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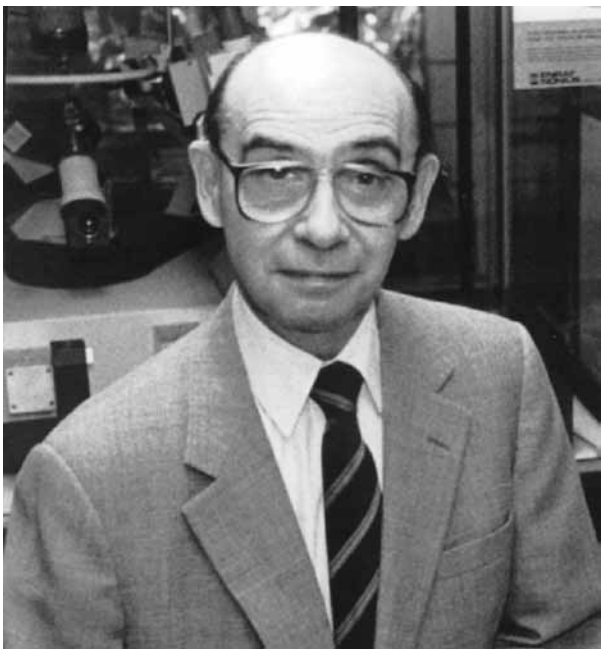
Foreword



The editors have assembled this special issue in honor of Professor Sheldon G. Shore on the occasion of his 70th birthday with a great sense of pleasure. He is a special friend, one who has generously shared his insight as well as his humor. Of course, it is the many contributors that make a special issue such as this one a success and we are grateful for the abundance of papers herein that reflect the breadth of Sheldon's interests as well as celebrate his chemistry. We preface this special volume with a short personal and scientific biography to introduce Sheldon to those who may not know him as well.

Sheldon was born in Chicago and grew up in the same locale as Herb Brown's wife Sarah. The high school he attended was in the same building that formerly housed the junior college that Herb attended. After high school he pursued a BS degree at the University of Illinois where he was introduced to research in the laboratory of Donald Ray Martin. Professor Martin left shortly thereafter for a position at the Naval Research laboratory but Sheldon continued to explore the thermal analysis of liquefied gases largely on his own. In doing so he developed intellectual independence at an early age — he even had a key to the building (forbidden undergraduates at the time).

Following graduation, he entered the PhD program at Michigan becoming an early student of a dynamic young professor named Bob Parry in 1951. There, a collaboration that consisted of Donald Schulz, Sheldon, and Parry solved a problem that had baffled chemists, including the father of boron chemistry Alfred Stock, for many years. In an elegant set of papers they demonstrated that the ammonia adduct of diborane is an ionic product resulting from unsymmetrical cleavage of the diborane molecule. At Michigan, Sheldon synthesized and isolated ammonia borane and showed it to be a reasonably air stable solid, rather than a compound that earlier workers in the field deemed too unstable to detect. With his fresh PhD in hand, Sheldon spent a year at Michigan as an instructor and then joined the faculty at the Ohio State University in 1957 as assistant professor. Typical of the times he received a bench and a wall in a Quonset hut. Shortly thereafter, he lost half the bench and the Quonset hut burned down. With little possibility of research he took up piano lessons, building on a musical bent of his youth. But that summer his first student, Selwyn Rose, joined his group and, with some real space, his independent research career began. Over the subsequent years it flourished and the body of research he and his co-workers

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produced is contained in more than 245 publications and patents ranging from boron hydride to transition metal chemistry. The emphasis has been synthesis, and features his insightful manipulation of the simple proton in borane cages and metal clusters as a 'functional group'. Some highlights of his research follow.

Sheldon is well known for the development of rational syntheses of the boron hydrides, thereby providing useful routes to rare boron hydrides. He also isolated and characterized stable salts of compounds with unsupported B–H–B bonds, analogs of the elusive 'non-classical' carbonium ion of organic chemistry and, with Bau, showed that the B–H–B bond is bent in $[H_3B–H–BH_3]^-$. This stimulated several theoreticians to redo their calculations on this anion since it was previously predicted to be linear. Most recently, in an experimental tour de force, he has been able to isolate and characterize $[BH_3]^{2-}$ and $[B_2H_6]^{2-}$. Isoelectronic with $[CH_3]^-$ and C_2H_6, respectively, the new anions are destined to become 'textbook molecules'.

