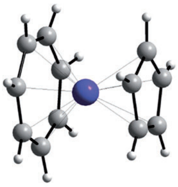
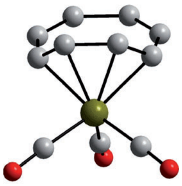
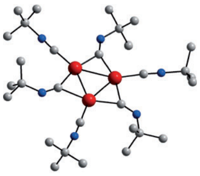
F. Gordon A. Stone



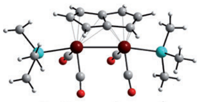
$[V(C_7H_7)(C_5H_5)]$



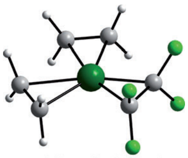
$[Fe(C_8H_8)(CO)_3]$



A Homoleptic Platinum Isocyanide



A Complex of Pentalene



$[Pt(C_2H_4)_2(C_2F_4)]$

F. Gordon A. Stone (1925–2011)

A pioneer of modern organometallic chemistry, F. Gordon A. Stone, CBE, FRS, of Baylor University, Waco, Texas passed away in his sleep on April 6 aged 85, one year after the death of his wife Judith. He is survived by his three sons Peter, James, and Derek.

Upon completing his BA (1948) and PhD (1951) under the supervision of Harry Julius Emeléus at the University of Cambridge, Gordon Stone moved to the University of Southern California as a postdoctoral Fulbright Scholar with Anton Burg, followed by an appointment as instructor working alongside Dietmar Seyferth in the group of E. G. Rochow at Harvard. It was at this stage that Gordon Stone's interest in organo-transition-metal chemistry began to emerge—a passion that would endure for 60 years. His entry into transition-metal chemistry began with the study of the reactions of cyclic polyolefins with metal carbonyls, and early results included the first cycloheptatrienyl sandwich complex $[V(\eta\text{-}C_5H_5)(\eta\text{-}C_7H_7)]$ and the cyclooctatetraene complex $[Fe(\eta^4\text{-}C_8H_8)(CO)_3]$, an early example of the now commonly observed ring-whizzing fluxionality. During studies on the coordination of nonconjugated dienes, divinyl derivatives of tin, germanium, and sulfur were found to readily eliminate butadiene to afford stannylene, germylene, and sufido clusters. Thiophene might be considered a special case of a divinylsulfide and was shown for the first time to be desulfurized by iron carbonyls to afford diferroles, foreshadowing the role that metals serve in the hydrodesulfurization of thiophene-containing petroleum feedstocks. Highlights from this period include the first σ,π-bridging vinyl ligands and the demonstration of $\eta^1\leftrightarrow\eta^3$ interconversion for allyl ligands.

At this time, transition-metal alkyl compounds were still somewhat rare and the factors contributing to their reactivity or stability were not well understood. An extensive program of study of the reactions of fluorocarbons with metal carbonyls ensued and provided fluorocarbon analogues of more conventional but elusive alkyls with the profound difference that they displayed considerably greater stability. This enhanced stability also allowed the direct observation of otherwise elusive processes such as the dimerization of alkenes to provide metallacyclopentanes and the hydrometalation of fluoroalkenes.

In 1962, Gordon Stone returned to the United Kingdom, briefly to a lectureship at Queen Mary College (University of London) and then soon to the newly inaugurated Chair of Inorganic Chemistry at the University of Bristol. The rapid rise of Bristol inorganic chemistry under his mentorship ensures that it will always be Bristol with which Gordon Stone is most closely identified.

