Chapter 9 ("Steroids and Related Substances") is perhaps the least satisfactory and least complete chapter in the book, probably reflecting the author's own interest in other areas. A number of the recent pertinent papers from the literature were not or could not be cited and several fragmentation mechanisms are based on very tenuous grounds. Indeed some of them (*e.g.*, discussion of 11-keto steroids on p. 347) have been disproved in the reviewer's laboratory by recent studies with deuterium-labeled steroids.

The last two chapers, entitled "Miscellaneous Classes" (7 pages) and "Applications to Synthetic Problems" (4 pages) represent only very sketchy outlines, with the exception of a useful discussion of recent work on nucleosides performed in the author's own laboratory.

The production and printing of the book follow the usual high standard established by the McGraw-Hill Book Company. The proofreading, on the other hand, has been carried out in a somewhat sloppy manner and the book contains a substantial number of trivial errors. Some of them are consistent misspellings throughout the book, which could have been caught by the editorial staff (furan, pyran, chlorohydrin, etc., spelled with a terminal *e*, deuterio spelled without the *i*—all of them insignificant but annoying because they appear so often) and so could the printer's own notation on p. 118. There are minor errors in the figures on pp. 47 (C_5H_5N), 272 (N-formylisoleucine) and 332 (M-43 misplaced), methyl groups missing in squalene (p. 247), extra carbomethoxy groups in structure (22) on p. 324, equations (3-36) and (3-37) reversed on p. 108 and bond *a* (mentioned in text) not marked in formula, as well as trivial spelling errors on pp. 108, 218, 235, 241, 275, etc. The peaks at *m/e* 176 and 178 mentioned on the top of p. 101 actually refer to *m/e* 146 and 148 in Fig. 3-16. These are only beauty marks, but they are unnecessary.

In conclusion, where does this leave the potential reader for whom this book is largely intended—the organic chemist with a minimum or no knowledge of the role of mass spectrometry in organic chemistry? I would recommend that such an individual start out with McLafferty's chapter (*loc. cit.*), which covers the organic chemist's field clearly and succinctly. Following this introduction, he should delve into Biemann's book, possibly in conjunction with the more extensive text of Beynon (*loc. cit.*), which can be employed for supplementary reading on those sections (*e.g.*, instrumentation, ionization potentials, etc.), where no detailed coverage was intended in the present book.

Actually, my view is that the ideal book on mass spectrometric applications in organic chemistry cannot be written for at least another two to three years, because there still exist too many gaps in too many areas, which however are being clarified at an ever accelerating pace. In another three years, the chapter on synthetic applications, instead of its present 4 pages, will be substantial; the mechanistic sections will be replete with well-documented cases based on labeled substrates; and, finally, many additional organic structures will have been subjected to the type of semiempirical approach that has created the presently existing body of knowledge. It is questionable whether at that time a single author will have the stamina and background to prepare such a book for the organic chemist. However, if single authorship is possible, Biemann may well be the author *par excellence* for that future and necessary monograph.

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Theories of Electrons in Molecules. By WILLIAM T. SIMPSON, Professor of Chemistry, University of Washington. Prentice-Hall, Inc., Englewood Cliffs, New Jersey. 1962. vii + 183 pp. 16 × 23.5 cm. Price, $9.00.

Advanced students of quantum chemistry will welcome Professor Simpson's book and will benefit from it. The expressed purpose of the book is to "fill in the gap between what is found in quantum chemistry books and what is found in the journals"; however its importance probably lies more in the fresh ideas and insights that it will bring to those who are already cognizant of the literature. Indeed, one cannot expect a book of this length to fill more than a few selected gaps. Also, it should be pointed out that the level of presentation is not noticeably below that of most chemical papers, and the reader is expected to be familiar with transformation theory and group theory.

The book is an integrated collection of special topics related to the author's research interest rather than an introduction to or survey of molecular quantum mechanics. Emphasis is placed on mathematical rigor; however the physical problems are always kept close at hand. Professor Simpson proceeds immediately into the calculation of matrix elements in the first pages, and a rapid pace consisting of concise statements, equations, and little wasted space is maintained throughout. Chapter 1 is mostly concerned with the quantum theory of atoms while Chapters 2 and 3, which are somewhat longer, are devoted to the molecular orbital method and the valence bond method, respectively. The treatment of the valence bond method is especially good. The independent systems approach is briefly discussed in Chapter 4 where, unfortunately, the novel molecules in molecules method is confined to one short section. In addition, a large amount of information is compressed into the twelve sections which make up the appendices and the treatment again is concise. The topics covered in these sections range from the Born–Oppenheimer approximation to time dependent polarizability.

