Robert J. P. Williams

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Founding father of bioinorganic chemistry

Robert (Bob) J. P. Williams who, after a short illness, died on the 21st March 2015 at the age of 89, was professor emeritus at the University of Oxford and was internationally recognized as a founding father of bioinorganic chemistry. His pioneering studies on the roles of metal ions in biological systems brought unprecedented insights into the structure, function, and dynamics of metalloproteins, and established a better understanding of biological signaling, electron-transfer processes, and enzyme catalysis. As one of the inaugural members of the Oxford Enzyme Group in 1972, he employed new developments in high-field NMR spectroscopy to reveal the connection between conformational change and biological function in iron- and calcium-binding proteins, cytochromes, and kinases. In the latter part of his career, Williams initiated a new area of study elucidating the chemical principles responsible for the structure, morphology, and function of calcium carbonate, silica, and iron oxide biominerals.

Williams studied chemistry at Merton College, Oxford for both his BA and DPhil (1944–1950). During his undergraduate research project, he published, with Harry M. N. H. Irving, a seminal paper in *Nature* (1948) on the relative stabilities of metal-ion transition-metal complexes, that became widely known as the Irving–Williams series. After Oxford, Williams took up a one-year postdoctoral position with Arne Tiselius in Uppsala, Sweden, where he developed chromatographic techniques for protein isolation, and published, as sole author, a ground-breaking paper in *Biological Reviews* (1953) entitled "Metal ions in biological systems". There he also met Jelly Büchli, whom he married in 1952. He returned to Merton College as a Junior Research Fellow (1951–1955), and was appointed in 1955 as Tutor in Chemistry at Wadham College and University Lecturer in the Inorganic Chemistry Laboratory. He subsequently switched to teaching biochemistry to undergraduates to widen his knowledge. Williams took sabbatical leave at Harvard Medical School in 1966 to work with Bert Vallee, which led to a long collaboration on the isolation of the Zn carboxypeptidase and the replacement of the Zn^{II} ion with the spectroscopically active Co^{II} ion. After his retirement in 1995 he held emeritus positions at Oxford.

Bob's long, outstanding career has been recognized by numerous international honors. He was elected as a Fellow of the Royal Society in 1972, and was a member of four further national academies, as well as the recipient of several honorary degrees. He was also recognized with many distinguished awards and titled lectures. He published over 700 articles, including several highly original books offering novel insights on general inorganic chemistry, the inorganic chemistry of life, the natural selection of the elements, and most recently, the co-evolution of the chemistry of the environment and life (such as *The Biological Chemistry of the Elements—The Inorganic Chemistry of Life* (with J. J. R. Fausto); and *Evolution's Destiny: Co-evolving Chemistry of the Environment and Life* (with R. Rickaby)). In recognition of his distinguished career, Wadham College established no less than three academic positions that bear his name. Bob was awarded an MBE (Member of the Most Excellent Order of the British Empire) in 2010 in recognition of his contributions to his local community in Oxford.

Bob Williams was a gifted man, wonderfully creative, highly inspirational, a brilliant teacher and supervisor, and passionate about many areas of science. He was a true polymath, with an encyclopedic knowledge of chemistry, biochemistry and geochemistry. With a sharp mind and fertile imagination he always sought to discover the larger picture and underlying principles hidden behind the facts. Bob was generous in sharing his insights sometimes before there was strong experimental evidence. Others were not slow to seize on his ideas. In 1960, he wrote papers describing a mechanism for the long-range conversion of the energy of reaction of oxygen and hydrogen into localized proton gradients and connecting this coupling to ATP production. Thus began an interest in the chemical processes of respiration and an examination of the possible roles of chains of catalysts within mitochondrial membranes. These ideas contrasted sharply with those of biochemists who were hunting for high-energy phosphorylated intermediates. After a lengthy correspondence with Williams, P. D. Mitchell took up the essence of these ideas to formulate his chemiosmotic hypothesis. Later, Williams developed a deep interest in how chemical constraints were fundamental to the evolution of life.

Williams' legacy to chemistry and biochemistry is enormous. His influence lives on amongst a widespread cadre of scientists beyond those who worked directly with him. No fewer than six of his former students have been elected to the Royal Society. Bob had a lively and engaging personality, and was generous and considerate to his students. The affection and loyalty felt by many extends across the world. Bob Williams will be sadly missed.

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