

## Book reviews

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*Boranes in Organic Chemistry*, by Herbert C. Brown, Cornell University Press, Ithaca, New York, 1972, xiv + 462 pages, \$24.50.

This is a fascinating personal account of Professor Brown's research philosophy and how he makes it work so productively. It is based on his Baker lectures at Cornell University in 1969. Any synthetic or mechanistic chemist can pick up useful insights as well as chemical information from this book. The coverage is considerably broader than the title implies, and only the last half (pp. 255–450) would be classified as organometallic chemistry.

The chapter headings in the organometallic part include "Hydroboration with Diborane", "Hydroboration with Borane Derivatives", "The Versatile Organoboranes", "The Reactions of Organoboranes with Carbon Monoxide", "Organoboranes as Alkylating and Arylating Agents", and "Free-Radical Reactions of Organoboranes". These summarize the remarkable body of synthetic organic chemistry based on organoboranes that has been appearing bit by bit in the form of preliminary communications. Some of the chapter topics have been reviewed elsewhere, but it is particularly useful to have all the work collected in one place to aid organic chemists in assimilating and applying this versatile approach to synthesis. Most of the classical synthetic problems have some sort of elegant solution in borane chemistry. Examples include chain extensions by one, two, or three carbon atoms, closure of small rings, conversion of olefins to alcohols, ketones, amines, and other derivatives, and a variety of useful ways of combining two or three olefins into one larger molecule containing a functional group. Many of these processes are highly stereospecific. Quite a number of new communications have appeared since the book was written, and some day a more comprehensive coverage will be needed, but the present volume covers most of the fundamental ideas.

The first half of the book is indirectly related to organometallic chemistry. It begins with the early history of Professor Brown's varied research interests and goes on to his work on steric effects, including organoborane–amine complexes and the nonclassical carbonium ion controversy. Steric effects can account for some of the phenomena previously attributed by other workers to nonclassical ion character. Professor Brown still seems to feel that the norbornyl cation has the classical structure, though he does not quite actually say so, and he dismisses Olah's very convincing contrary evidence with a single paragraph questioning its relevance. This reviewer has never been able to see why the nonclassical ion structure should arouse so much suspicion, especially in view of the analogous three-center bonds found in trimethylaluminum dimer, carboranes, and, ironically, diborane. The following chapter in the book covers selective reductions with borohydrides and aluminohydrides.

Professor Brown promotes organoboranes as the most versatile organometallic

reagents available, surpassing even the Grignard reagents in the variety of their reactions. Perhaps other organometallic chemists will rise to meet this challenge. If they are to make new and exciting discoveries, they will need Professor Brown's favorite attitudes: optimism and enthusiasm.

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*Progress in Inorganic Chemistry, Volume 16*; edited by S.J. Lippard, Wiley-Interscience, New York, 1972, 630 pages, \$15.95, £7.50.

There are three reviews within this volume: Halides and Oxyhalides of the Early Transition Series and Their Stability and Reactivity in Nonaqueous Media; by R.A. Walton, Stereochemical and Electronic Structural Aspects of Five-Coordination; by J.S. Wood, and Transition Metal Complexes Containing Carbenoid Ligands; by F.A. Cotton and C.M. Lukehart.

Of these three, the first will provide something of a challenge to the casual reader, due primarily to the extraordinary density of factual material presented. The high ratio of references cited to the number of pages (650 references, 194 pages of text) is, in one sense, an index of this; for comparison the section on metal-carbenoid complexes covers 119 pages and contains 139 references.

This article can only be considered to serve as an exhaustive literature survey of this area. In my opinion such an article is particularly timely. One is aware of the current extensive effort involving applications of transition metal halides as precursors to the catalytic systems; for example, olefin metathesis reactions generally begin with higher oxidation state molybdenum, tungsten or rhenium halides or oxides. No doubt an in-depth survey of this subject by a knowledgeable inorganic chemist will stimulate work in this area. And if one wishes an article for a general survey there are available other alternatives such as D.L. Kepert's book, "The Early Transition Metals", which has just appeared.

Wood's article on Five Coordination appears now following substantial (though perhaps waning?) research efforts on this subject. Since the last major review article on five coordination appeared six years ago, the appearance of Wood's review at this time appears appropriate. The author, rightly I think, has concentrated on five-coordinate transition metal complexes; earlier treatments dealt more with molecular compounds of the main group elements. There is in this article a very good section on the electronic structures of transition metal complexes, and a complete summary of structural data on five coordinate species.

Unfortunately the article on Carbenoid-Metal Complexes by Cotton and Lukehart appears just after another article on the same subject in *Chemical Reviews* by Cardin, Cetinkaya