Usually the presentation is clear, though at times overly abbreviated, and the derivations and illustrations are often original. The examples, which are worked out in many sections, are exceedingly useful. Although a few typographical errors are present, they do not detract from the usefulness of the book.

I strongly recommend this book to advanced students of quantum chemistry and to spectroscopists with sufficient background. The non-experts will find that it is not easy reading and that step-by-step verification with pencil and paper will often be required; however their labors will be well rewarded.

DEPARTMENT OF CHEMISTRY
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CHARLES S. JOHNSON, JR.

Inorganic Polymers. Edited by F. G. A. STONE, Department of Chemistry, Queen Mary College, University of London, London, England, and W. A. G. GRAHAM, Arthur D. Little, Inc., Cambridge, Massachusetts. Academic Press Inc., 111 Fifth Avenue, New York 3, N. Y. 1962. xi + 631 pp. 16 × 23.5 cm. Price, $19.50.

This book was written to provide chemists with a reliable review of current research in several areas of inorganic polymer chemistry. It consists of nine chapters contributed by leading industrial and academic scientists. As pointed out in the Preface the state of knowledge of inorganic polymers is not as well developed as it is for organic polymers. Much of the effort in this field at the present time is devoted to the study of the basic chemistry of model systems and the book reflects this by frequently discussing simple, even non-polymeric, inorganic systems.

In Chapter 1 (A. V. Tobolsky) pertinent polymer properties are defined and briefly reviewed. Obviously the objective of this chapter was to acquaint workers in the inorganic polymer field with some of the fundamentals on which the organic polymer chemist bases polymer evaluation. Many readers will be prompted to dig deeper.

The second chapter (J. R. Van Wazer and C. F. Callis) on "Phosphorus-Based Macromolecules" draws very heavily on the book "Phosphorus and Its Compounds, Vol. I" by Van Wazer. Thus, of the thirty-four figures in this chapter twenty-four are credited to this source. The discussion of the polymeric phosphonitrilic chlorides—essentially word for word the discussion in the above treatise (published in May, 1958)—does not take into account the well over one hundred papers published since 1958. As a consequence, the views presented on this unique, completely inorganic system exhibiting typical polymer properties are not up to date. The discussion on the polymerization of the lower phosphonitrilic chlorides, for example, is based entirely on the work by Patat, *et al.*, and ignores the results of later investigators such as Konecny and Douglas, Gimblett, etc. Becke-Goehring's work on linear phosphonitrilic chloride polymers endcapped by HCl—cited as a personal communication (ref. 6)—was published in 1959 (*Chem. Ber.*, **92**, 1188 (1959)). This reviewer—who may be biased—would have preferred coverage of the phosphonitrilic polymers similar to Schmulbach's review in "Progress in Inorganic Chemistry" (Vol. 4).

Chapter 3 ("Sulfur Polymers," by M. Schmidt) is limited to compounds containing sulfur–sulfur bonds with the additional arbitrary restriction that at least one of the sulfur atoms must be bivalent. After a rather detailed up-to-date discussion of the various forms of elementary sulfur—which incidentally is also briefly covered in Chapter 2—the chapter mainly reviews the basic chemistry of polysulfides, polythionates and related systems.

Boron polymers are reviewed in Chapter 4 by A. L. McCloskey. The reader may stumble over an apparent contradiction: on p. 161 borazole is said to be thermally stable at 500° whereas on page 163 the statement is made that "borazole deposits solids on standing or on being heated, and gives off hydrogen under the same conditions." It should also be pointed out that references 54 and 63 report not only on the volatile products from the pyrolysis of borazole, but also on non-volatile residues of compositions $BNH_{0.8}$ and $BNH_{0.3}$, contrary to the statement on p. 163 "These residues have not since been investigated."

