

design is pharmacodynamic or chemotherapeutic activity, the goal in searching for diagnostic radiopaques is biological inertness. Iodine is the radiopaque element of choices because it forms inexpensive, stable carbon compounds. Despite the large doses needed, several agents have been found to meet the requirements of low toxicity, high radiopacity, selective localization, and complete elimination.

The subject matter of the chapter illustrates the futility of establishing permanent generalizations based upon structure or solubility and utility. Barium sulfate because of water insolubility is well established as a contrast medium for gastrointestinal roentgenography, but water insolubility is not a requisite for gastrointestinal visualization since sodium diatrizoate, a water-soluble iodinated organic compound, has recently been recommended for that purpose. The same organic salt finds excellent utility in intravenous injection for cardiovascular angiography and excretion urography, but the free acid can not be used for injection.

Author Hoppe shows an inclination to discuss the same subject under more than one heading and to use the same heading more than once. Thus, the properties and uses of barium sulfate are mentioned on pp. 319 and 322, and Chemical and Biological Properties fall under General Properties as well as under Structure-Activity Relationships. But no harm results, for as Churchill has declared, one should make his point three times to be understood.

The reader will be disappointed if he expects Volume VI to contain scintillating discourses on up-to-the-minute topics. The chief value of the work lies in its timeless, encyclopedic quality. The future researcher or reader who wishes enlightenment on the three subjects will be saved countless hours by having the volume at hand. In addition to purely informational value, discussions of the authors might afford the reader concepts, approaches, and philosophies applicable to other areas.

The paper, printing, and binding of the well-known publisher meet the usual standard of excellence.

Volume VI of "Medicinal Chemistry" was appropriately dedicated to the memory of the late Walter H. Hartung, who edited Volume V and co-edited Volume VI. Medicinal chemistry, as a field and as a curriculum, owes much to Walter Hartung. He demanded that his graduate students become good chemists—especially competent in organic chemistry—and that they complete courses in basic medical science in order to become medicinal chemists. Indeed, the chief practitioners of medicinal chemistry today carry out organic chemical procedures in the light of biological and physical information. Nevertheless, Volume VI contains a minimum of chemical and maximum of pharmacological considerations. Such coverage becomes acceptable upon recollection that the curricula of most organic chemists now working in medicinal chemistry contained little or no biological science.

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The Modern Structural Theory of Organic Chemistry. By LLOYD N. FERGUSON, Chairman, Department of Chemistry, Howard University, Washington, D. C. Prentice-Hall, Inc., Englewood Cliffs, N. J. 1963. 600 pp. 16 × 24 cm. Price, \$13.00.

This book is capable of providing a senior or first year graduate student with an excellent qualitative introduction to that segment of physical organic chemistry having to do with structures of molecules in the normal state. Although some attention is devoted to the subject of reaction mechanisms, this area of study is not emphasized.

Most of the chapters in the book serve more as an introduction to a given subject than as a rigorous treatment of it. For example, the chapter on absorption spectra gives an interesting and lucid discussion of ultraviolet, visible, infrared, and nuclear magnetic resonance spectra, but the research worker who makes use of spectra in the elucidation of structures of molecules will have to study more advanced texts in order to make efficient use of his spectral data. However, this book represents a good starting point for such study, and the numerous references given therein will guide the reader to more rigorous treatments.

Certain topics are covered in greater depth in this book than in any other essentially qualitative text that the reviewer has read.

For example, the discussions of charge-transfer complexes and inclusion compounds are especially commendable.

There are five chapters in the book covering the broad topics of "Chemical Bonds," "Electronegativity and Electric Dipole Moments," "Intramolecular Forces," "Charge Distributions and Molecular Properties," and "Absorption Spectra." The references provided in each of these chapters are reasonably up-to-date and well selected. In fact, the majority of books and research articles cited were published in the period of 1950–1962.

The book is remarkably free of typographical errors, and the drawings, tables, and structural formulas are clear and visually appealing. The questions provided throughout the book are, for the most part, pertinent and thought-provoking. The student who makes a determined effort to answer these questions will certainly derive a more complete understanding of the contents of the book.

Throughout the book, much attention is given to the use of physical methods in the investigation of structure, conformational effects, kinetics, and equilibria. Such discussions should prove helpful to the reader when he faces similar problems in his own research efforts.

Inasmuch as most teachers of physical organic chemistry give preference to the subject of reaction mechanisms, it is unlikely that there will be numerous adoptions of this book as a class text. However, the reviewer hopes that many seniors and graduate students will study it carefully as they prepare themselves for a productive career in chemical research.

