Volume Preface: "Tall Oaks from Little Acorns Grow"

It is a distinct honor and a great pleasure for me to undertake the writing of the Preface for this volume of the *Science of Synthesis Reference Library*. My dear friend and boron chemist extraordinaire, Profesora Elena Fernández, has very graciously allowed me the opportunity to write a few words of introduction.

As the last graduate student and a lifelong disciple of Professor H. C. Brown, I cannot help but bring some of his wisdom and insight to bear on this wonderful contribution by Elena and an all-star cast of authors. As many may know, the discovery of the hydroboration reaction was quite serendipitous.[1] Upon studying the reducing capabilities of sodium borohydride/aluminum trichloride with scores of diverse, polar functional groups, a single anomaly was noted in the reduction of ethyl oleate, an unsaturated ester. Thus, although two moles of "hydride" were expected to be consumed in the reduction of the ester, quite surprisingly, 2.4 moles were required. According to Brown, discussions were held concerning potential reasons for this, including the possibility of an impure sample of the ester, etc. A stickler for detail, Professor Brown insisted that the reaction be repeated with pristine ethyl oleate, and, somewhat surprisingly, this produced the same result! The conclusion that the alkene was also being reduced to afford an organoborane was inescapable, and thus the hydroboration reaction was discovered.

As subsequently noted by Professor Brown,[2] at the time, this discovery of a simple route to organoboron compounds was not greeted with the great acclaim that we might, with the value of hindsight, have suspected. As he pointed out, many readers (and reviewers!) expressed serious doubt about the significance of this reaction. In those days (1956), little was known about the chemistry of these rather exotic reagents, which had been first prepared by Frankland in 1862. It was assumed by these skeptical individuals that nearly 100 years of inactivity in the area meant a lack of importance. Undaunted, Brown set out to explore their chemistry, and the rest is history.

It is difficult to imagine the world of chemistry as we know it today without the richness of organoboron chemistry. Few classes of compounds have altered the landscape of organic chemistry, broadly defined, as have organoboron compounds. Among the landmark processes that involve boron are Suzuki coupling, Chan–Lam coupling, the Miyaura borylation, the Smith C—H borylation, the Petasis reaction, and the Matteson homologation, to name a few. These reactions and others are currently driving discovery and production in the pharmaceutical and agrochemical industries worldwide, providing a better life for us all.

Professor Brown was always an optimist about science. He viewed the discovery of organoboranes as akin to the discovery of a new continent, waiting to be explored. In his lifetime, he witnessed dramatic developments in the field of chemistry that he loved, and in the intervening 15 years since his passing, the evolution of the area of science that he founded has, if anything, increased at an exponential pace.

The current volume, so deftly organized by Elena and expertly detailed by her authors, outlines in great detail the continued exploration of this vast continent. It delineates with authority and clarity many of the tremendous advances in organoboron chemistry that have taken place within the last 15–18 years. Moving away from the venerable hydroboration reaction, these chapters outline the latest generation of chemical reactions that can be carried out with exquisite selectivity, creating novel structures, reactivity patterns, and platforms for synthesis that were unimaginable even a few short years ago. As detailed within these pages, perhaps the most striking advances have been those brought about by transition-metal catalysis, which allows access to processes with astounding precision under extraordinarily mild conditions.

As I stated in a recent Perspective,[3] "My graduate mentor, Professor H. C. Brown, was very fond of the quote 'Tall oaks from little acorns grow' to describe the growth of organoboron chemistry from its humble beginnings with the chemistry of sodium borohydride and the subsequent discovery of the hydroboration reaction. With the continued exploration of … other areas of related organoboron research, more and more boughs continue to grow on this magnificent tree." The current contribution to the *Science of Synthesis Reference Library*, detailing some of the most recent, important advances in boron chemistry, highlights many aspects of this exciting, continually evolving area of research, and will certainly provide tremendous inspiration for further exploration of the wonderful world of organoboron chemistry for many years to come.

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References

[1] Brown, H. C., *Hydroboration*, W. A. Benjamin Inc.: New York, (1962).
[2] Brown, H. C., *From Little Acorns to Tall Oaks – from Boranes through Organoboranes*, Nobel Lecture, December 8, 1979.
[3] Molander, G. A., *J. Org. Chem.*, (2015) **80**, 7837.