Silicones are the only inorganic polymers that have so far reached commercialization. There is, of course, much more information available on these polymers than on any other inorganic polymer system. They are admirably reviewed by A. J. Barry and H. N. Beck in Chapter 5 which almost could have

been published as a separate book. In accordance with its title, "Silicone Polymers," most of the chapter's 130 pages are devoted to polysiloxanes with only a few pages covering polysilazanes, polysilalkylenes and arylenes, polysilanes and polymetallosiloxanes. The latter four systems are discussed in more detail in Chapters 6 and 7.

Chapter 6 (R. K. Ingham and H. Gilman), in addition to polymers based on silicon–silicon and silicon–carbon chains, also reviews polymers containing germanium, tin and lead in their backbones. Most of the research covered by this chapter is quite recent and the authors have succeeded in presenting an excellent up-to-date summary of the large amount of work which has been published.

Chapter 7 by D. C. Bradley is primarily concerned with linear polymers containing metal–oxygen bonds. After a discussion of metal alkoxides—mostly oligomers—the polymeric products formed by their hydrolysis are reviewed as well as polymetallosiloxanes and polysiloxymetalloxanes.

This reviewer will not comment on Chapter 8 ("Coordination Polymers," by B. P. Block) since he had the opportunity to discuss the manuscript with its author. For those interested it should be pointed out that two groups of polymers are discussed—natural and synthetic coördination polymers, the former referring to materials that are included even though their polymeric structure is probably limited to the crystalline state. Since a very broad definition of the term coördination polymer has been used, the review is not limited to chelate polymers.

A brief chapter on electron-deficient polymers by A. J. Leffler which includes metal alkyls, boron and aluminum hydrides and carboranes, concludes the book. Many of the compounds mentioned are of interest as building blocks for high polymers. Success in this field since the book appeared points out the importance of understanding the basic chemistry of such systems.

As far as typographical errors are concerned the book contains no more than the usual number of misprints. Thus the formula for phenylsilsesquioxane on p. 12 is given as $C_6H_5SiO_{2/3}$ and the arrows are incorrect at the bottom of page 356—to mention two of the errors which the reader will not find too disturbing.

More attention to details on the part of the editors could have made the book shorter and probably clearer without impairing the large amount of well documented information. For example, the editors apparently made no effort to have the authors adhere to a uniform nomenclature. Quite often there are confusing inconsistencies, even within the same chapter. Thus in Chapter 7 the R_3SiO- group is referred to as silyl oxide (p. 411), silyloxy (p.433), siloxy (p. 434) and finally siloxano (p. 433). Furthermore, the terms "polyorganosiloxanometalloxanes" and "polyorganometalloxanosiloxanes" are introduced to describe two types of polymers. Yet the author himself uses the more common names for these polymers, as illustrated by the statement on p. 437 under the heading "Polyorganometalloxanosiloxanes": ". .In recent years Andrianov and co-workers developed other methods for preparing polyorganometallosiloxanes." The same polymers are named polysiloxanemetalloxanes in Chapter 5 (p. 288). All this may not seem important—but the reviewer feels that the book could have provided systematizing leadership instead of adding confusion by introducing new terminology which it does not even use consistently.

Because of the substantial price difference "Inorganic Polymers" will have competition from another recent book on the same subject ("Developments in Inorganic Polymer Chemistry," edited by M. F. Lappert and G. J. Leigh, Elsevier, 1962 ($10.00)) for a place in the chemist's personal library.

PENNSALT CHEMICALS CORPORATION
RESEARCH AND DEVELOPMENT DEPARTMENT
WYNDMOOR, PENNSYLVANIA G. BARTH-WEHRENALP

The Chemistry of Rhenium. By K. B. LEBEDEV, Candidate of Technical Sciences, translated by L. RONSON in collaboration with A. A. WOOLF, Ph.D. Butterworth and Co. (Publishers) Ltd., London, 88 Kingsway, W. C. 2. 1962. x + 105 pp. 14.5 × 22 cm. Price, $7.50.