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Metall- π -Komplexe mit di- und oligoolefinischen Liganden. By Professor Dr. ERNST OTTO FISCHER und Dr. HELMUT WERNER, Anorganisch-Chemisches Institut der Universität München. Verlag Chemie, G.m.b.h., Weinheim/Bergstr., Postfach 149, Germany. 1963. 142 pp. 15 × 32 cm. Price, DM 19.

This monograph is a survey of the enormous and ever-increasing field of transition metal complexes with olefinic systems. The book begins with a brief historical survey of the development of the field, and contains an interesting extract showing Liebig's scepticism of Zeise's preparation of the first ethylene complex of platinum(II), his now-famous salt $K[C_2H_4PtCl_3]$. A brief survey of theoretical treatments of olefin-metal bonding follows, and a comparison is made between the relative σ - and π -bonding abilities of CO and olefins on the basis of dipole moment and infrared data. After a review of general methods of preparing olefin complexes, we have the last and longest section of the book: a survey of the complexes formed with various transition metals by a series of cyclic olefins, starting with cyclobutadiene and substituted cyclobutadienes and increasing in complexity to 1,5,9-cyclododecatriene, acenaphthylene, and dipentene. The complexes formed by noncyclic conjugated and noncyclic nonconjugated diolefins and triolefins conclude the work; monoolefin complexes are arbitrarily excluded. Infrared, n.m.r., and (where available) X-ray structural data on the complexes are tabulated, and 252 references are given (not alphabetically). There is a subject index, but no author index.

The problems of organizing the material in this field are immense, but this reviewer nevertheless feels that greater effort could be made to compare and evaluate all the results listed. Thus, the recently discovered complexes of π -allyl ligands, which can be regarded as donating three π -electrons to a metal, are evidently intermediate in character between olefin complexes and aromatic complexes. These receive no coherent treatment in the book, although they are mentioned in various places throughout. Surely a separate section on unsymmetrically delocalized π -complexes could have been written. The bonding in cyclobutadiene-metal complexes can be readily compared with that in π -cyclopentadienyl and π -arene complexes, but this is not done. In general, the theoretical treatment given does not go beyond the Dewar-Chatto ideas for monoolefin complexes, which are in any case excluded from the experimental section. The possibility of regarding conjugated diene complexes, such as (butadiene)Fe(CO)₃ and cyclopentadiene complexes, as Diels-Alder adducts, with σ - and π -bonding from the olefin to the metal, is not discussed. The authors mention in the introduction that the expansion in the chemistry of metal-olefins has had repercussions in other fields, but there is no mention of the possible im-

portance of olefin complexes in industrially important reactions, such as hydroformylation, the Wacker process, or Ziegler-Natta polymerization of olefins.

The book is free from misprints, although on p. 9 the stability of $C_5H_5Fe(CO)_2P(C_6H_5)_3$ compared with $C_5H_5Fe(CO)_3$ is ascribed to weaker π -acceptor power of triphenylphosphine compared with CO, and on p. 31 to its stronger π -acceptor power compared with CO.

To summarize, the book will be a useful source of reference to workers in the field, but whether it will stimulate practising chemists, theoreticians, and X-ray crystallographers to become interested, is more doubtful. General readers will be better advised to study the article by Bennett in *Chemical Reviews*.

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Einführung der Äthynyl- und Alkynyl- Gruppe in organische Verbindungen. By DR. WILLI ZIEGENBEIN, Wissenschaftliches Laboratorium der Chemische Werke Hüls AG. Verlag Chemie, G.m.b.h., 694 Weinheim/Bergstr., Postfach 149, Germany. 1963. 187 pp. 23 × 15 cm. Price, DM 24.

This book is a review of the literature dealing with the introduction of acetylenic groupings into organic substances. The literature between 1955-1961, inclusive, is covered, although some key references to earlier work are given. Only reactions involving formation of a new bond with an acetylenic carbon atom in a preformed ethynyl compound are considered. Not included are methods for the actual formation of the acetylenic bond [which have already been reviewed by the author together with W. Franke and H. Meister, *Angew. Chem.*, 72, 391 (1960)], the introduction of acetylenic groupings when a saturated carbon atom in the acetylenic component is involved in bond formation, or the introduction of alkoxy-acetylene functions.

The review is a very thorough one, within the rather narrow scope chosen by the author. Such a review is particularly useful, since many of the references are concerned with work originally published in patents and in Russian journals, which may not be generally available. A welcome feature is the inclusion of full details of typical experimental procedures, especially in those cases where the patent literature would have to be consulted for the original (a typical example is the description on p. 112 of the conversion of 19-norandrostenedione to 17 α -ethynyl-19-nortestosterone in over 90% yield, taken from a German patent).

