

Frank Albert Cotton (1930–2007)

Prior to WWII, inorganic chemistry was a relatively weak discipline in the US, but F. Albert Cotton was a major contributor to the renaissance of inorganic



chemistry in America after the war. His books—especially *Advanced Inorganic Chemistry* with G. Wilkinson, his PhD mentor at Harvard, and *Chemical Applications of Group Theory*,^[1] texts that every

inorganic chemist has examined and most have used—his enthusiasm for research, and his own personal drive put the discipline of inorganic chemistry on a par with the other strong subdisciplines of chemistry worldwide. He had over 1600 research publications, and mentored 116 PhD graduates and over 150 postdoctoral scholars from all over the globe. His many contributions are legendary, rivaling the impact of Linus Pauling. His half century of active work was marked by his focus on fundamentals, studies he liked to call “curiosity driven research”.

Al Cotton's truly exciting discoveries began with cyclopentadienide “sandwich” complexes, which later gave rise to his work on the concepts of fluxionality for some of these organometallic compounds. He saw the importance of mathematical concepts, such as group theory, and their application to the understanding of bonding and structure very early in his career. He was among the first to apply group theory to electronic and vibrational spectroscopy of transition-metal inorganic and organometallic compounds. I was fortunate to work with him as a PhD student at MIT during this exciting period. Soon afterwards (1964) he recognized the formation of quadruple bonds between metallic elements. Discovering the implications for new chemistry of metal–metal bonding through σ -, π -, and δ -orbital overlap became his passion.

Much has already been written about the career of this remarkable chemist who, as Steve Lippard writes,^[2]

had “the ability to recognize and explain properties of matter that others have previously encountered but could not comprehend.” His contributions to science are documented in his autobiography (to be published) and an article written by Carlos Murillo.^[3]

When I came to Texas A&M as Dean of Science in 1983, I was fortunate to have my research group associated with the Laboratory for Molecular Structure and Bonding that Al directed and to occupy an office next to his. We often talked about academic and scientific matters, including international chemical research and the publication in non-US journals such as *Angewandte Chemie*. He enjoyed foreign travel, which, over his lifetime, included much of the globe. As a graduate student, Cotton received a fellowship from the University of Copenhagen, where he developed a long friendship with Carl Ballhausen. Christian Klixbüll Jørgensen impressed him greatly, and Al often talked about Jørgensen's encyclopedic memory. The fundamental ideas of these two theoreticians became part of Al's repertoire. In the late 1950s, he became a very frequent visitor to London, mainly to soak up the knowledge being developed in Ron Nyholm's laboratory. Knowledge he had gained from these visits resulted in my first publication with him on nickel(II) acetylacetonates. After one of his trips, he was very excited to tell us about the work of Cirila Djordjević with Nyholm on tetrahedral tetrahalogenido complexes of Ni^{II} and other transition-metal ions. He also used these trips to discuss with Wilkinson issues related to the “the inorganic bible” (*Advanced Inorganic Chemistry*).

Cotton had a good ear for sounds and language; as well as reading Danish, he spoke French, Spanish, and German. Although his critical ear often left him unhappy after poor concert performances, he always enjoyed good classical music, and there were many occasions on which he, alone or with his wife Diane (Dee), who sometimes traveled with him, attended concerts in London and Paris. Early in his career at MIT, he and Dee spent a year in Argentina, which ultimately led to the translation of *Advanced Inorganic Chemistry* into Spanish. Cotton received many honors,

among them numerous honorary degrees, the King Faisal Prize in Science (1990), as well as the Wolf Prize from Israel (2000). In total, he was a member of eight science academies outside the US. Cotton certainly was the most internationally acclaimed inorganic chemist of our time.

For those of us who knew Al, his death at age 76 was very premature. The day before he was first hospitalized, he stopped in my office, and we talked about aspects of his recent China trip. He also was very excited about a new ligand that might enable a dinuclear molybdenum complex to show an even lower oxidation potential than that of an earlier published complex, which loses an electron more readily than cesium.^[4] He loved such fundamental discoveries. The F. Albert Cotton Award in Synthetic Inorganic Chemistry of the American Chemical Society is a tribute to his interest in creating new molecules. Cotton is survived by his wife Diane and his daughters Jennifer and Jane.

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- [1] F. A. Cotton, G. Wilkinson, C. A. Murillo, M. Bochmann, *Advanced Inorganic Chemistry*, 6th ed., John Wiley & Sons, Chichester, **1999**; F. A. Cotton, *Chemical Applications of Group Theory*, 3rd ed., John Wiley & Sons, New York, **1990**.
- [2] S. Lippard, *Nature* **2007**, *446*, 626.
- [3] C. A. Murillo, *Inorg. Chim. Acta* **2007**, *360*, 2519.
- [4] F. A. Cotton, N. E. Gruhn, J. Gu, P. Huang, D. L. Lichtenberger, C. A. Murillo, L. O. Van Dorn, C. C. Wilkinson, *Science* **2002**, *298*, 1971.

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