Kenneth S. Pitzer – Physical chemist *par excellence*

An obituary

Kenneth S. Pitzer, one of the most profound physical chemists, passed away on 26 December 1997. Kenneth Pitzer grew up in the Lewis–Pauling tradition in chemistry. His brand of physical chemistry is becoming rare today, for he was an outstanding expert in thermodynamics, quantum mechanics and statistical mechanics and used spectroscopy extensively. He contributed to a variety of facets of physical chemistry, as if in response to the definition of G. N. Lewis that 'physical chemistry was anything that was interesting'.

Kenneth Pitzer was born in Pamona, California, in 1914. His father was a lawyer and owned orange orchards. His mother had taught mathematics in a high school. He went to the California Institute of Technology for his undergraduate studies. During his very first year at Caltech in 1931, he worked with Albert Noyes on the oxidation states of silver and published three papers in the *Journal of American Chemical Society*. E. Bright Wilson was one of the laboratory instructors at that time. Pitzer carried out some research work on silicon hydrides with Yost and later, on crystallography with Linus Pauling in his final year as an undergraduate. His work with Linus Pauling was published in 1935. He went to the University of California, Berkeley, for his Ph D degree where Lewis was the Head of the Department. By that time, Lewis had established a prominent school in chemistry, particularly dealing with the physico-chemical aspects of the subject. The nature of the chemical bond had already been established by Lewis and Pauling. For Pitzer, this was a great opportunity because he was entering Berkeley during the golden age of modern chemistry. He carried out calorimetric measurements with Latimer and published ten papers as part of his Ph D thesis. Simultaneously in 1936, as a fresh graduate student, Pitzer identified the importance of internal rotation in organic molecules. It is really remarkable that at such a young age, he could come out with this revolutionary finding, which changed chemistry in a big way. His estimate of the 3 kcal mol^{-1} barrier, was soon confirmed experimentally. Later in 1963, by extensive quantum mechanical calculations, Libscomb and Russel Pitzer (son of Kenneth Pitzer) established the origin of this barrier. Kenneth Pitzer became a faculty member in Berkeley soon after obtaining the Ph D degree.

Kenneth Pitzer carried out a variety of studies in Berkeley on spectroscopy, molecular structure, thermodynamics and so on and his school became renowned in physical chemistry. He, along with Hassel, Barton and Prelog, proposed the term *axial* and *equatorial* to describe the conformation in cyclohexane and other related molecules. For some reason, Pitzer was left out of the Nobel prize, even though he was probably one of the first persons in chemistry to worry about conformation. Other important areas he contributed to were, third law of thermodynamics, pseudorotation in ring molecules, corresponding states and the acentric factor, molecules of carbon, hydrogen bonding and liquid ammonia solutions. Pitzer always carried out theoretical work in addition to experimental studies involving thermodynamic and spectroscopic measurements. Relativistic quantum chemistry is one such area. Of the many students and post-doctoral associates he had, mention must be made of William Gwinn and George Pimentel in spectroscopy, Enrico Clementi and Octay Sinanoglu in quantum mechanics, Curl, Spitzer and Kilpatrick in thermodynamics and K. Balasubramanian in relativistic quantum chemistry. He collaborated with many people, including young Hershbach when he was starting his research career in Berkeley.

Kenneth Pitzer occupied important academic and administrative positions. Besides being a Dean of the College of Chemistry in Berkeley for many years, he was for some time, Director of Research of the Atomic Energy Commission and also President of Rice University and Stanford University. His wisdom and counsel were eagerly sought by the academe and the Government. He was in several influential advisory committees including those of the US Presidents. He left the Presidentship of Stanford University and came back to Berkeley as a Professor in 1971 and continued his research work until his last day. It is inspiring to see fine papers that he continued to publish even after his 80th year. Towards the end of his career, he took up a reexamination of the Debye–Hückel theory of ionic fluids and made a major contribution whereby one can today use the Pitzer equations to deal with concentrated electrolyte solutions. Pitzer authored two very important books. One was on quantum chemistry and another the revision (along with Brewer) of the famous book on thermodynamics by Lewis and Randall.

Kenneth Pitzer was honoured in many ways. He was elected member of the US National Academy of Sciences when he was 35 years old. Besides receiving many awards including the Medal for the Pure and Synthetic Chemistry and the Gibbs Medal of the American Chemical Society, he received the highest honour of the American Chemical Society, the Priestley Medal. He was the recipient of the Welch award and the National Medal of Science. He was an honorary member of the Indian Academy of Sciences.

It was a matter of great delight for me to have been his post-doctoral student early in my career in the 1950s. The period I spent with him was most enjoyable, when I could talk with him on many research areas. Ken gave unlimited time for scientific discussions and let me publish many papers independently. We kept in touch all these years, and a few months ago, when I went to give a seminar at Berkeley, he was my host. His death was sudden and he leaves behind his wife, two children and a large number of admirers and past students. It will be difficult to find anybody equivalent to Kenneth Pitzer, who is a titan in both classical and modern physical chemistry.

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