The book is divided into two main sections, one dealing with the introduction of acetylenic groupings *via* metal derivatives, and the other *via* Grignard derivatives. While this is logical, some of the other classifications used in the text, such as "Äthinylierung," "Äthinylierung," "Alkinylierung," and "Alkinylierung" seem to do little but confuse the reader. The only serious criticism, however, is the absence of any indexes. The presence of a subject index would doubtlessly have added considerably to the utility of the book.

The formulas are well presented, although occasionally "bent" acetylenes (e.g., \equiv) appear. The book seems to be accurate and free from errors. The only significant mistake noticed was the remark by the publishers on the page preceding the Preface to the effect that an extract from the book has been published previously in the above-mentioned *Angewandte Chemie* review. In fact none of the material covered in the present book appears there.

In summary, the book is a valuable one and can be recommended to all who take an interest in acetylene chemistry, both from an academic and an industrial point of view.

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Naturally Occurring Oxygen Ring Compounds. By F. M. DEAN, B.Sc., Ph.D., Senior Lecturer in Organic Chemistry, University of Liverpool. Butterworth, Inc., 7235 Wisconsin Ave., Washington 14, D. C. 1963. viii + 661 pp. 15.5 × 25.5 cm. Price, \$24.95.

This very comprehensive discussion of the chemistry of naturally occurring oxygen heterocyclics can be regarded as a

most important contribution to the literature of organic chemistry. Several textbooks have been published recently dealing with certain aspects of this class of natural products, but any overlap is fully justified since this is the first book to be published which provides a thorough survey of the field. It is a very easy book to read and the topics that are covered include epoxides, furans, lactones, lignans, pyrones, coumarins, chromans, xanthenes, flavonoids, isoflavonoids, rotenoids, and depsidones. Writing a book covering this range of topics is a mammoth task, and in addition the author has successfully extended his terms of reference to include an appreciation of the importance of these compounds in medicine, agriculture, and genetics. The final chapter is a critical discussion of the current situation regarding the biosynthesis of natural phenolic and related compounds.

Dr. Dean is to be congratulated because the book, in spite of its extensive coverage, is nevertheless sufficiently detailed to make it of considerable value to the expert. It will also have general appeal because he has managed to emphasize those features of natural product chemistry which have provided a fundamental basis for the growth of organic chemistry.

The text contains many structural formulas, and the standard of presentation is excellent. The publication of specialist textbooks is often associated with such a high price that their wide purchase cannot be recommended. In this case, although the book is expensive, the price can be justified, and it is likely to serve as a standard textbook for a number of years.

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Inorganic Polymers. By D. N. HUNTER. The Houldsworth School of Applied Science, University of Leeds. John Wiley and Sons, Inc., 605 Third Ave., New York 16, N. Y. 1963. 110 pp. 14 × 22.5 cm. Price, \$7.25.

This slim, well-manufactured volume presents a brief, unified treatment of the present-day *descriptive* chemistry of a wide range of inorganic macromolecules. Structural formulas for straight chains are given in abundance throughout the book. In accord with the type of information in much of the original literature cited, a large proportion of these structural formulas are said to be "suggested" or "thought to be" as given. However, in spite of this, the unwary reader may find it difficult to distinguish between the purely conjectural and the elegantly proven structures, since no details and insufficient references are presented for the latter.

The classification of the macromolecules into homopolymers (Chapter 2) based on sequences of like atoms and heteropolymers (Chapters 3 and 4) based on alternating atoms is well conceived, as is the grouping (Chapter 5) of organic derivatives of the inorganic polymers (substituted homo- and heteropolymers as well as "hybrid heteropolymers" of the type e-R-e-R-). The brief discussion of technology (Chapter 6) is also nicely organized.

This book will be of particular value in widening the horizons of the usual polymer chemist who works solely with carbon compounds and in directing the attention of inorganic chemists devoted to relatively narrow specialties to related areas of general chemistry. Two main faults with the over-all presentation, in the eyes of this reviewer, are (1) omission of any treatment of branching [*i.e.*, the structural formulas are usually given as

Cl
|
(-Si-O-)_n
|
Cl

straight chains even in cases, such as (-Si-O-)_n on p. 13, where

disproportionation of the suggested monomeric unit to give branching units is to be expected]; and (2) no indication of the labile nature of many of the systems treated, particularly with respect to molecular rearrangements and reorganization. Because no theoretical framework is presented and the reference citations are weighted in favor of qualitative studies leading to conjectural structures, the uninitiated reader will probably gain a false impression of universal naiveté and backwardness in the field of inorganic macromolecules. Nevertheless, this book (which contains satisfactorily few misprints) is highly recommended as a short introduction to an exciting and growing branch of chemistry.

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