cleavage of the silicon-ring carbon bonds, solvent protonation, and further reduction. In such anions the electron-rich α carbons would be doublets. Aqueous quenching of the anion solutions has been less definitive than the spectral evidence. A complex mixture is obtained which contains at least six silicon-containing compounds in addition to three silacyclopentenes. The proton NMR of this complex mixture displays a broad benzylic region ($\delta \sim 2.9$–4.1). This indicates that protonation is occurring on the ring phenyls as well as on the central silacyclopentane ring.

Much work with silacyclopentadienes has undoubtedly been undertaken with the hope that cleavage of a silicon-substituent bond would lead to a silacyclopentadienide ion.[10,11] In the case of **2**, after the addition of two electrons, loss of methyllithium would result in 1-methyl-2,3,4,5-tetraphenyl-1-silacyclopentadienide ion. No evidence for the formation of methyllithium was found, and the very large upfield shift change (–493.6 ppm) argues strongly against this pathway for **2**. Although silacyclopentadienide ion formation might occur in silicon systems similar to **2**, particularly when silicon bears a better leaving group than methyl, the possibility of tetraanion formation should also be considered.

Acknowledgment. Support of this work by the Robert A. Welch Foundation (Grant A-331) is gratefully acknowledged.

(10) Attempted formation of pentaphenylsilacyclopentadienide ion by removal of a proton from silicon with *n*-butyllithium: (a) Curtis M. D. *J. Am. Chem. Soc.* **1967**, *89*, 424–425. (b) *Ibid.* **1969**, *91*, 6011–6018.

(11) Proposed formation of a silacyclopentadienide ion in the potassium reduction of 5,5-diphenyldibenzosilole: Janzen, E. G.; Harrison, W. B.; Pickett, J. B. *J. Organomet. Chem.* **1969**, *16*, 48–50.

Book Reviews

Preparation and Properties of Stereoregular Polymers. Edited by W. Lenz (University of Massachusetts) and F. Ciardelli (University of Pisa). D. Reidel Publishing Company, Dordrecht, Holland. 1980. XVII + 472 pp. U.S. $44.75.

This book contains the texts of the main lectures presented at the NATO Advanced Studies Institute on Advances in Preparation and Properties of Stereoregular Polymers held at Tirrenia near Pisa, Italy, from October 3 to 14, 1978. Also, a few contributed papers that were concerned with topics not included in the main lectures have been included. Because of the nature of the subject, the topics covered are rather specialized.

There is a rapidly increasing activity in the study of stereoregular polymerization and the preparation of structurally ordered polymers as a means of achieving improvements in existing polymeric materials through new developments in synthesis and properties as well as in discovering new polymeric structures.

Continued progress is needed in areas such as the improvement of existing polymerization processes, through the discovery of new catalytic systems with much higher activity and stereospecificity, and in the improvement of mechanical and stability properties of existing polymeric materials. Increasing attention is also being directed toward the custom synthesis of polymers with highly defined molecular and morphological structure for use in a wide variety of new applications such as catalysis, drug-delivery systems, electronics, super-high tenacity fibers, processed foods, metal recovery, secondary recovery of oil, ecological and environmental control applications, and many others. Indeed, the field of custom designed macromolecules is destined to make an increasingly important contribution to mankind in the future.

The subjects treated are organized in a classical manner under the two general areas as follows: Section I—Synthesis of Stereoregular Polymers and the Mechanism of Stereospecific Polymerization, and Section II—Structure and Properties of Stereoregular Polymers.

Section I includes an excellent introduction of the basic concepts of stereoregularity in polymers, recent developments, kinetic consideration, new catalysts, diolefin selective polymerization, stereoregulation in metathesis reactions, homogeneous free radical, cationic and anionic polymerization, active species in anionic polymerization, ion pair effects on anionic oligomerization, stereoregulation of polyisocyanides, stereospecific polymerization of cyclic monomers, both three-membered and large rings, and stereoregular polymers from β-lactones and β-lactams.