Gordon Stone's discovery of a simple direct synthesis of $[Ru_3(CO)_{12}]$ allowed the subsequent and rapid development of ruthenium carbonyl cluster chemistry, a field that was to dominate much of his future work. Combining this with his interest in cyclooctatetraene chemistry led to the isolation of complexes of the highly reactive pentalene. With the increasing use of cyclooctadiene (cod) as a labile ligand, Stone set about developing an effective route to the zerovalent platinum complex $[Pt(\eta^4\text{-cod})_2]$. This complex proved to be a veritable platinum mine in terms of opening up numerous avenues by serving effectively as a source of bare platinum for the introduction of all manner of ligands. These included other olefins, with $[Pt(\eta^2\text{-}H_2C{=}CH_2)_3]$ being a true organometallic classic. Whilst this work was ongoing, a very simple idea emerged with far-reaching consequences: If a C–C multiple bond can coordinate to a metal, might a metal–carbon bond behave similarly? Some 120 subsequent publications confirmed the answer was a resounding yes. The use of carbyne ligands in such bridge-assisted metal–metal bond formation processes provided an enormously versatile method for the stepwise and systematic construction of heteropolymetallic assemblies under remarkably mild conditions. Perhaps the most elegant demonstration was the stepwise construction of cyclic octametallic star clusters, one of which, $[W_2Ni_2Pt_2(\mu\text{-}CR)_4(CO)_8(\eta\text{-}C_5H_5)_4]$, adorned a cover of this journal. These results and many more from the Bristol group provided a copious library of complex structures that could be deconstructed by isoelectronically mapping metal–ligand fragments to simple more familiar hydrocarbon units—the basis of Hoffmann's isolobal analogy.

The exploration of the impressive generality of this approach to various carbyne complexes raised the question of replacing the cyclopentadienyl ligand in $[W(\equiv CR)(CO)_2(\eta\text{-}C_5H_5)]$ with Hawthorne's dicarbollide dianion, the exposed face of which presents valence orbitals of the same symmetry as those of the cyclopentadienyl anion. The basic premise proved successful in amply demonstrating parallels. More intriguingly, numerous instances were uncovered wherein the dicarbollide cage proved less than innocent, often participating in subsequent transformations. This essentially new field, the combination of carbaborane and transition-metal hybrid clusters, became the focus of Stone's last two decades of research. Upon his UK retirement in 1990, Gordon Stone was lured to Baylor University, in Waco, Texas to become the Robert A. Welch Foundation Distinguished Professor of Chemistry until his retirement.

Only a very small number of his impressive contributions to the science of organometallic chemistry have been mentioned here. During his time in the UK Gordon Stone was, however, similarly active in national committees concerned with teaching, research funding, and the distribution of resources for chemistry. The contributions made by Gordon Stone to UK science policy over many years were considerable. These culminated in the University Grants Council commissioning Gordon Stone to chair the study “*University Chemistry—The Way Forward*” (colloquially known as the Stone Report).

Gordon Stone was awarded the Davy Medal of the Royal Society in 1989 and the Longstaff Medal of the Royal Society of Chemistry in 1990. He is one of the relatively few chemists to have received both this Medal and the Davy Medal. He also received the American Chemical Society’s “Award for fundamental advances in research in inorganic chemistry” in 1985. With Robert West, Gordon Stone was the founding editor of the series *Advances in Organometallic Chemistry*, now in 58 volumes, and with E. W. Abel and G. Wilkinson was a co-editor of the encyclopedic works *Comprehensive Organometallic Chemistry I and II*.

Some 100 graduate students have acquired Ph.D. degrees working under his supervision, and over 60 postdoctoral workers have studied in his laboratory. Such has been his influence on academia that currently about 80 of those who have been associated with him occupy university teaching posts throughout the world. To those fortunate enough to have studied with Gordon Stone, what immediately springs to mind is the uncompromising loyalty he showed to his co-workers, his concern for those that were struggling with their work, and his genuine enthusiasm for each new result. In his own words, “*Making oneself available to graduate students and postdoctoral assistants, even outside normal working hours, I deem to be of crucial importance for their well-being.*” Gordon Stone was tireless in his efforts, behind the scenes, to foster the careers of former students. The other more elusive factor that distinguished Stone is much harder to delineate—chemical intuition or instinct. Some people have it, most don’t; or as the Nobel laureate Roald Hoffmann once observed: “*What has always impressed me is how you could know ahead of time what the theoreticians would come up with*”.

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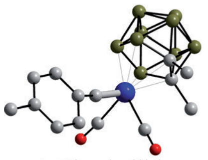
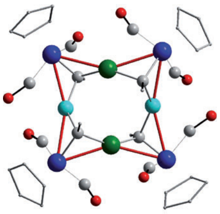

A Dicarbollide Carbyne


A $W_4Ni_2Pt_2$ Star