulse shape crafting in NMR and laser spectroscopy. The formalisms of generating shape pulses, the exactly solvable cases, the perturbative treatments, and computer numerical optimization methods are discussed in detail. The applications are described from the perspectives of laser spectroscopy as well as from NMR and magnetic resonance imaging.

In the last chapter, written by Leo J. Lynch, David S. Webster, and Wesley A. Barton. the practical aspects (probe design, methodology, and data analysis) of using pulse $^1$H NMR to monitor thermal transformation in materials in situ ("$^1$H NMR thermal analysis") are described. The applications of this method to the characterization of the structure and the kinetics of thermal transformation of materials such as coal, shale, and synthetic and natural polymers are illustrated.

This volume has maintained the same high quality as in the previous volumes of this series. All the chapters are lucidly written and supplemented by a large number of well-produced figures. This book should be a valuable addition to the library and to the collection of chemists and physicists who are interested in NMR spectroscopy.

**Tuck C. Wong,** *University of Missouri—Columbia*

**Computational Methods in the Chemical Sciences.** By A. F. Carley and P. H. Morgan (University of Wales). John Wiley & Sons: New York and Chichester. 1989. 337 pp. $115.00. ISBN 0470-21490-2.

The authors tell us that their "motivation for writing this book lies in a strongly held belief that every science graduate ought to be versed in rudimentary numerical and computational skills," and, as such, the book is aimed primarily at a novice audience. The elements of numerical analysis are introduced in a casual and readable style, interspersed with chemical examples, and minimal prerequisite knowledge is demanded of the reader. Those interested in a comprehensive exposition of numerical methods will, however, find this volume rather incomplete. There is no discussion, for example, of Gaussian quadrature or advanced linear algebra (eigenvalues/eigenvectors, etc.), but the authors promise that a "sister" volume, to be published in the near future, will include more advanced topics. Also, the authors' treatment is at times unsatisfying, and the reader will find him/herself directed to other sources, or simply wanting to know more. These shortcomings are presumably the result of a desire to keep the book to a relatively short length, which is perhaps unfortunate considering its price.

The book contains six chapters, each augmented by listings of related programs written in Applesoft BASIC. This choice of language reflects the intended novice audience and is appropriate for microcomputer applications. BASIC is not, however, a language of choice for advanced scientific programmers.

Chapter 1 encompasses a variety of subjects including basic approximation and error concepts, root-finding algorithms, basic Monte Carlo concepts, and elementary linear algebra with an introduction to Gauss–Seidel iteration. Chapter 2 on interpolation methods discusses divided differences, Aitken's method, Lagrange polynomials, rational functions, and cubic splines. Chapter 3 is dedicated to numerical integration and differentiation, with emphasis on Simpson's rule and related methods. Solution of differential equations is treated in Chapter 4, through Taylor series, Euler, predictor–corrector, and Runge–Kutta methods, with an introduction to partial differential equations as well. Chapter 5 discusses the analysis of experimental data by linear, polynomial, and nonlinear least-squares fitting. Finally, Chapter 6 on optimization techniques covers direct search and gradient methods, least-squares minimization, error estimation, and incorporation of constraints.

Overall, this is not a comprehensive or advanced textbook of numerical analysis. It is a relatively short and friendly introduction to an increasingly important subject, written for those with special interest in chemistry who want an alternative to the oftentimes dry standard treatments.

**A. D. Becke,** *Queen's University*

**Nonlinear Optics of Organics and Semiconductors. Springer Proceedings in Physics 36.** Edited by T. Kobayashi (University of Tokyo). Springer-Verlag: New York and Berlin. 1988. xi + 322 pp. $59.50. ISBN 0-387-51045-1.

This is the 36th book in the Springer Proceedings in Physics Series and represents a collection of papers presented at a two-day conference. The format is essentially journal-like, with no introductory material presented. The reader will need to have some familiarity with the field. Given this, the contents do provide a useful cross-section of nonlinear optical methods and materials.

Nonlinear optics utilize the quadratic or higher order optical hyperpolarizabilities of various materials. Samples from two broad classes of materials—semiconductors and organics—with appreciable nonlinear characteristics are treated.

Parts I and II of the text deal with semiconductors. Part I presents theoretical developments and some experimental work, while Part II is primarily experimental. The theory is not useful as an introduction to the field, but may present insights for the experienced worker. Several semiconductor systems with nonlinear properties are discussed, but the coverage is not intended to be exhaustive.

The majority of the book focuses on organics, apparently because these hold promise for large nonlinear effects and more flexibility of design. Part III begins with three papers discussing hyperpolarizability calculations. This would serve as a useful starting point for predicting the nonlinear properties of new materials—the effects of substituents, polarity, and molecular volume, for instance. Part IV discusses the properties of two organic molecules and their derivatives.

Part V presents 11 papers dealing with polymers. The length of this section is indicative of the importance of polymers to nonlinear optics. The material is well presented and covers a range of properties and materials. I found the papers on films and copolymers, and descriptions of the range of experiments used to measure the nonlinear properties, intriguing.