Section II includes properties of optically active polylactones, NMR analysis of stereoregular polymers and copolymers, configurational and conformational analysis, application of chiroptical properties to conformational analysis, vibrational spectroscopy, crystalline structure, viscoelastic and mechanical properties, and effect of stereoregularity on bulk properties.

The editors have endeavored to maintain an integration of subject matter, among all aspects of the science of stereoregular polymers. This integration has quite adequately been achieved by treating synthetic procedures and mechanisms of stereospecific and stereoselective (or stereoelective) polymerization with chemical transformations and the physical properties of stereoregular polymers (with particular emphasis on characterization, solution, and solid-state properties) and mechanical properties. By this approach, a continuous spectrum of research activities extending from synthesis to structure, structure to properties, and properties to application has been attained. It is anticipated that polymer scientists will recognize this spectrum as the characteristic which makes polymer science unique among the sciences, and will have an appreciation for their place and their interdependence within the spectrum.

Also, the book should provide the reader with the basic knowledge and the inspiration necessary for the continuing development of the science of stereoregular and structurally ordered polymers, and promote cooperative research programs and interdisciplinary approaches to defined problems.

It is anticipated that those readers who will benefit most from this publication are those professional scientists who have as their objective the attainment of one or another of the above-defined goals rather than the casual reader of scientific publications.

George B. Butler, *University of Florida*

Organic Chemistry. Topics in Current Chemistry. Volume 92. Managing Editor: F. L. Boschke. Springer-Verlag, Berlin. 1980. iv + 178 pp. $54.00.

Although titled "Organic Chemistry", this book will appeal to a broader audience, particularly organometallic chemists. The 92nd in a series designed to "present critical reviews of the present position and future trends in modern chemical research", it includes several thought-provoking, but difficult, chapters.

Two-Step Reversible Redox Systems of the Weitz Type, by S. H. Hünig and H. Berneth, considers polymethines in which the terminal groups exhibit quinoid character in the reduced form (e.g., "Viologenes" such as Paraquat). The emphasis is on correlations of chemical and physical properties, in particular redox potentials (and potential differences), disproportionation equilibria, and spectral properties, with structure. The remarkable variety of redox systems of this type, combined with the predictive ability derived from the correlations, suggest that redox systems can be tailored to meet special purposes.

Controlling Factors in Homogeneous Transition-Metal Catalysis, by P. Heimbach and H. Schenkluhn, is an ambitious attempt to apply the methods and formalisms of inorganic chemistry and of enzyme chemistry to the study of metal-catalyzed coupling reactions. The basic empirical concept is that "chemical systems coupled via a metal atom behave like fragments joined with one another by σ-bonds". Starting from that point the authors examine variations in the metal, ligands, and reacting groups in order to derive a model for the analysis of the structural and dynamic features of complex chemical systems. Although this is a potentially important paper (even if, as the authors note, it is somewhat risky), it is incredibly difficult to read. A combination of unusual English, vast amounts of unique terminology, and complicated diagrams make it hard to follow the authors' arguments.

In Search of New Organometallic Reagents for Organic Synthesis, by T. Kauffmann, was originally presented as a meeting lecture. Consequently, it is basically a review of the author's own work and that of his students, primarily in the field of lithium chemistry.

Orbital Correlation in the Making and Breaking of Transition-Metal Carbon Bonds, by P. S. Braterman, is a valuable and readable account of the application of frontier orbital theory to this important class of organometallic reactions. While remaining fully cognizant of the dangers and limitations of the method, the author makes a convincing case for a general picture of orbital correlations in oxidative addition and reductive elimination reactions.

Although the book has no subject index, it does contain an author index for volumes 50–92. This volume, like many of its predecessors in the series, represents a useful addition to the chemical literature.

David B. Brown, *University of Vermont*

Chemical and Biochemical Applications of Lasers. Volume 5. Edited by C. Bradley Moore (University of California, Berkeley). Academic Press, New York. 1980. xii + 281 pp. $23.00.