The chapter headings, Production and Application, Rhenium Sources, Extraction of Rhenium, and Preparation of Metallic Rhenium, are more indicative of the contents of this book than is its title. Brief chapters on the properties, compounds and analytical chemistry of rhenium are incomplete and contain some rather loose statements and errors. The status of rhenium amalgams and carbides is not clear from the text. The citation of rhenium tetroxide complete with vapor pressure curve will jar most readers, as will the use of contemporary (1932) heptoxide data from the same source. Much of the excellent work of Boyd, W. T. Smith, Cobble, and others in this country appears to be unknown to the author. Presumably, the Russian and foreign literature through 1959 has been utilized. But, in spite of the title, the book does not intend to replace those of Druce or of Tribalat; *i.e.*, it is not concerned with the "pure" chemistry of rhenium.

Parenthetically, neither is this work as complete or as authoritative as is the recent compilation edited by Gonser with respect to alloys, applications and some aspects of metallurgy. The book does, however, give a relatively complete summary of Russian practice in attempting the extraction and economical isolation of rhenium from a great variety of materials. This is the primary purpose of the book, and the extractive procedures are adequately described and often novel to those in this country. While of some interest to metallurgists, the work is not complete regarding the metallurgy of rhenium.

DEPARTMENT OF CHEMISTRY
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Ions in Hydrocarbons. By ANDREW GEMANT, Research Associate, The Grace Hospital, Detroit, Michigan. Interscience Division, John Wiley and Sons, Inc., 440 Park Avenue South, New York 16, N. Y. 1962. viii × 261 pp. 16 × 23.5 cm. Price, $12.50.

The author has attempted coverage of a tremendous field in a short treatise. His efforts have resulted in a pleasant, readable introduction to the subject. The book contains sections covering (1) correlation with other fields; (2) hydrogen ions; (3) ions in amine–aliphatic acid solutions; (4) ions from oxidation of *ortho*-substituted aromatics; (5) ions from ozonolysis of aromatics; (6) metal–complex ions; (7) electron transfer ions and (8) radiolytic ions. Unfortunately each section treats its subject matter in so superficial a manner as to leave much to be desired in a reference book. If one looks upon this book as an introduction to the subject of ions in hydrocarbons, it fulfills its purpose and can be recommended on this basis. However, a second thought might be necessary before an expenditure of $12.50 is considered.

MELPAR, INC. M. J. ALLEN
FALLS CHURCH, VIRGINIA

Elements of Chemical Thermodynamics. By LEONARD K. NASH, Department of Chemistry, Harvard University. Addison–Wesley Publishing Company, Inc., Reading, Mass., 1962. ix + 118 pp. 15 × 22.5 cm. Price, $1.75.

This book is one in a series on Principles of Chemistry, designed to be used as a supplement to an introductory text on general chemistry. Prepared for the beginning college student, the topics covered are: an introduction on heat and work; the first principle of thermodynamics, including enthalpy, thermochemistry, heat capacity, ideal gases; the second principle of thermodynamics, including the Carnot cycle and entropy; consequences of the thermodynamic principles, including free energy and equilibrium, colligative properties, equilibrium constant, galvanic cell, and the temperature dependence of the equilibrium constant. Three appendices give, respectively, some operations of the calculus, problems, and some thermodynamic data at 25°. The author carefully states the topics which are omitted from this text. This book represents a good step in the direction of bringing chemical thermodynamics as such to the student in the first course in college chemistry. The author has the material under actual trial for the second year with students at his university, and reports good success. Lecturers in general chemistry will wish to examine this book carefully to determine whether it will fit into their respective courses.

UNIVERSITY OF NOTRE DAME
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Electronics for Scientists. Principles and Experiments for Those Who Use Instruments. By H. V. MALMSTADT, University of Illinois, and C. G. ENKE, Princeton University, with the assistance of E. C. TOREN, JR., Duke University. W. A. Benjamin, Inc., 2465 Broadway, New York 25, N. Y. 1962. xi + 619 pp. 16 × 23.5 cm. Price, $10.75.

This book is written to be of practical service to a wide variety of scientists covering the range from biologists and medical researcher through to chemists, physicists and engineers. This is a very ambitious undertaking and it is with some skepticism that this reviewer undertook to evaluate the success with which the objective was reached. There are many books and pamphlets on the subject of electronics which give simple pictures of how various electronic devices work. However, to say that these are of practical value is another matter.

An experimental scientist should be expected to produce data as good as his instrumentation permits and his experiment justifies. Thus practical for him often means the sophisticated