Parts VI and VII move on to organic crystals, either single crystals or powders. Most of the papers focus on one molecule (and its derivatives), so the utility of these sections lies in the quantity (9) and diversity of papers presented.

A short section (Part VIII) involving liquid crystals follows. More information would have been welcome here, since liquid crystals (and polymeric liquid crystals) can provide some very unusual physical properties to the experimenter.

The final section covers device-oriented research. As with the rest of the text, the value of this section lies in the multiplicity of systems and techniques discussed.

Reviewing a proceedings is difficult—the material is spread between a range of authors, whose diversity of styles and interests makes thematic unity impossible. The shortness of this particular conference ensured that certain topics would be missed or, at least, greatly reduced in importance. Overall, the strength of this book lies in the diversity of topics covered—the range of techniques and molecular systems studied. As noted at the outset, the primary weakness for the chemist interested in the field is the lack of introductory material—the book is essentially a compilation of journal articles. The text would be a good reference for the worker in the fast-growing field of nonlinear optics.

This text, as is usual for proceedings, uses a number of typefaces, but it is always legible and contains no handwritten formulae.

**Michael S. Bradley,** *University of Connecticut*

**Crystals: Growth, Properties and Applications. Volume 12. Crystal Growth from the Melt.** By G. Müller (Universität Erlangen). Springer-Verlag: New York and Berlin. 1988. 138 pp. $77.60. ISBN 0-387-18603-4.

The ever increasing application of semiconductor-based electronics has created an enormous demand for high-quality semiconductor single crystals; industrial production has grown to over 3000 metric tons in a nearly billion-dollar per year industry. This book covers the recent advances in bulk single-crystal-growing science for semiconductors (e.g., Si and GaAs) and oxides, which are at present commercially produced and have nonuniform properties in the microscale (e.g., doping striations) and in the macroscale (longitudinal and lateral segregation). There are six different growth methods discussed, with three or four variations of most of these methods. The book is very informative and has an excellent coverage of the current literature with a good analysis of recent reports and publications. The author is well acquainted with this research and recent authors and has integrated their contributions into a very readable text. This text is written for the practicing scientist who already has a background in crystal growth from the melt by the Czochralski, Bridgman, or zone methods. The inexperienced reader will need to review these topics from other sources. The authors provides a good list of symbols and has provided 200 references. Both the subject index and author index are adequate.

The pictures are excellent, the figures and tables are abundant, and a liberal use of equations all help to illustrate this well-written book. A goal of this science and this book is to bring about an improvement of the microscopic and macroscopic homogeneity for all applications, including very high speed integrated-circuit quality. This work addresses the improvement of existing techniques and the development of new methods with the aim of producing more homogeneous crystals and should contribute to this goal by investigating the origin of the formation of inhomogeneities and developing a process model of crystal growth. Certainly this book shows considerable advancement over one of the first textbooks on crystal growth, *The Art and Science of Growing Crystals*.

Some of the notation is confusing, such as the use of $V$ for velocity and $\nu$ for viscosity with 1 for length, resulting in equations with $(1V/\nu)$ which looks as though it should simplify to one—but of course it does not.

The eight chapters cover the current status of the development and refinement of the science and crystal growth from melts. Modeling these methods still requires simplification, and they are limited to one- or two-component systems with doping. However, the influence of gravity (both increases using centrifuges and reduction of gravity involving zero-gravity studies in space) has been treated in detail, noting some good improvements in crystal quality, especially for the crystal-pulling technique named after Czochralski. Its optimization is very difficult because of the interaction of three different convection mechanisms (buoyancy, rotation, and capillarity) as well as crucible reactions (e.g., for Si). They predict distinct improvement of the homogeneity by using smaller effective melt height (by use of continuous liquid feed), wall heating instead of bottom heating, and a vertical magnetic field. The best alternative to the Czochralski process, especially for the growth of III–V compounds, is the vertical Bridgman configuration with bottom seeding. This method offers, from both a theoretical point of view as well as from an experimental one, the best conditions for the growth of macroscopically and microscopically homogeneous crystals. This method has been hampered by the disadvantage that one cannot observe the growing crystal, resulting in problems with the seeding process. Also the crystal grows in contact with the crucible wall.

In summary, this book, while offering the very latest in advances in this valuable area, provides discussion of ways and means of avoiding the formation of undesirable inhomogeneity during melt growth of semiconductor crystals by using process models that contain considerable approximations and simplifications because of the limitation of existing computers. The numerical modeling will most certainly be improved continuously in the future if the limitations can be reduced stepwise, with the aim of a simultaneous treatment of heat and material transport, buoyancy, rotation, and capillary convection in three dimensions.

**Joseph S. Cantrell,** *Miami University*

**Chemical Analysis of Polycyclic Aromatic Compounds.** By Tuan Vo-Dihn (Oak Ridge National Laboratory). John Wiley and Sons: New York and Chichester. 1989. xxiv + 494 pp. $85.00. ISBN 0471-62889-1.

This is Volume 101 in Chemical Analysis: A Series of Monographs on Analytical Chemistry and Its Applications. It is comprised of 15 chapters concerned with the analysis of polycyclic aromatic compounds and is written by experts in the field.