Volume 5 contains seven papers. The first three discuss recent developments in laser spectroscopy. Laser Selective Detection of Single Atoms (V. S. Letokhov, 38 pages, 57 references) discusses the methods used to detect single atoms. Some new high-resolution spectroscopic techniques being used to investigate the structure of transient species are discussed in the next two papers. Structural Studies of Transient Molecules by Laser Spectroscopy (E. Hirota, 54 pages, 105 references) largely discusses laser diode and Zeeman laser diode infrared spectroscopy. Some discussion of new visible laser and double resonance techniques is also included. As the title implies, Far Infrared Laser Magnetic Resonance (K. M. Evenson, R. J. Saykally, D. A. Jennings, R. F. Curl, Jr., and J. M. Brown, 43 pages, 77 references) covers FIR-LMR spectroscopy. The last four papers discuss recent developments in laser photochemistry. Laser Kinetic Spectroscopy of Elemental Processes (H. Reisler, M. Mangir, and C. Wittig, 45 pages, 72 references) explores the use of laser photodissociation to provide information on dissociation dynamics and to provide state selected transient species for kinetic studies. IR Laser Photochemistry in Matrices (M. Poliakoff and J. J. Turner, 41 pages, 62 references) presents some results which have been obtained from single photon laser photolysis of molecules trapped in rare gas matrices. The final two papers discuss the feasibility of using laser photolysis to purify materials in the gas phase [Laser Purification of Materials, A. Hartford, Jr., and J. H. Clark, 20 pages, 46 references] and in solution [Photochemical Separation of Elements in Solution, T. Donohue, 34 pages, 72 references].

All of the papers are well written. Each contains at least one example where the technique has been used which clearly shows both the power and the limitations of the technique. It is stated in the preface that the goal of this series is to preview rather than review research using lasers. Volume 5 meets this goal in that most of the references have been published within the past five years and each paper clearly indicates where further development is needed. This volume should be of interest to anyone with an interest in lasers and particularly useful to anyone interested in the use of lasers in spectroscopy or photochemistry.

Thomas C. DeVore, *James Madison University*

Lanthanide and Actinide Chemistry and Spectroscopy. By N. M. Edelstein (Lawrence Berkeley Laboratory). American Chemical Society, Washington, D.C. 1980. vii + 472 pp. $40.00.

This monograph is based on a symposium on the lanthanide and actinide elements which took place at the 178th Meeting of the American Chemical Society, Washington, D.C., September 1979. The twenty chapters are divided into three different areas: (1) organometallic f-element chemistry, (2) complex chemistry, thermodynamic properties and transcurium chemistry, and (3) electronic structure and spectroscopy of f element complexes.

In the first section on organometallic chemistry, five of the six chapters present recent results from the authors' laboratories. As such, these chapters are useful to the specialist in this area, but are less valuable as general references than the recent book, "Organometallics of the f-Elements" (T. J. Marks and R. D. Fischer, Ed., Reidel, 1979), arising from a NATO Advanced Study Institute on the same topic. The exception in the organometallic section is a chapter on the NMR spectroscopy of uranocenes which provides comprehensive, up-to-date information on that topic.

The majority of chapters in the other two sections of the book present general summaries of recent advances in their respective areas. These chapters make this book a valuable general source of information on a variety of f-element-centered topics which are not commonly found in any other single volume. The second section of the book contains a chapter on specific sequestering agents for actinides, a chapter on inner- vs. outer-sphere f-element complexes, two chapters on thermodynamic considerations of the actinide metals, and two chapters on the chemistry of the heavier actinides. Also included in this section is a well-illustrated discussion of the necessary microchemical techniques for handling the radioactive transcurium elements. The third and largest section of the book contains two chapters devoted to optical properties of the f elements, including hypersensitive systems, and single chapters on f-element lasers, electronic structure of actinyl ions, uranium photochemistry, multistep laser photoionization, photoelectron spectroscopy, and borohydride complexes. Since several of the topics in section three are too infrequently reviewed, the publication of these symposium lectures is a valuable contribution to the f-element literature.

