complex where only the *n*-butyl-substituted complex has been isolated in the alkylation reaction.[20] Finally, the ability to monoalkylate 2 to produce the mixed iodo–alkyl complex 8 opens the pathway to investigate the interactions of different types of reactive groups attached to these dinuclear compounds. Further studies directed toward exploring the reactivity of complexes 2 and 3 and their derivatives are subjects of a continuing investigation.

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Registry No. **1**, 80399-47-9; **2**, 80409-36-5; **3**, 80409-37-6; **4**, 80409-38-7; **5**, 80399-48-0; **6**, 80399-49-1; **7**, 80409-39-8; **8**, 80399-50-4; PPh_3, 603-35-0; $(PhO)_3P$, 101-02-0; $Me_2Si[C_5H_4Fe(CO)(PPh_3)H]_2$, 80399-51-5.

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(18) Other differences are currently being studied. For instance, preliminary results indicate that the reaction of 8 with $AgBF_4$ in the presence of olefin does not give an alkyl–olefin complex as would be expected.[19] A full account will be reported later.

(19) Reger, D. L.; Coleman, C. J.; McElligott, P. J. *J. Organomet. Chem.* **1979**, *171*, 73–84.

(20) Reger, D. L.; Coleman, C. J. *Inorg. Chem.* **1979**, *18*, 3155–3160.

(21) Camille and Henry Dreyfus Award for Newly Appointed Faculty, 1980.

Book Reviews

Gmelin Handbook of Inorganic Chemistry, 8th Edition, Au, Organogold Compounds. H. Schmidbaur, volume author, A. Slawisch, volume editor. Gmelin Institut für Anorganische Chemie der Max-Planck-Gesellschaft zur Förderung der Wissenschaften and Springer-Verlag, Berlin/Heidelberg/New York. 1980. vi + 351 pages. DM 789. $465.60.

We have in this new Gmelin volume a comprehensive treatment of organogold chemistry: 296 pages of text packed with everything that is known about gold compounds in which there is a gold–carbon bonding interaction. The compounds which the reader will encounter range in stability from the elusive matrix-isolated gold carbonyls to the very stable phosphorus ylide complexes of gold. Although organogold chemistry, until recent years, has not been investigated by many research groups at any one time, the accumulated results, dating back to the preparation of the first organogold compound in 1907 by Pope and Gibson, are impressive indeed: the empirical formula index for this volume requires 19 pages, with 50–60 compounds listed per page!

The organization of the material in this book follows the rules which have been established for the Gmelin volumes on organometallic compounds. The book begins with a discussion of mononuclear organogold compounds and continues with dinuclear compounds (regardless of how the two gold atoms in the molecule are connected) and then with compounds of higher gold nuclearity, to the last chapter, which covers polymeric organogold compounds. Within each of these chapters the compounds are presented first of all according to organic ligand hapticity, then according to organic ligand type and number and gold oxidation state (I or III). Included among the organic ligands bonded via one C atom are alkyl, aryl, alkenyl, and carbene groups; among those of higher hapticity are olefins and polyolefins, acetylenes, carboranyl groups, and chelating alkylene and dienyl groups. Of special interest are the gold compounds with trialkylphosphonium methylide and dialkylphosphonium bismethylide ligands which were discovered and studied with great vigor by the author of this book and the intriguing salts of 1,1-bis(triorganophosphinegold(I))-substituted olefins, arenes, ferrocenes, and cymantrenes discovered by Nesmeyanov, Perevalova, and their co-workers, who have contributed so much to other aspects of modern organogold chemistry.

The coverage of organogold chemistry in this book is as exhaustive as "Chemical Abstracts" allows, with references to original research papers, theses, and conference reports and to the review literature through the end of 1979. All known details about the compounds covered are provided in text and tables: preparation, physical, and spectroscopic properties, theoretical studies, chemical studies, and applications.

As mentioned, a formula index is provided. There also is a ligand formula index, and the long and very detailed table of contents will quickly guide the reader to the section he wants.

This book is one of the new-style "Gmelins" in that it is written in English. It is a welcome addition to the Gmelin Handbook series on organometallic chemistry, and it will be the definitive treatment of the organic compounds of gold for some years to come.