The first two chapters are concerned with very important general information that will help beginning scientists in the polycyclic aromatic compounds (PAC) area, or act as a good review for those already active in the field. Such information included in these chapters are definitions of PAC's, where they occur in nature, the importance of heterocyclic PAC's, and the fate of these compounds in the atmosphere and during sampling.

The other 13 chapters give in much detail the different analytical techniques that are available to analyze PAC's with many excellent examples. They cover three general analytical areas: chromatography, spectroscopy, and immunoassay. The chromatography sections include (1) gas and liquid chromatographic techniques, (2) capillary supercritical fluid chromatographic methods, and (3) micelle-mediated methodologies.

There are 9 chapters discussing the latest spectroscopy techniques used in PAC analyses. These are (1) ultraviolet and luminescence spectrometry, (2) phase-resolved fluorescence spectroscopy, (3) mass spectrometry, (4) laser multiphoton ionization spectroscopy, (5) multidimensional resonance two-photon ionization mass spectrometric based analysis, (6) photothermal spectroscopy, (7) infrared analysis, (8) Raman spectroscopy, and (9) surface-enhanced Raman spectroscopy.

Finally, there is a chapter devoted to the ever increasing and important field of immunoassay as it applies to PAC analysis.

This is a must book for anyone analyzing polycyclic aromatic compounds and/or teaching the subject. It is the most up-to-date comprehensive book written on the subject. All the important analytical techniques for PAC analyses are discussed in detail.

**Rodney J. Bushway,** *University of Maine*

**Self-Diffusion in Electrolyte Solutions: A Critical Examination of Data Compiled from the Literature. Physical Sciences Data 36.** By R. Mills (The Australian National University) and V. M. M. Lobo (University of Coimbra). Elsevier Science Publishers: Amsterdam and New York. 1989. 354 pp. $134.25. ISBN 0-444-87288-4.

This volume will be useful to those interested in the transport properties of species in water and some other solvent systems. The short introductory section on techniques is necessary but is too condensed to be much help to some potential users of the book except to provide a good source of authoritative references on the subject. There is a puzzling lack of discussion of units, which would be appreciated by nonexperts in this introduction.

For a book such as this to be titled a "critical examination" of data, credibility has to be established by very careful attention to details, and in this respect, the work is marred. For example, the comments section under each entry sometimes simply contains the symbol N/C (needs checking), but for reasons not shared with the reader. Some comments are trivial; others are perplexing, such as an assigned estimated precision of $\pm>1\%$, because the journal was not available to the authors! The brief statement on complex ion formation (and lack of mention of hydrolysis) without reference to concentration effects and infinite dilution values of the self-diffusion coefficients is unfortunate. I note the tabulation of calculated $D^\circ$ values in Appendix I at other than normal temperatures and pressures cannot be used in some cases because the authors did not list the known number of significant figures. Further, in this case, important references were overlooked resulting in omission of entries for several important species (e.g., $HCO_3^-$ and $SO_4^{2-}$). Finally, this reader almost despaired in trying to locate various sections of the book referred to in the comments under each electrolyte but not indexed by page or in any detailed table of contents.

**James W. Cobble,** *San Diego State University*

**The Additives Guide.** By Christopher C. Hughes. John Wiley & Sons: Chichester and New York. 1987. 131 pp. $37.95. ISBN 0-471-91496-7.

At one time or another virtually everyone has picked up a box of cereal or other prepackaged food and scanned the list of ingredients on the label. That the number of additives usually exceeds the number of natural ingredients is likely to be troubling to the average citizen. It is for the concerned consumer that *The Additives Guide* is written. Its objectives are to demystify the list of additives and simultaneously to reassure the reader about the safety of the food supply. These objectives are realized quite adequately.

The book consists of three short descriptive chapters on the general aspects of food additives and an extensive glossary. The latter comprises more than 80% of the text and catalogues 450 chemical substances, natural and "chemically synthesized", which are currently added to food. Included in this list are some unlikely substances such as sawdust, carbon dioxide, nitrogen, silver, and gold, the latter metals being used as colorings in the confectionary industry. The glossary also defines some 30 generic terms such as sequestrants and flavor enhancers. There is a great deal of interesting information here, all of it accessible as a result of careful cross-referencing.

Although it was published in Great Britain, one must assume that the book covers most food additives in common usage in the United States. The treatment of the various additives is highly objective with a minimum of editorializing. But the coverage is also rather spotty, ranging from a single sentence for potassium hydroxide (!) to several paragraphs for ascorbic acid. In contrast the important and popular issue of sulfites in food merits only passing references under the headings of $KHSO_3$, $NaHSO_3$, $Na_2SO_3$, and $SO_2$.

The book is clearly intended as a reference for the layperson. Additives are characterized only by molecular formula or, for simpler compounds, by IUPAC name. The absence of structural formulas is understandable given the intended audience, but frustrating for the professional who could utilize this information. The dependence on molecular formula would be misleading to the nonchemist who might conclude that elemental composition, rather than structure, defines molecular properties. From a scientific standpoint, moreover, the coverage is occasionally inaccurate (formulas of $CaCO_2$ for calcium carbonate and $KNO_3$ for potassium nitrite, for example) and woefully incomplete. Missing from the book are any quantitative data on the harmful properties of additives or the typical concentrations of these substances in common food preparations. At a price of $37.95 for this little volume one is entitled to more substance.