By extrapolating his synthetic and experimental techniques from boron hydride chemistry to transition metal cluster chemistry, Sheldon developed new synthetic procedures for metal cluster anions, and mixed metal clusters. Additionally, he carried out a series of difficult experiments which detailed kinetic and mechanistic aspects of the homogeneous catalysis of the water gas shift reaction by hydrido ruthenium carbonylates. This work demonstrated the activation by carbon monoxide of the hydrogen in a hydrido-carbonylate so that it functioned as a hydride donor. It also challenged chemical dogma regarding the ability of certain clusters to serve as hydride donors. Most recently, in collaboration with an engineering colleague, Umit Ozkan, Sheldon demonstrated that his mixed lanthanide–palladium metal arrays serve as precursors for nanoparticle bimetallic catalysts for the reduction of NO by methane in the presence of oxygen.

Sheldon recognized that $(\mu\text{-H})_3Os_3(CO)_{10}$, an unsaturated cluster, should be subjected to hydroboration and as a result produced $(\mu\text{-H})_3Os_3(CO)_9(\mu_3\text{-BCO})$, the first example of a cluster ketenylidene analog containing a BCO unit. This synthesis was followed up by studies of activation of the carbonyl of the BCO unit by electrophiles and resulted in several new types of cluster that relate to cluster vinylidene and cluster alkyne systems. Further, this molecule serves as a precursor to an osmium cluster containing an interstitial boron atom. Recently he has shown that a hydrido ziconoocene derivative of a cyclic organohydroborate complex can be converted into an unusual unsupported single hydrogen-bridged cation.

As emphasized by his 12 patents, Sheldon is aware of potential applications. A practical application of this work is his solvent free synthesis of high purity diborane which is licensed and employed in applications in the electronics industry. Amorphous boron nitride prepared by his own method can be converted into a turbostratic form possessing a previously unreported hollow tubular morphology. In addition, he has described a new approach to AlN/BN materials and prepared a number of novel extended lanthanide–transition metal structures. In the last couple of years, he has contributed new borane derivatives to an interdisciplinary collaboration on boron neutron capture therapy.

Sheldon's work has received significant recognition including the Morley Award of the Cleveland section of the American Chemical Society, the Columbus Section ACS Award, the Charles H. Kimberly Chair of Chemistry at Ohio State, presentation of the prestigious Wiberg Lecture in Munich, and election as a Corresponding Member of the Bavarian Academy of Science. In 1996, he was selected as one of three faculty members to be Distinguished Lecturer of The Ohio State University and to present a public lecture on his discipline.

Although dedicated to his chemistry, Sheldon is hardly monolithic. Indeed, from the early days he was a lab rat, but he also had a pet rat at Michigan, named Wallingford, who would partner him during late night stints at the lab bench. Undoubtedly, Wallingford was not just a pretty face as he had the run of the lab at night and ended up having Sheldon's thesis dedicated to him. In later life, Sheldon's taste in pets changed to cats and his latest, Mildred, graces his Christmas cards (and dominates the Shore homestead in Columbus). An accomplished piano player, he was for many years an avid flyer, ferrying visiting speakers and giving friends rides in the Boron Hyride, a Cherokee 235, four seat, 150 mph plane with full navigational instrumentation and a 800 mile range. A lifetime bachelor Sheldon was a hit with the waitresses at the Venetian Restaurant (since closed) and a couple would often accompany him in the 70s on airborne milk runs to deliver borane samples to Notre Dame for mass spectrometric analysis. Several of us recall Sheldon being greeted on arrival at Monterey airport for a NSF workshop by a striking blonde named Marilyn, a former waitress/student at OSU now living in California. It is typical of Sheldon to keep in touch with his friends and, in turn, they cherish his friendship. With a deprecating sense of humor and a deadpan delivery, his one-liners and Snoopy take-offs have enlivened many a conversation and brightened days when life was a drag.

Sheldon emphasized to the Editors that this issue does not signify retirement and we look forward to new developments in his on-going chemistry. But it is appropriate to pause after three score and ten years and savor the moment. His friends and colleagues, those who have contributed to this issue, and those who could not, wish him the very best in his continuing chemistry and life.

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Description of Cover Graphic

The cover illustration is an ORTEP plot of a hybrid-1,3-diborolyl/tricabadecaboranyl triple-decker sandwich complex. Alternatively, the mixed-metal 30 valence electron complex may be described as a common cluster with a common rhodium atom. The RhC_3B_7 cluster has the expected octadecahedral geometry. For further information, see the paper by Müller, Kadlecek, Carroll, Sneddon, and Siebert in this special volume, pages 125–130.