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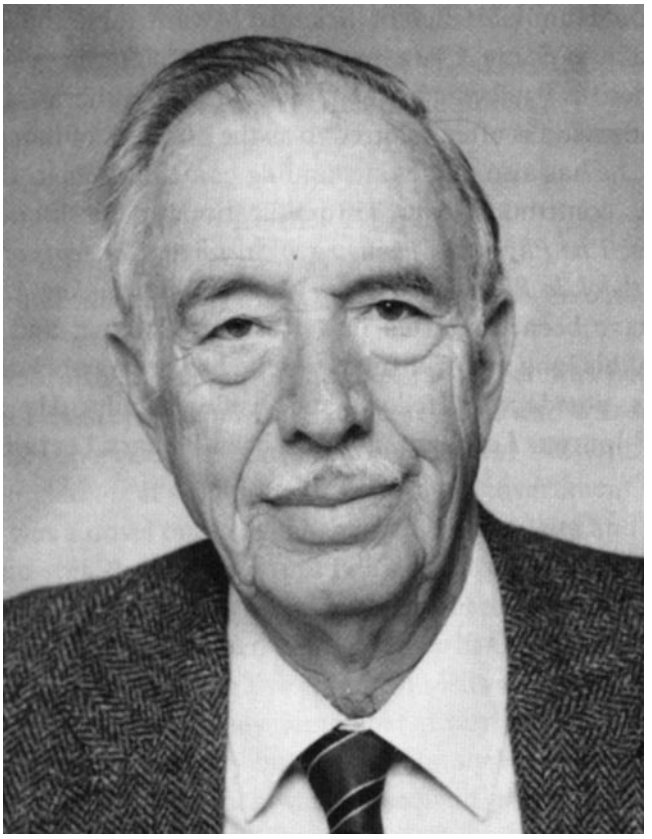
Arthur W. Adamson — A birthday celebration



This collection of papers is dedicated to Arthur W. Adamson on the occasion of his 80th birthday. A one-day symposium to celebrate this milestone in an extraordinary career was held during the 217th National Meeting of the American Chemical Society in March, 1999. At that event, several former co-workers and long-time colleagues presented research talks that were interspersed with recollections of their interactions with Arthur over the years. These speakers and several other individuals who wished to honor him were invited to submit the papers collected here.

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Arthur Adamson was born on August 15, 1919 in Shanghai, China, where his father, a civil engineer, was supervising the construction of a YMCA building. A fascinating personal account of his childhood, education, and early professional days can be found in an interview with him published a few years ago in this journal [1]. Our emphasis here will be to recount some of his numerous contributions to chemistry in general, and inorganic photochemistry in particular.

Adamson has aptly been called the 'father of inorganic photochemistry'. Prior to his entry in the late 1950s, the field was largely a collection of scattered observations on the light sensitivity of a few transition metal complexes. He was perhaps the first scientist (certainly the first in the USA) to undertake a systematic investigation of the quantitative consequences of the interaction of light with these compounds. His early work established two fundamental and far-reaching principles: (i) the photochemical reactions of a metal complex are not merely photo-accelerated thermal processes, but instead represent the distinct reactivity of electronically excited states, and (ii) the population of excited states of different orbital types can result in different reactivity patterns.

Building upon this foundation, Adamson published a series of classic studies that set the tone and direction for much of the research in inorganic photochemistry over the next 40 years. He formulated the now famous Adamson's rules [2] governing the photosubstitutional chemistry of metal complexes, especially those of chromium(III). These rules allowed the prediction of which ligand would be photolabilized if more than one kind were coordinated and, as a corollary, which complexes would appear to be photoinert. The rules were responsible for a major stimulation of research; laboratories worldwide devoted their efforts to finding new cases which further confirmed the rules, and others, to finding and then explaining exceptions to them. The rules, also provided guidance to theoretical groups who sought to explain the photoreactivity patterns of metal complexes in terms of the electron density distribution of individual excited states.