**Mark R. DeCamp,** *University of Michigan—Dearborn*

**Density Functional Theory of Atoms and Molecules.** By R. G. Parr and W. Yang (University of North Carolina). Oxford: New York and Oxford. 1989. ix + 333 pp. $55.00. ISBN 0-19-504279-4.

This book is an excellent rigorous introduction to the ideas of density functional theory, couched in the language of density matrices that is familiar to theoretical chemists. It is well-written and authoritative, fills a void in the literature, and should be part of the library of practicing theoretical chemists and physicists. However, it is more than a reference book and should be very useful for both formal courses and self-study. This reviewer has used some of the material in a brief set of lectures in an introductory graduate quantum mechanics course for chemists, with very good results. In addition, the reviewer's research group is studying and discussing the material in the book during regular meetings. For both these purposes, the book is excellent, especially if the readers have been exposed to quantum chemistry and density matrices.

The first chapter is a brief review of elementary wave mechanics including the Hartree–Fock method, correlation energy, and the Hellmann–Feynman theorem. Chapter 2 covers density matrices in some detail along with a brief discussion of the N-representability problem for reduced density matrices. Formal density functional theory is presented in Chapters 3–5. Chapter 3 includes the Hohenberg–Kohn theorems, representability of the electron density, and finite temperature extensions. Chapters 4 and 5 cover the chemical potential; the latter contains an especially lucid exposition of the relationship between derivatives of the chemical potential and various chemical properties such as electronegativity, hardness, softness, and reactivity.

Implementations of density functional theory are covered in Chapters 6–8. Chapter 6 covers Thomas–Fermi through Thomas–Fermi–Dirac–Weizsacker models, which utilize either local or gradient-corrected kinetic energy functionals. Kohn–Sham theory is detailed in Chapters 7 and 8. The final three chapters cover extensions of density functional theory, applications to atoms and molecules, and miscellaneous topics. Six appendices provide mathematical and physical information. The last appendix is an excellent 37-page review of the literature.

As in any book of modest size, some topics must be left out. In the present book, this includes the multitude of applications in extended systems as well as much work on development of new exchange-correlation and kinetic energy functionals. For most chemists, the focus solely on atoms and small molecules will be appropriate. However, further treatment of the exchange-correlation energy functional will be of major importance to chemistry and chemists. The present book will serve to introduce the subject and also to guide new researchers to the literature.

**Andrew E. DePristo,** *Iowa State University*

**Selectivity and Detectability Optimizations in HPLC.** By Satinder Ahuja (CIBA-GEIGY Corporation). John Wiley & Sons: New York and Chichester. 1989. xiii + 610 pp. $85.00. ISBN 0471-62645-7.

This book, Volume 104 in the continuing series in Chemical Analysis, attempts to tie together the two primary goals of the chromatographer, e.g., chromatographic selectivity and optimization of the detection process. Selectivity is defined as the ability of the column/mobile-phase components of the chromatographic system to separate various sample compounds present in a mixture in a reasonable amount of time. Detectability relates to the capabilities of a specific detector system (detector and associated electronics) to maximize the signal produced by a sample component while minimizing noise and peak width.

Chapter 1 briefly defines selectivity and detectability optimizations and provides a framework for subsequent discussion of these concepts. The next two chapters provide a background on the physicochemical basis of retention. Chapter 2, contributed by L. R. Snyder, gives excellent coverage of this subject. Chapter 3 describes a number of studies conducted to improve our understanding of separation mechanisms. The author's warning that a sound foundation in HPLC is necessary prior to utilizing this book comes into play here in the form of a number of undefined terms and concepts. Finally, Chapter 4 gives a summary of conventional approaches to mobile-phase selection and optimization, and contains an excellent summary table of factors influencing retention in ion-exchange chromatography.

The next series of chapters (5–10) describes approaches to the optimization of selectivity for the various chromatographic techniques (normal-phase, reversed-phase, ion-exchange, and ion-pair chromatography) and molecule classifications (macromolecular and isomeric separations). As before, a number of terms are not defined, and the reader is expected to remember meanings of symbols defined in earlier chapters. (A table of symbols would improve the usability of this book for those who do not start at the beginning and progress directly to the end.) In each chapter there is a wealth of reference material given relating to specific applications.

Chapter 11, Computer Optimization of Selectivity, might better be named Techniques for Optimization and Selectivity; the focus here is on the techniques themselves and not on computer hardware/software systems. This chapter gives a good summary of the optimization techniques available and the fundamental statistical approaches on which they are based. This chapter is one of the best in this book.

The final two chapters deal with the second subject of the book, optimization of the detection process. Chapter 12 begins with a description of the general requirements for selective detection in HPLC, describes the common detector systems available today, and provides a number of referenced examples of the use of these detector systems. Chapter 13 gets into the concepts of noise and detection limits and how chromatographic columns and various detector systems impact on these concepts. An important section of this chapter discusses the use of derivatization techniques to improve both detection limits and selectivity. Again there are a number of referenced examples of these techniques given.

