

Professor Robert Arnold Alberty (1921–2014)



(Courtesy of the MIT Department of Chemistry)

Robert Arnold ('Bob') Alberty, who died on 18 January 2014 in Cambridge, Massachusetts, was born in Winfield, Kansas, in 1921, the eldest son of teachers. He had a distinguished career that spanned nearly 70 years, from his first paper, published in 1945, a study of the ternary system formed by isobutanol, benzene and water, until his last, recommendations on the presentation of biochemical thermodynamics, in 2011.

He was educated mainly in Nebraska, and registered in 1939 at the University of Nebraska, intending to become a chemical engineer. He went on to work on a secret war-related project at the University of Wisconsin involving the ultracentrifuge and electrophoresis, and after the war he obtained a faculty position at Wisconsin. Despite a heavy teaching load and a large output of research papers (more than 50 during the 1950s), he found time to learn to fly, obtaining a pilot's licence in 1960. He remained at Wisconsin until 1967, and, although increasingly involved with administration, becoming Dean of the Graduate School in 1963, he continued to have a large output of papers during the whole of the 1960s. In 1967, he became Dean of Science at the Massachusetts Institute of Technology (MIT), a position he occupied until 1982. There the weight of administration did put an end to his research career for a while, and between 1969 and 1983 he had just one paper.

His early research concerned the physical chemistry of organic and biological compounds,

but, by 1950 he was, as he tells us in his scientific autobiography, "anxious to move on to enzyme kinetics, ...inspired by Linus Pauling's ideas about enzymes being complementary to their substrates". Pauling invited him to spend a year at CalTech, and during his time there he acquired an interest in fumarase, the subject of much of his research during the 1950s, starting in 1953 with a paper on its kinetics and thermodynamics. This was followed by an series of papers that introduced an astonishing number of new techniques and concepts: ionization properties of enzymes, effects of buffer concentration, variation of sedimentation coefficients as a function of time in the ultracentrifuge, development of integrated rate equations for understanding the time courses of reactions, the stereospecific hydration of fumarate, diffusion control of enzyme-catalysed reactions, reversible reactions, electrophoresis of enzymes, application of NMR to enzyme substrates, the investigation of fast reactions ... the list is endless. Other people also worked on these topics of course, but no one contributed so much to so many of them. His work from this period that is most remembered today concerned the mechanisms and equations for reactions of two or more substrates. Despite some studies by in the 1950s by Barnet Woolf and J.B.S. Haldane in the 1930s, it was almost a virgin field until Paul Boyer, Keith Dalziel and Bob Alberty opened it up in the 1950s.

Returning to research and teaching in 1982 after retiring as Dean of Science at MIT, Bob felt that he had been away from enzyme research too long to carry on from where he had left off, and moved into petroleum chemistry, inspired by his worries about declining resources after the oil crisis of 1972. After publishing numerous papers in this field, he returned to enzymology when he became Emeritus Professor at MIT at his 70th birthday. He had always been interested in thermodynamics and equilibria, being one of the first to realize that ATP and similar substances exist in solution as complex mixtures of numerous ionic forms, and to understand the implications of this for the study of enzyme mechanisms, and this became the principal area of interest in the last 20 years of his life. He was very supportive of the initiative of the Beilstein-Institut in creating the STRENDa Commission, which has as its mission to improve the way enzyme data are

reported in the literature, and struggled hard (but with very limited success, it must be admitted) to persuade biochemists not to write equations for reactions that imply more knowledge of the ionic species involved than there is actually is.

In 1977, I received a letter from Bob, then Dean of Science at MIT, with a comment about my first book, which had appeared a year earlier. It was one of the proudest moments of my life, as though I had received an unsolicited letter from Linus Pauling. I didn't meet him until 15 years later, when he was on holiday in Nice with his wife, and came to Marseilles to meet me. After that, I met him several times at different meetings. I never heard him teach, but I can well believe, as reported by others, that he was very effective as a teacher, being patient, careful and kind. No one can ever have accused him of mumbling in his lectures, as he had about the loudest speaking voice I have ever encountered; in earlier times, he could have found work as a town crier.

In addition to his papers, he had an enormous influence as author of textbooks, including one that has remained a leader in its field for a century: *Outlines of Theoretical Chemistry*, by Frederick Getman, was first published in 1913. It went through numerous editions, the later ones co-authored by Farrington Daniels, who invited Bob Alberty to join with him revising it as *Physical Chemistry*. This had its first edition in 1955, and after seven editions Bob published a new first edition with Robert Silbey. This is now in its fourth edition, and remains widely used, more than 100 years after it first appeared. He was author or co-author of several other books: *Experimental Physical Chemistry* early in his career, as well as *Thermodynamics of Biochemical Reactions*, *Biochemical Thermodynamics: Applications of Mathematica** and *Enzyme Kinetics: Rapid-Equilibrium Applications of Mathematica** towards the end of it.

In 2010, Bob was predeceased by Lillian, his wife of more than 65 years, whom he met while they were president and secretary of the chemistry club at high school. He leaves two daughters and a son. ■

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