

## Book Reviews

**The Organic Chemistry of Phosphorus.** By A. J. KIRBY, University Demonstrator in Organic Chemistry, and Fellow of Gonville and Caius College, Cambridge (Great Britain), and S. G. WARREN, University Demonstrator in Organic Chemistry, and Fellow of Trinity College, Cambridge (Great Britain). American Elsevier Publishing Co., Inc., 52 Vanderbilt Ave., New York, N. Y. 1967. xii + 404 pp. 14.5 × 21.5 cm. \$23.00.

This handsomely manufactured volume is one of several that have appeared in recent years in various languages in this area of organo-inorganic chemistry. The authors state their purpose to be an attempt to bring some order into the literature dealing with organic chemistry of phosphorus within the framework of reaction mechanisms. How well they have succeeded with this task is a matter for each individual reader to decide, with the reviewer's opinion being shown below. In a matter of half a dozen pages the authors dispose of the problem of electronic structure and bonding in phosphorus compounds (surely much too brief an excursion into the subject material that makes the very reactions they discuss possible) before plunging into the subject of reactions of these compounds, divided into chapters on: structure and reactivity, nucleophilic attack by trivalent phosphorus, elimination of trivalent phosphorus, free-radical reactions at phosphorus, four-center rearrangements, reactions not involving a central phosphorus, nucleophilic attack on trivalent phosphorus, nucleophilic attack on phosphonium salts and pentavalent phosphorus compounds, nucleophilic attack on tetrahedral P(V) compounds, and finally, phosphorylation. An author index and a modest subject index complete the book.

In this reviewer's opinion the amount of order that has been indeed brought into being by the labor of the authors of this volume is not tremendously great. For many of the reactions that are listed in the book the real mechanisms are not known and remain a matter of surmise on the part of either the reader or the workers in the area. So many diverse reactions, and their variations, are known in this field, especially in the last decade's explosion of publications on the organophosphorus chemistry, that at this time only a small fraction of them may be properly catalogued as to the mechanistic type. Hence, the true value of the present collection will depend on the accuracy of the authors as prophets; surely not necessarily a certain wager for any chemist, no matter how bright.

The authors did a good job in assembling for the reader a vast amount of reference material. They assembled this into chapters and subheadings, for catalog purposes. They have not been able to prove that much of this classification is indeed supported by existing and published facts as of today. Nevertheless, they have, of course, the right to speculate as they wish.

It is rather difficult to find a specific reaction when hunting for a reaction designed to do a certain job; the present book will not help very much in such a situation. It is not designed for the chemist interested in preparation of compounds. Nor will the chemist find readily material dealing with conditions for reactions; this has been left, as was the selection of reactions, to such books as the monumental Houben-Weyl to which the authors specifically defer. What is left then is the collection of reaction references that had been catalogued according to the authors' open and freely given opinions, most of which, I am sure, are well enough founded on past chemical science. What is left, in reality, is a listing, under the various subheadings, of hundreds of reactions without very much rhyme or reason within a given section. Some areas which have been rather thoroughly explored by the chemical mechanicians, obviously, get the lion's share of the page area. Whether or not this is well enough deserved in light of current interests and trends in the area is a matter of personal opinion. Thus a vast amount (relatively) of paging is devoted to ring compounds with phosphorus in the cycle, which is an interesting enough subject but one hardly deserving quite so much exposure, especially in light of the existence of proof of cyclic structure for a number of the compounds discussed.

To some degree the book makes the present reviewer think of such a book being compiled by a latter-day Mellor and coworkers—much data; but how much of it is useful, valid, and get-at-able???

Finally, a small but useful point. While the authors give at each

chapter ending a rather satisfactory literature list, it is rather obvious that the time expended on this was considered too lightly, and in a number of instances the same people end up with different spellings of their names in the various places their names appear in the book. It is regrettable that the name of Professor Arbuzov (the late pioneer in this field) is found spelled either with a "z" or with the Germanic "s" which, for some unaccountable reason, the British have taken from the Germans (despite two recent wars) in the matter of transliteration of Russian names. The matter of variable spelling is not a vital one, but it does indicate a certain laxity on the part of book construction.

The physical make-up of the book is very good and the price is not out of line with the current trends.

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**Reactions of Transition-Metal Complexes.** By J. P. CANDLIN, K. A. TAYLOR, and D. T. THOMPSON, Imperial Chemical Industries Ltd., Petrochemical and Polymer Laboratory, The Heath, Runcorn, Cheshire (England). American Elsevier Publishing Co., Inc., 52 Vanderbilt Ave., New York, N. Y. 1968. xvi + 483 pp. 15.5 × 23 cm. \$30.00.

This book is a comprehensive review of the reactivity of transition metal compounds. It includes therefore the substitution and redox reactions of metal complexes, as well as the reactions of the coordinated ligands. The latter deals with the fascinating area of "metal template" chemistry—the formation of macrocyclic systems—and catalysis of organic reactions under the influence of metals, oligomerization, insertion reactions, and production of otherwise unstable organic systems, of which ferrocene is a now classic example. In a separate section are reviewed the multifarious interactions which transition metal complexes can undergo with organic functional groups such as  $-C=C-$ ,  $-C\equiv C-$ ,  $RH$ ,  $R-Hal$ ,  $R-NC$ ,  $OR^-$ , as well as a variety of inorganic substances of which  $H^-$ ,  $CO$ ,  $NO$ , and substituted phosphines and arsines are the most important examples. It is difficult for a chemist formally educated prior to 1950 to appreciate some of the wierd structures, many of which have been firmly established, scattered throughout the book.

The whole is a creditable effort to cover a fast moving area by three young scientists who grew up with the subject (the overwhelming number of references refer to articles after 1960 and many in 1967 are included). The literature is covered very thoroughly and the book is therefore concentrated reading, something like Annual Reports of the Chemical Society, and not a book for bedtime. A good background in chemistry is assumed, deliberately, for the reader so that kinetic theory, principles of organometallic chemistry, and the basis of the spectroscopic methods of structural analysis are all omitted.

In a book of this scope some criticisms are inevitable. The collection of references in small blocks throughout the book is irritating. The symbol  $\Delta E^\ddagger$  used in several places is an unfamiliar one to kineticists. Planar (?)  $Co\ phen_3^{2+}$  is a poor example (p 96), even if true, of the many cobalt(II) complexes which take up  $O_2$ . The discussion of Marcus theory is meager (p 202), while the conformational aspects of transition metal chemistry are ignored altogether. On the credit side, however, there is a refreshing absence of typographical errors, the format is attractive, the formulas and reaction schemes are carefully and accurately depicted, and there is a reaction index which is very useful in a book of this nature.

This is a worthwhile publication and, although the price is steep, one is partly paying for a thorough literature search and compilation, and certainly all research chemists in the area should have access to this book.

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