William J. Evans, *University of Chicago*

Societal Risk Assessment. How Safe is Safe Enough? Edited by Richard C. Schwing and Walter A. Albers, Jr. (General Motors Research Laboratories). Plenum Press, New York and London. 1980. X + 363 pp. $39.50.

As the science of chemistry advances into the 21st century, its interrelationships with man and his environment will become increasingly more complex. In the United States, we have already seen the beginnings with the advent of stringent EPA, NIOSH, and TSCA regulations and guidelines. A balance needs to be struck between what is needed to be done and how its implementation will affect others. This volume, therefore, appears at a very opportune time. It is the proceedings of the 24th annual symposium sponsored by the General Motors Research Laboratories held October 8–9, 1979. While the meeting was not chemical in nature (indeed only one chapter specifically deals with chemicals), this report does give a person in our field an opportunity to evaluate all of the risks—economic, toxicologic, safety, and legal—that are necessary to make a safe and competent decision.

The first day's discussions concerned certain and uncertain risks and subjective and objective risk perceptions. The second day's discussions dealt with the processes of determining acceptable risks, the economics and regulations of perceived risks, and looks into the past and future of risk management.

Each chapter is well written and includes an abstract, references, and a transcript of the ensuing discussion.

This book has arrived at an ideal time and should be required reading for any chemical professional. It opens our eyes to the realization that any chemical operation requires some risk and that this risk must be evaluated against all the parameters, not just chemical or economic ones.

Howard S. Friedman, *Ferro Corporation, Bedford, Ohio*

Principles and Applications of Organotransition Metal Chemistry. By J. P. Collman (Stanford) and L. S. Hegedus (Colorado State). University Science Books, Mill Valley, California. 1980. 715 pp. $22.00.

This book is intended as an introductory text for senior undergraduates, first-year graduates, and synthetic organic chemists and also as a concise review of applied organotransition-metal chemistry.

The emphasis throughout is placed on reactions and mechanisms in understanding the subject material, with the use of references to key papers and reviews as a lead-in to further elaboration of these and other aspects such as structure, bonding, and spectroscopy.

The introductory chapters cover the scope of the material presented, an historical perspective of organotransition-metal chemistry, basic structure, and bonding in transition metal compounds, and a survey of the scope of transition metal complexes according to ligands (sections on oxygen, sulfur, and phosphorus donors, hydrides, σ-bonded carbon ligands, end- and side-bound π-acid carbon ligands, unsaturated nitrogen ligands, dioxygen and sulfur dioxide). Two chapters deal with the topics of oxidative additions, reductive eliminations, and insertion reactions. The remaining ten chapters build on the basic concepts established and exampled in the first five. Topics covered include catalytic hydrogenations and industrially important catalyzed reactions involving carbon monoxide, including the Oxo, Fischer–Tropsch, and Reppe reactions, Monsanto's acetic acid process, and olefin hydrocyanations. Stoichiometric reactions of metal carbonyls and metal hydrides are also covered, as are the formation and fragmentation of metallacycles, as related to olefin metathesis and acetylene cyclo-oligomerization reactions. Practical applications are covered in the remaining chapters on alkyls, olefins, alkynes, η^6-arenes, and η^3-allyls.

Input from many of the leading chemists in the areas treated has enabled the authors to present a very up-to-date, balanced account of the current state of knowledge (or lack of it) on mechanisms of the often very important reactions described. Throughout, the book is liberally exampled, with over a thousand tables, figures, and reaction schemes.

Within the self-imposed limitations of scope, outlined in their introductory remarks (topics not covered include high oxidation state compounds, metal clusters, metal–metal multiple bonds, and photochemistry), the authors have presented an excellent treatment of this field of ever-increasing importance. The very modest price certainly enhances its value, both as an introductory tool for students and researchers and as an overall subject review for those already familiar with the chemistry.

Robert F. Gerlach, *University of Michigan*