In summary, this is not a book for the novice; a sound fundamental understanding of HPLC is required to best profit from it. This also is not a "how-to-do-it" book. Its style is more like the *Annual Reviews* published each year by Analytical Chemistry. In general there is not enough information given to use the techniques discussed. An excellent set of references to the original literature is provided, however, so that the reader can pursue any technique that appears promising. Mechanically the style is somewhat stream-of-consciousness with the same (or very similar) statements appearing several times within a section. It is annoying that a number of terms and symbols are not defined and that a table of symbols (for those that are defined) is not provided.

**Barry H. Gump,** *California State University—Fresno*

**The Art of Electronics, 2nd Edition.** By Paul Horowitz and Winfield Hill. Cambridge University: Cambridge and New York. 1989. 1152 pp. $49.50. ISBN 0-521-37095-7.

This book is one of a relatively small group of texts intended primarily as lecture or reference texts for physical-science students and instructors. This volume was conceived as both an electronic circuit-design textbook and a reference book. It begins at the lowest level of electronics knowledge and progresses through relatively high-level circuit design. The text is logically organized, placing prerequisite circuits and techniques in advance of more advanced material. Many of the concepts used in the text were developed by the authors from a course intended to teach undergraduate or graduate students to "do" electronics.

The authors' concept for the text is not compatible with an extensive mathematical treatment for circuit design and analysis. Rather, the text stresses the art of electronics and places minimal emphasis on theory. Although this approach is generally successful in producing practical circuits with minimum effort, it occasionally results in providing only a superficial understanding of circuit properties and principles.

The reduced emphasis on formal mathematical aspects of circuit design and analysis somewhat reduces the value of the book as a lecture text, at least within the framework of conventionally structured courses. For example, there is a brief discussion of the complex plane and its use in circuit analysis, but transfer functions, and Laplace and Fourier transformation techniques are not elaborated.

The text contains a great amount of resource material for the experimental chemist. Included, for example, are fully specified practical circuits of the type usually available from semiconductor applications notes. The text includes many analytical expressions describing the behavior of specific circuits. The authors offer their own selection of circuit applications and practical hints. The text is rich with excellent concept illustrations throughout. These have been well thought out and executed, and provide valuable assistance in understanding important concepts of electronic circuit design and application. A considerable amount of reference information on discrete devices is collected in the many tables and several excellent appendices. The tables have been up-dated to include new devices since publication of the first edition. This information will greatly assist the reader in component selection or replacement and repair.

Chapters of particular interest to the experimental chemist include those on signal-noise and grounding techniques, pointing out do's and don'ts for optimizing S/N in measurement instruments. Also of interest are chapters on active filters, computer interfacing, and measurement transducers. The text will be a useful addition to the library of a chemist whose research involves instrumental measurement.

**A. H. Francis,** *University of Michigan*

**Organic Luminescent Materials.** By B. M. Krasovitskii and B. M. Bolotin (Moscow Research and Production Association). VCH: Weinheim. 1988. xi + 340 pp. $28.00. ISBN 0-89573-662-4.

This monograph is a translation of the 2nd Russian edition published in 1984. The bibliography has been updated through 1985 and with the addition of non-Russian references. The book has a general introduction and two main parts. The 20-page introduction reviews the general concepts of luminescence and organic luminescence materials and includes standard material on Jablonski diagrams, solvent effects, energy transfer, and the general effects of structure and substituents on luminescence characteristics.

The first main part of the book discusses the properties and synthesis of organic luminescent compounds. The seven chapters in this part are organized based on general structure character and include material on aromatic hydrocarbons and their derivatives, compounds with arylethylene and aryacetylene groups, compounds with exocyclic C=N groups, 5- and 6-membered heterocyclic compounds, and carbonyl-containing compounds. The second part of the book is composed of applications. Topics include luminescent dyes for paints, plastics, and fibers, brightners, scintillators, laser dyes, chemiluminescence, electrochemiluminescence, and analytical and clinical applications.

The organization and content of this book are quite different from other monographs on luminescence techniques. The chapters in the first part provide a detailed account of how absorption and emission wavelengths and luminescence quantum efficiencies vary with the type of compound and the nature and position of substituents. Much of the material is derived from patents and Russian literature, which is not as readily available to many readers. The material in the second part is even more unique as the practical or commercial applications of luminescent compounds are not covered in most luminescence books. The amount of material on analytical, biological, and clinical applications is slight compared to other books which are often solely devoted to these topics.

Overall I would recommend this monograph as a good reference for any researcher routinely involved in luminescence techniques. The cost is quite reasonable. I found the writing style entertaining and clear.

**James D. Ingle,** *Oregon State University*

**Chaos and Integrability in Nonlinear Dynamics: An Introduction.** By M. Tabor (Columbia University). John Wiley & Sons: New York and Chichester. 1989. vi + 364 pp. $55.00. ISBN 0-471-8278-2.