Dietmar Seyferth, *Massachusetts Institute of Technology.*

The Chemistry of Catalytic Hydrocarbon Conversions. Edited by H. Pines. Academic Press, New York. 1981. xiii + 305 pages. $35.00

The first chapter of this eight-chapter book describes "Acid-Catalyzed Reactions", including a discussion of zeolite-catalyzed cracking, and comprises more than 40% of the entire treatise. In considering nomenclature a better case than the author admits to can be made for the use of the term "carbenium ion" to describe the carbocations, R_3C^+ (R may be hydrogen, alkyl, or aryl). Enium and onium are generic terms. Carbenium ion thus refers to an enium ion having a positively charged carbon atom possessing six valence electrons. Carbonium logically refers to an ion having a charged carbon with a coordination number greater than three. Other chapters in the book are, in order: Base-Catalyzed Reactions: Heterogeneous Hydrogenation; Dehydrogenation and Cyclodehydrogenation (Aromatization); Oxidation; Homogeneous Catalysis by Transition Metal Organometallic Compounds; Metathesis of Unsaturated Hydrocarbons; and Synthesis of Liquid Hydrocarbons (Synthetic Fuels). The first, second, and fourth chapters describe work to which the author has made substantial contributions; these contain many fascinating nuggets of information. The last three chapters are rather cursory treatments of important current topics that are discussed in more complete and sophisticated detail in other books and reviews.

It is difficult to determine exactly what kind of audience this book is intended for and the preface provides little guidance. However, students with a good undergraduate course in organic chemistry should have no trouble understanding most of it. It is disappointing not to find in a book dealing with catalysis clear definitions of terms such as selectivity and turnover number.

As the author points out, the chemistry of catalytic hydrocarbon conversions is of enormous practical importance to all industrialized nations and is at the core of the petroleum and associated industries. The preeminence of the United States in this field during the period 1945–1960 was due in no small measure to a small group of talented chemists and chemical engineers. It would have been a treat if the history of this exciting achievement could have been worked into this book by one of the major contributors to this effort.

Milton Orchin, *University of Cincinnati.*

A Bibliography of X-Ray Crystal Structures of Tin Compounds (I.T.R.I. Publication No. 588). By P. A. Cusack, P. J. Smith, J. D. Donaldson, and S. M. Grimes, International Tin Research Institute, Greenford, Middlesex (England). 1981. 160 pages. £4.00.

This I.T.R.I. publication will be welcomed by chemists who deal with inorganic or organic tin chemistry as well as structural chemists. In this soft-cover, photoreproduced volume is provided complete coverage of all known crystal structures of tin compounds—inorganic and organic—which have been reported (via "Chemical Abstracts") up to mid-1980. This is not, as the authors point out, a critical discussion of structural tin chemistry, rather it is a source book for tin compound structures. For each structure which has been reported the compound formula is given, the salient features of the structure are provided and the literature reference is given, e.g., to cite on example: "$Ph_3SnNO_3,P(O)Ph_2(CH_2)_2Ph_2P(O),Ph_3SnNO_3$. Coordination number 5: each tin atom is occupying a trigonal-bipyramidal R_3SnX_2 geometry, with the diphosphine ligand bridging two axial sites through the oxygens. The other axial positions are occupied by the oxygen atoms from the unidentate nitrate groups". There are no figures, but the structures, for the most part, are simple ones and the one-to-two sentence descriptions are clear.

Separate chapters, each with a fairly detailed table of contents, provide coverage of organotin(IV), organotin(II), inorganic tin(IV), and inorganic tin(II) compounds. A 15-page appendix brings recent structures not included in the main text. There are no indexes; a formula index would have been useful.

The International Tin Research Institute is to be commended for providing this volume as a service to tin chemists at an affordable price (which includes postage and packing, but not airmail charges).

Dietmar Seyferth, *Massachusetts Institute of Technology.*

The Heterocyclic Chemistry of Phosphorus-Systems Based on the Phosphorus–Carbon Bond. By L. D. Quin. Department of Chemistry, Drake University. John Wiley and Sons, New York. 1981. ix + 434 pages. $47.50.

This is the first major treatise in this area in many years in a fast growing field of heterocycles. Dr. Quin has done an excellent job in beginning this review with sufficient background that a beginning student of the field can obtain an adequate introduction before proceeding to the more sophisticated material. The Chapters given are as follows: 1. Introduction to Phosphorus-Containing Ring Systems and Some General Characteristics; 2. Principles of Forming 5-Membered Ring Compounds in Phosphorus Chemistry; 3. Synthetic Methods for 6-Membered Rings; 4. Small and Large Rings Containing Phosphorus; 5. ^{31}P NMR Spectroscopy of Cyclic Compounds; 6. ^{13}C NMR Spectra of Heterocyclic Phosphorus Compounds; 7. Proton NMR Spectroscopy of Cyclic Phosphorus Compounds; 8. Special Properties of Phosphorus Heterocycles: Conformation and Cyclic Electron Delocalization. The development of the chemistry, including the synthetic approaches to each ring system as well as the discussion of the reactions at phosphorus and at other reactive functional groups in the ring systems, has been accomplished logically in a most lucid manner in the first four chapters. NMR analysis, which encompasses ^{31}P, ^{13}C, and ^{1}H techniques, then follows and permits the reader to glean an excellent overview of the entire field of structural analysis with this class of heterocycles. Solid-state properties, conformational analysis, reactivity at phosphorus, and the participation of phosphorus in electron delocalization bring the text to a sound conclusion. The drawings are quite well done in this last chapter which makes for easier comprehension of the shape of the molecules as well as to the direction of attack on such systems by reagents. This is particularly true for the chemistry of the 5- and 6-membered ring compounds. The tables containing NMR data are especially well done with structure, NMR chemical shift, and reference centrally located. In fact, the reference citations are extremely comprehensive for each chapter.