The Adamson group provided the first example of intermolecular energy transfer involving the excited state of a transition metal complex in room temperature, fluid solution [3]. As with the photolysis rules, this observation engendered great interest and stimulated much literature developing sensitization as a phenomenon applying to metal complexes. Inorganic photochemistry acquired a new dimension.

In a truly seminal study, the lowest excited state of tris(2,2′-bipyridine)-ruthenium(II) was shown to undergo bimolecular electron transfer chemistry [4]. This discovery provided kineticists with a new family of high-energy redox reactions with which to test the Marcus theory, and allowed them to explore the 'inverted region'. Equally important, the discovery made available the fundamental process on which to base the design of systems for harnessing sunlight to generate fuels and/or electricity. Work in this area has expanded explosively with the use of assemblies of metal complexes immobilized at interfaces, and such supramolecular systems have put in place the elements needed for practical solar energy conversion devices.

As well as stimulating other laboratories, Adamson, sought and found evidence that the photochemistry of metal complexes was generally not predissociative or

prompt and did not occur from hot ground states, but rather from thermally equilibrated excited states. He emphasized that such states were good chemical species, having their own conventional absorption spectra, both UV–Vis and IR, a defined structure, and their own chemistry. The thermally equilibrated excited state constituted a thermodynamic ensemble — not just a spectroscopic state — which had entropy and a standard redox potential. To add emphasis, he introduced the term 'THEXI state' [5] to denote such ensembles as distinct chemical species.

Other major achievements from the Adamson laboratory include the pioneering use of flash photolysis, continuous laser photolysis, and pulsed laser photolysis in the study of metal complexes [6–10], the first complete photochemical and photophysical study of a metal carbonyl complex [11], the first reported use of photocalorimetry to obtain enthalpies of photosubstitution reactions of metal complexes [12], the first report of the detailed kinetics of a slow chemiluminescence reaction involving a metal complex [13], and the first use of a shock wave from a high-energy laser source to produce triboluminescence in a coordination compound [14]. For his numerous contributions to the field of inorganic photochemistry, Adamson received, in 1982, the American Chemical Society Award for Distinguished Service in the Advancement of Inorganic Chemistry. About 120 of his 250 + publications have dealt with photochemical topics. The Citation Index shows that, since 1974, this body of work has received some 3000 citations.

Arthur Adamson is one of very few scientists who conducted internationally recognized research in two distinct areas. Thus, in addition to his aforementioned studies of inorganic photochemistry, he maintained a very active research program in surface chemistry. He authored the most important text and reference book in the field, *The Physical Chemistry of Surfaces*, now in its sixth edition (Professor Alice P. Gast of Stanford University became a co-author on this edition). In 1979, Adamson received the American Chemical Society Kendall Award in Surface or Colloid Chemistry. He was selected, in 1984, as founding editor of the ACS journal, *Langmuir*. In 1992 the American Chemical Society established the Arthur W. Adamson Award for Distinguished Service in the Advancement of Surface Chemistry.

Adamson authored two other important textbooks: *Understanding Physical Chemistry* and *A Textbook of Physical Chemistry*. Each has gone through multiple editions and been translated into several languages. The popularity of these books provides a tangible measure of the impact that he has had on countless students worldwide. For his contributions to the teaching of chemistry, he received, in 1984, the American Chemical Society Award in Chemical Education.

Over his career, Adamson won three national ACS awards and had a fourth named in his honor, a distinction that places him in a small, very select group of scientists. Even more impressive, these awards span three distinct fields: inorganic photochemistry, surface chemistry, and chemical education. For his lifelong service to the field of chemistry, Adamson received, in 1994, the Gold Medal of the American Institute of Chemists. This extraordinary list of honors attests to the broad impact of his scientific accomplishments.

Those of us fortunate enough to have interacted with Arthur can attest to the positive role that he played in our professional careers. The entire scientific community owes him an enormous debt of gratitude. For the future, we wish him a long, happy, and productive retirement.

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