It is well-known that the theoretical foundations of geometrical methods established by Poincaré and Birkhoff in nonlinear dynamics were not studied extensively; and, because they concentrated on energy-conserving Hamiltonian systems, they appear to have had little impact on applied dynamics (except celestial mechanics) for half a century. Recently, this topic became popular in many areas of engineering through the study of the dissipative system using the Poincaré's qualitative (*nonquantitative*) topological approach and also through the wide availability of powerful computers. Classical mechanics is a core course in graduate school, and the traditional method of teaching classical mechanics does not cover the new discoveries, such as Liapunov's stability analysis, perturbation theory based on KAM theorem, Poincaré–Birkhoff's fixed-point theorem, ergodic and mixing behavior of real systems, and anharmonic oscillators. This book, which is a natural extension of the old physics, contains new discoveries in these areas (even though popular engineering topics on chaos and fractals are excluded) and demonstrates how such a difficult aim can be achieved by a careful organization of diverse topics. I *strongly* recommend this book as a replacement for the conventional textbooks on classical mechanics (i.e., Goldstein's); however, if this book is to be used as a text, it would be desirable for the authors to provide exercise problems at the end of each chapter. Further, to appreciate fully the power of geometric view and to understand better the many illustrations contained in this book, examples containing computer-oriented work would be useful. In addition, this book may also be an excellent reference for astronomers and designers of particle accelerators.

Currently chaos is common terminology in the areas of engineering, chemistry, biology, ecology, medical science, and social science even though many people do not properly understand chaos on a scientific basis. Unfortunately, since people working in these fields may lack a firm background in physics, they will not appreciate the classical approach the author has taken. A book on chaos which places a considerable emphasis on the Hamiltonian systems is certain to be unpopular, especially with engineers who do not have a firm background in physics nor the patience to read such a physicist-oriented book. In my teaching experience, fewer than 1% of graduate students in chemical engineering know much about classical mechanics. However, with proper guidelines from an instructor, this book could be used for engineering students. For example, one could completely omit the differential geometry (see pages 81–88), quantum chaos, and soliton problems. At the beginning or the end of Chapter 5, one could add fundamental differences and common features between the conservative systems and dissipative systems and add more examples on dissipative systems useful to engineers. In conclusion, this book is excellent for understanding the fundamentals of chaos; however, I would like to see future revisions useful for engineers.

**Myung S. Jhon,** *Carnegie Mellon University*

**Controlled Release of Drugs: Polymers and Aggregate Systems.** Edited by M. Rosoff (Long Island University). VCH: New York and Weinheim. 1989. ix + 315 pp. $65.00. ISBN 0895-73321-8.

In response to the rapid advances made in the development of technologies for the "controlled release" of pharmacologically active agents, a number of books have been published over the last few years attempting to compact the proliferating primary literature into a concise collection of authorative reviews. Due to the multidisciplinary nature of the field of controlled drug release, this is an important and quite challenging effort.

This book is a collection of nine reviews whose unifying theme is that they describe the use of diverse polymeric or aggregated materials in controlled release applications. The book includes reviews by R. A. Siegel (Modeling of drug release from porous polymers), R. J. Linhardt (Biodegradable polymers for controlled release of drugs), C. Thies (Dispersed systems for parenteral administration), P. Tyle (Liquid crystals and their applications in drug delivery), A. T. Florence et al. (Multiple w/o/w emulsions as drug vehicles), R. Leung and D. O. Shah (Microemulsions: an evolving technology for pharmacological applications), A. L. Weiner et al. (Commercial approaches to the delivery of macromolecular drugs with liposomes), B. Ezio et al. (Solubilization and structural properties of nucleic acids in reverse micelles), and R. Baker and F. Kochinke (Transdermal drug delivery systems).

The editor has attempted to bring together a wide range of topics, placing emphasis on the "personal ideas of the author, especially with regard to the direction and practical implications...as well as in recognition of patterns or unifying concepts". This editing concept has given rise to an impressive collection of individual review articles that, when taken together, lack internal cohesion and fail to provide the reader with a perspective of the relative importance of the individual topic within the field of controlled release. The attempt to cover a very diverse array of topics led to what appears to be a random collection of reviews. While the book provides the reader with a good feeling for the diverse techniques used for the controlled release of pharmacologically active agents, any one reader may not be interested in more than one or two of the topics presented. This raises the question of who might benefit from the material presented in the book. Without doubt, this text cannot be recommended as first reading for students or for the nonspecialist who wishes to familiarize himself with the field of controlled release. On the other hand, scientists who are fairly familiar with at least some aspects of controlled drug release will probably find the book useful as a general resource. In this context, however, the book suffers from a definitive lack of timeliness. Most chapters cover the literature extensively only up to about 1985. In a rapidly developing field such as controlled release, a review that was written in 1985 or 1986 is barely "up-to-date" in 1990.

The strongest aspect of the book is the quality of some of the individual chapters. Most of the individual contributions are well written and provide a concise but thorough (albeit slightly out of date) overview of the respective subject. In this sense, the individual contributions may be better than the book itself.