Perhaps some might have wanted more discussions on the operation of pseudorotation in these families, but there are other reviews on the subject. There are several citations to the phenomenom where appropriate. This reviewer considers this book a requirement for those serious minded chemists who work in phosphorus chemistry and for those who want to begin work in this branch of phosphorus chemistry. The monumental task of searching the literature, evaluating the information, and drafting such a readable book has been done in a masterful way by a pioneer in the field who has made such outstanding contributions in his own right. Carbon–phosphorus heterocycles remains an area not totally matured and will continue to grow over the next decade. This book will serve as a benchmark for the work which follows.

K. Darrell Berlin, *Oklahoma State University.*

Soviet Scientific Reviews/Section B. Chemistry Reviews. Volume 2. Edited by M. E. Vol'pin. Harwood Academic Publishers, Chur, Switzerland. 1980. ix + 469 pp. $99.00.

This book is a collection of six separate chapters by Soviet authors. The edition is well prepared and published and suffers little from the original having been written in the Russian language. The chapter headings are as follows: The Catalytic Properties of Zeolite Systems in the Presence of CO_2; Gel-Immobilized Metal-Complex Catalysts; Biphotonic Photochemistry; Organometallic Catalysis in Stereospecific Polymerization Processes and Nature of the Active Centers; Boraheterocycles from Allylboranes; Long-Range Electron Tunneling in Chemical Reactions in Condensed Media.

Each of the chapters is up-to-date with references through the late 1970s. Obviously the majority of the references are to Russian work, but in several cases an attempt is made to integrate the Soviet research with that from other parts of the world. All of the chapters present considerable experimental detail which makes the book more of a reference material than a readable text. The chapter on boraheterocycles is of interest to a very limited readership and is largely a description of the personal work of the author B. M. Mikhailov. The chapters on Biphotonic Photochemistry and Long-Range Electron Tunneling in Chemical Reactions in Condensed Media are particularly interesting. Each one gives a good summary of the field and is useful reading for learning the beginning literature in the field as well as the current research. The remaining three chapters are related to catalysis and would be useful to persons having direct interest in these particular fields. Overall the book has use to persons having specific interests in the fields of the chapters. As usual in such books the chapters are not coordinated together, and the number of references in each chapter varies from 17 to 258.

D. Max Roundhill, *Washington State University.*

The Inorganic Heterocyclic Chemistry of Sulfur, Nitrogen and Phosphorus. By H. G. Heal. Academic Press, New York. 1980. xv + 271 pages. $86.00.

Fifteen years ago it was possible for a single author to survey the whole field of inorganic heterocyclic chemistry in some depth and without serious neglect of any one area. This is no longer possible. Today a multiauthored encyclopedia would be needed to provide an adequate coverage. Faced with this problem, the monograph writer has two options—either to focus on one narrow research area and produce an in-depth analysis mainly for the benefit of specialists in that area or to write a survey book for the general reader, aiming for an overview rather than depth. Heal has chosen the latter approach.

Even though heterocyclic systems derived from only sulfur, nitrogen, and phosphorus are considered, the coverage is, of necessity, at a rather general level. The book seems designed to stimulate the reader's curiosity rather than provide a detailed analysis. This approach may generate a few grumbles from researchers in the various specialized areas, but this is not a book for specialists. Instead, it provides a useful introduction to the field at a level that should appeal to university students or professional scientists in other areas.

The book deals with general synthesis methods, sulfur imides and amides, bonding in sulfur–nitrogen systems, phosphorus–sulfur rings and cages, and phosphazanes and phosphazenes. Sulfur–nitrogen and phosphorus–nitrogen polymers derived from heterocyclic precursors are also mentioned, although not in detail. References are given to primary research data and reviews up to