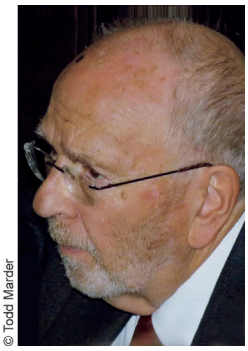
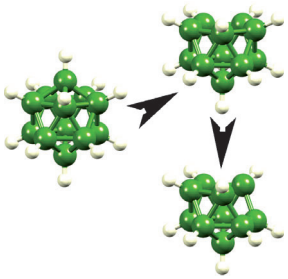


Kenneth Wade



Kenneth Wade (1932–2014)

My first encounter with Kenneth (Ken) Wade was during my undergraduate chemistry degree at the University of Durham when Ken presented a course on boranes. His lecture style was unhurried and always in his characteristic wry manner. His *New Scientist* article "Boranes: rule-breakers become pattern-makers" had just been published (1974); notice that this placed boranes in a popular science journal, accessible to the general public. This was my first introduction to molecules that mapped onto polyhedra, and strongly appealed to my love affair with three-dimensional structures. Ken was a wonderful teacher, having a gift for making his students think rather than simply taking notes. Tutorials were an unknown quantity as he threw in questions and thought-provoking ideas that seemed a mile away from the basic course material. For an undergraduate essay assignment in 1975, I chose a "Wadean" topic of "Skeletons in the Cupboard" and later wondered if something more mainstream might have been a better idea. Still, I stuck with the skeletons.

Ken Wade was born in 1932 in Sleaford, Lincolnshire (UK). He read chemistry at the University of Nottingham, with his PhD studies under the guidance of Norman Greenwood (Ken was Norman's first doctoral student) investigating the addition compounds of gallium and boron trichlorides. His postdoctoral periods were at Cornell University with Albert Laubengayer investigating organonitrogen aluminum compounds (1959–1960), preceded by two years with the esteemed Professor Harry Emeléus in Cambridge. This latter period is personally described by Ken in *Nature Chemistry* (**2009**, *1*, 92)—a study of "assorted reactions of diborane", fraught with explosions, with the aim of assessing the use of boranes as fuels or fuel additives in connection with the space race in the 1950s and 1960s. This proved not to be a realistic goal, but nonetheless opened up a dazzling world of boranes and carboranes that challenged the, then current, structural and bonding concepts.

In 1960, Ken started his independent academic career as a lecturer at Derby College of Technology, moving in 1961 to the University of Durham, where he was subsequently promoted to senior lecturer (1971), reader (1977), and professor (1983). On the administrative side, Ken worked assiduously with his colleagues toward improving the national and international standing of the chemistry department in Durham. His natural demeanor tended to hide a determination that soon won through in meetings and in planning for the future. Ken's research career spanned a period from 1961–1997 and his achievements were recognized by numerous awards including the Royal Society of Chemistry's Main Group Award in 1982 and Tilden Lectureship in 1987–1988. Election to a Fellowship of the Royal Society in 1989 was a just reward for Ken's unique approaches to main-group chemistry. In 1997, Ken formally retired, but remained highly visible as emeritus professor for many more years.

Ken's research focused within the p-block of the periodic table. By the late 1960s, Ken and his research group were heavily involved in reactions of organoboron, -aluminum, and -gallium compounds, and this progressed to numerous aspects of organolithium and -beryllium chemistries, as well as the corresponding compounds of silicon, germanium, and tin. In 1970, Ken, along with Ron Snaith and Barry Wyatt published a report of "the first crystalline aluminium–nitrogen compounds to have three-coordinate aluminium bound to organonitrogen ligands with orientations appropriate for maximum dative N–Al π bonding" (*Inorg. Nucl. Chem. Lett.* **1970**, *6*, 311). Always acutely interested in bonding within compounds of the main group elements, Ken wrote an excellent textbook *Electron Deficient Compounds* in 1971. This was an enlightening book for students to read, one that was, naturally, recommended to the then undergraduates in Durham.

Despite the significant advances that he made in synthetic organometallic main-group chemistry, Ken Wade is, of course, best remembered for Wade's Rules. These are a set of surprisingly simple empirical rules relating the number of skeletal electron pairs to the polyhedral shape of the borane and carborane clusters (*J. Chem. Soc. D* **1971**, 792). They are a tribute to Ken's determination to understand the nature of the bonding in so-called electron-deficient boron-containing clusters. The initial families of *closo*, *nido*, and *arachno* clusters were joined by the more open *hypho* cages, and later extended to encompass the more exotic borane clusters that emerged experimentally. Wade's Rules (or polyhedral skeletal electron pair theory, PSEPT) and the extended Wade–Mingos Rules have been taught, and continue to be taught, to students worldwide. Ken used to tell colleagues that SECS (skeletal electron counting scheme) would have been a better acronym! Although it may be (to some) more satisfying to teach the concept of electron-counting in borane and related clusters through the use of molecular orbital theory, this loses much of Ken's simple and original approach. Despite Ken's thoughtful manner, some of his ideas came with sudden impulse. I recall him entering the laboratory one morning and startling me with: "What do you think to cyclobutane being a *hypho* cluster?"—little cited, admittedly, but this did, rather remarkably, make it to the literature (*Tetrahedron Lett.* **1979**, *20*, 3175).

Internationally, the boron community comes together through Imeboron, but for several generations of boron chemists in the UK, it was the annual Intraboron Meetings that were of special significance. Initially organized by the "three Johns" (Kennedy, Morris, and Leach), these were a wonderful and informal platform for young boron researchers, and Ken was ever-present as a father figure with his characteristic humor that would suddenly turn into stimulating suggestions and ideas.

Ken never headed a large research team. So what made Ken Wade such a unique individual among his generation of inorganic chemists? From my perspective, it was his ability to think clearly and logically and to encourage others to think, coupled with his wry sense of humor. The international main-group chemistry community will miss him.

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