In summary, this book provides a collection of review articles dealing with applications of polymeric materials in controlled release that may be of value to scientists working in the field of controlled release. A certain lack of timeliness, a lack of cohesiveness in regard to the selection of topics covered, and the absence of a general overview that could provide some perspective are perceived by this reviewer as the main shortcomings of this book.

**Joachim Kohn,** *Rutgers–The State University of New Jersey*

**Organotin Chemistry. Journal of Organometallic Chemistry Library 21.** By Iwao Omae (Teijin Limited). Elsevier: Amsterdam and New York. 1989. vii + 356 pp. $142.00. ISBN 0-444-87456-9.

The appearance of a book which reviews organotin chemistry is timely because of the increasing importance of the field and accelerating development of uses in organic synthesis, in mechanistic studies, and in the variety of applications of organotin compounds. The book aims to cover comprehensively various aspects of organotin chemistry with a scope useful both to researchers in organometallic chemistry and other areas, as well as students.

An introductory chapter is followed by one on aspects of metallic tin. This is followed by Chapter 3 on methods of preparation of organotin compounds primarily from inorganic tins. Chapter 4, the longest in the book, is devoted to the preparation and properties of organotin compounds with various functional groups bonded to tin, organoditins, organopolytins, cyclic organotins, and stannylenes. The major classes of compounds are discussed in varying degrees of detail, but adequate to provide the reader with a reasonable perspective. Then in Chapter 5 reactions of organotin compounds including hydrostannation, hydrostannolysis, radical reactions, and reactions of organostannylenes are reviewed. The section on radical reactions discusses formation of organotin radicals but does not point out what roles they play in synthetically useful reactions. Chapter 6 on organic synthesis with organotin compounds covers most of the important applications, but unaccountably omits the important applications in the formation of five-membered ring compounds by reaction of appropriate unsaturated halides with organotin hydrides.

Chapter 7 on the structure of organotin compounds deals briefly with derivatives of Sn(II), tetrahedral organotins, and pentacoordinate species formed by inter- and intramolecular coordination with oxygen, nitrogen, and phosphorus. The next chapter treats spectroscopic investigations by $^{119}$Sn NMR and Mössbauer spectroscopy and correlation of spectroscopic parameters with structure. The final chapter treats applications of organotin compounds as polyvinyl chloride stabilizers, catalysts, wood preservatives, antifoulants, pesticides, and pharmaceuticals.

The references in the text extend into the year 1987. A large number of individual equations and schemes simplify digestion of the material. On the other hand, some of the tables are of limited interest, especially those in which the melting points, boiling points, and refractive indices are presented. The textual material is reasonably clear and concise.

This book is the most useful survey of organotin chemistry that has become available since Neumann's excellent 1970 volume. It would be a very useful addition to the chemistry collection of a chemical library of a university or chemical company.

**Henry G. Kuivila,** *State University of New York at Albany*

**Chemical Triggering: Reactions of Potential Utility in Industrial Processes.** By Gebran J. Sabongi (3M Company). Plenum: New York and London. 1987. xii + 284 pp. $55.00. ISBN 0-306-42643-9.

This book is a survey of chemical reactions of potential industrial utility which can be turned on and off by the application of a triggering energy. The triggering energy will either release a specific compound or change the physical and chemical properties of the starting material of a unimolecular reaction. One example of this method is the application of azides in direct color-forming materials used for imaging (page 68). Exposure of an aryl azide to an imaging radiation triggers a decomposition to release the corresponding nitrene, which in the presence of suitable couplers such as phenolics, undergoes an insertion reaction with the formation of a dye to form an image.

One of the strengths of this book is the highly structured manner in which it is organized. The book is divided into an introduction and five individually referenced chapters. These are Triggered Release of Gases; Triggered Release of Acids, Bases, Radicals, Nitrenes, and Carbenes; Triggered Release of Other Monomeric Species; Triggered Reactions of Polymers; and Triggered Isomerization and Color Changes. An excellent Table of Contents gives a complete outline including the sections and subsections, making it easy for the reader to quickly access desired information.

Each chapter begins with a brief introduction of the reactions discussed and how they are used in industrial processes. They are then divided into sections based on the triggering energy (thermal, photochemical, electrochemical, and ultrasonic) and further divided into subsections based on the chemical entity released in the reaction (carbon dioxide, carboxylic acids, olefins, polyimides, etc.). The reference section includes citations to reviews, mechanisms and methods of preparations of the starting materials, as well as applicable patents. Often substituent and solvent effects are discussed along with relative reaction rates and yields.

One weakness of the book is the index, which is incomplete and can be misleading. For example, although indolinospiropyrans are discussed under both the sections for thermochromic spiropyrans (page 241) and photochromic spiro compounds (page 262), the index only leads the reader to a short paragraph in the chapter's introduction (page 237) which mentions only two of the many widely reported uses of the indolinospiropyrans.

By the author's own admission, this book is not meant to be absolute or exhaustive, but rather directive and provide food for thought. In this, the author has succeeded. This book could serve as a guide and reference for the chemist in industry or applied research who is willing to look at published reactions from a new perspective. It could stimulate new research and be a springboard for developing new processes. Overall the book is well written and I would recommend it to anyone who is interested in development or applied research.

