Book Reviews

Contributions to Chemistry

Boranes in Organic Chemistry. HERBERT C. BROWN. Cornell University Press, Ithaca, N.Y., 1972. xiv, 462 pp., illus. $24.50. George Fisher Baker Non-Resident Lectureship in Chemistry, Cornell University, 1969.

The coverage of this book is not limited to the author's pioneering contributions in hydroboration and the chemistry of organoboranes. It presents an account of his entire research activities over the past 35 years, conveying the true flavor of his discoveries and the personality behind them. It provides the present and future generations of chemists with historical perspective, and with a vicarious experience of the past. Brown's expressed purpose for his approach, in this era of pessimism about the future of basic research in chemistry, was to provide the student and recent graduate with reasons for optimism and a realization that interesting and important research still can be done with only a modest investment in manpower and equipment. In these objectives Brown has succeeded admirably.

In the prologue of the book, the author reminisces about the professors who influenced his early career and describes the many problems he faced as a young scientist in obtaining an academic position and in starting his research program. Part 1 of the book then provides the reader with an account of the author's early studies with diborane and alkali metal hydrides, reagents which in his hands played a key role 20 years later in the development of highly selective reducing agents and the hydroboration reaction. Brown's important early contribution on free-radical chlorinations and chloroformylation, the properties and selectivities of free radicals, and directive effects in free-radical aliphatic substitution are also described in this section.

The next two sections lead the reader into Brown's fundamental work on steric strains and their chemical effects and his contributions on the nonclassical cation problem. His definitive work on steric strains has led to a more quantitative assessment of steric effects in organic chemistry, and thus has brought him the distinction of being the father of modern stereochemistry. The controversy of the nonclassical cation problem, which has dominated the chemical scene for many years, is presented in a fair, factual manner. Brown's demonstrated view that the "unusual" rate and product stereochemical behaviors of many reported chemical systems, especially those containing the norbornyl skeleton, can be attributed simply to steric factors is clearly pointed up.

A section on reductions with borohydrides, aluminohydrides, boranes, and alanes then gives an up-to-date account of Brown's investigations in the development and applications of tailor-made selective reducing agents. These contributions have provided the synthetic chemist with some of his most useful methods for attacking syntheses involving complex stereochemical problems.

The history of organometallic chemistry is punctuated by landmark discoveries which have had a profound influence on the whole of organic chemistry. One of these is certainly the discovery of the hydroboration reaction together with the exploration of the utility of the resultant organoboranes in organic synthesis by Brown and his co-workers. This is the topic of the last two sections of the book. Although only ten years have passed since publication of Brown's *Hydroboration,* the hectic pace and tremendous progress made in this field make these reviews very timely. Especially fascinating are Brown's personal comments which constantly make the reader aware of the influences leading to the initiation of certain research programs and of how by recognizing the significance of and exploiting minor anomalies in experimental results one can open major new research areas.

In summary, the reader of this book must certainly conclude that Brown is one of today's most important figures in chemistry. Few living organic chemists can claim such major accomplishments in such a wide variety of areas. The current status of many of the topics in the book is aptly epitomized in the closing sentences of the epilogue: "There are doubtless additional new continents around us awaiting discovery. They will not be discovered by pessimists, but by optimists, exploring with enthusiasm and hope." Thus, this book is strongly recommended not just to the researcher currently working in the area of organoboron chemistry. One can sincerely hope that every chemist will take the opportunity to read and benefit from this fascinating scientific research autobiography.

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Biochemistry of Development

Critical Variables in Differentiation. BARBARA E. WRIGHT. Prentice-Hall, Englewood Cliffs, N.J., 1973. xvi, 110 pp., illus. $7.95. Concepts of Modern Biology Series.

Genetic and biochemical analyses of gene expression have been eminently successful in defining the temporal sequence of events controlling growth and differentiation of viruses and bacteria. However, it is an open question whether this approach will be effective in the study of differentiation in complex multicellular organisms. The description of developmental changes in transcription and translation of specific genes can point out that these events occur in a well-regulated manner but cannot tell us why they occur. On the other hand, we already know that metabolic processes which affect cellular physiology depend on factors other than the enzymatic complement of the cell, such as compartmentalization, substrate availability, and enzyme activators and inhibitors. In this monograph, Wright emphasizes the role that small molecules may play in differentiation.

Differentiation is considered as an integrated process by which the function of the cell or tissue is redirected. The emphasis is not on the details of each individual biochemical step, but on the interplay of the components. Critical variables are considered to be those which limit the rate of differentiation at particular points in time.

This point of view is applied to biochemical changes which occur during development of the cellular slime mold, *Dictyostelium.* Wright's concern with