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

**Kirk–Othmer Concise Encyclopedia of Chemical Technology.** Edited by M. Grayson and David Eckroth. John Wiley & Sons: New York and Chichester. 1989. xxxii + 1318 pp. $59.95. ISBN 0-471-51700-3.

This book was published in hardcover in 1985 and is now available in paperback format. It was reviewed in this Journal **1985**, *107*, 4370.

## Volumes of Proceedings

**Hydrotreating Catalysts. Preparation, Characterization and Performance. Studies in Surface Science and Catalysis Volume 50.** Edited by M. L. Occelli (Union Oil Company of California) and R. G. Anthony (Texas A&M University). Elsevier: Amsterdam and New York. 1989. x + 296 pp. $144.00. ISBN 0-444-88032-1.

The typescript papers that make up this book derive from the Annual International Meeting of the AIChE, held in Washington in 1988. Hydrodesulfurization and hydrodenitrogenation were of particular concern, and processes of industrial importance were emphasized. There is a short index.

**Fire Safety Science. Proceedings of the Second International Symposium.** Edited by Takao Wakamatsu (Science University of Tokyo) et al. Hemisphere: New York and Washington. 1989. xvii + 956 pp. $160.00. ISBN 0-89116-864-8.

"Fire safety science" is a remarkably broad area and ranges from fire physics, which includes sophisticated mathematical modeling, to interaction of people with fires, which is an aspect of behavioral psychology. These and other subjects were the concern of a symposium held in Tokyo in 1988. Both major lectures and reports of original research were included. Chemistry is widely evident, in such aspects as flame retardation, smoke, and control of chemical fires. A 4-page subject index is included.

**Zeolite Synthesis. ACS Symposium Series 398.** Edited by Mario L. Occelli (Unocal Corporation) and Harry E. Robson (Louisiana State University). American Chemical Society: Washington, DC. 1989. xiii + 650 pp. $139.95. ISBN 0-8412-1632-0.

This book collects 42 typescript papers, mostly research reports, derived from a symposium held in Los Angeles in 1988, sponsored by the ACS Division of Colloid and Surface Chemistry. It is thoroughly indexed.

**Plant Cell Wall Polymers. Biogenesis and Biodegradation. ACS Symposium Series 399.** Edited by Norman G. Lewis (Virginia Polytechnic Institute and State University) and Michael G. Paice (Pulp and Paper Research Institute of Canada). American Chemical Society: Washington, DC. 1989. xii + 676 pp. $119.95. ISBN 0-8412-1658-4.

The materials of which the walls of plant cells are made are mainly lignins, cellulose, and hemicelluloses—all natural polymers. The method by which they are formed and the path by which they undergo biodegradation are still incompletely understood. A symposium held in Toronto in 1988 brought together investigators from different disciplines to discuss the subject and present new advances, and generated the 47 papers that make up this volume. The papers are grouped in eight categories: Plant Cell Development, Plant Phenolic Compounds: Metabolism and Reactions, Biogenesis and Structure of Protolignin and Cutin, Cellulose Biogenesis and Structure, Pectin and Other Polysaccharides, Plant–Microbe Interactions, Biodegradation of Lignin and Tannins, and Biodegradation of Cellulose and Xylan. The subject index is exceptionally thorough.

**Molecular and Cellular Controls of Hematopoiesis. Annals of the New York Academy of Sciences Volume 554.** Edited by Donald Orlic (New York Medical College). New York Academy of Sciences: New York. 1989. ix + 250 pp. $62.00. ISBN 0-89766-506-6.

The 23 papers, nicely set out in type, that make up this volume come from a conference held in Mexico in 1988. The emphasis of the conference was on growth factors and other regulator molecules, and the approaches range from biochemical to clinical. Not indexed.

**Thyrotropin-Releasing Hormone: Biomedical Significance. Annals of the New York Academy of Sciences Volume 553.** Edited by Geoffrey Metcalf (Ayerst Laboratories Research Inc.) and Ivor M. D. Jackson (Brown University). New York Academy of Sciences: New York. 1989. xvii + 631 pp. $158.00. ISBN 0-89766-496-5.

The large number of reports of original research in this volume are in the form of lecture texts (mostly 5–30 pages) and poster presentations (mostly 2–4 pages). They are concerned with biosynthesis, receptors, messenger systems, metabolism, etc. Not indexed.

**Trends in Colloid and Interface Science III. Progress in Colloid & Polymer Science Volume 79 (1989).** Edited by P. Bothorel and E. J. Dufourc (Domaine Universitaire). Springer-Verlag: New York. 1989. viii + 356 pp. $117.90. ISBN 0-387-91364-5.

The 40 oral and 130 poster presentations from the 1988 meeting of the European Colloid and Interface Society, held in France, gave rise to this volume of typeset papers. They are grouped under five headings: Colloids of Biological Interest; Colloids of Industrial Interest, Wetting, Adsorption, and Interfaces; Structure and Stability of Colloids; and Theoretical Studies of Colloids. Author and subject indexes are included.