

Remembering Edward I. Stiefel



Edward I. Stiefel passed away on September 4, 2006. Following his retirement from ExxonMobil in 2001, Ed joined the Department of Chemistry at Princeton University as the first holder of the Ralph W. Dornte Chair, a distinguished visiting lecturer position with rank of Professor. Ed was a vibrant participant in the teaching and research missions at Princeton. His arrival followed a distinguished career in chemical and biological sciences both in academia and industry which was highlighted by numerous achievements.

Ed received his PhD with Harry Gray at Columbia University in 1967. He served on the faculty at SUNY Stony Brook and was Senior Investigator at the Charles F. Kettering Research Laboratory, prior to joining the Catalytic Materials Group at Exxon's Corporate Research in 1980. While at Kettering he made pioneering advances in our understanding of nitrogenase enzymes, illuminating the role of molybdenum in catalyzing the conversion of atmospheric nitrogen to ammonia by those systems. Ed's arrival at Exxon made an immediate impact, vastly increasing the group's interdisciplinary research. He initiated discussions concerning the active centers of nitrogenase and other molybdenum enzymes that bridged "industrial catalysis" and "biological catalysis". This new insight led to questions such as "why don't tungsten enzymes exist" in analogy to molybdenum enzymes? Stiefel's prediction of the existence of these enzymes predated Mike Adams' discovery of the first example of a tungsten enzyme in *Pyrococcus furiosus* in 1989. While at Exxon, Ed developed many new inorganic compounds, based on molybdenum chemistry, which are useful as catalysts and lubricating oil additives. For example, Ed was the principal inventor of the commercially important "thiomolybdate" additive for lubricating oils.

Ed's knowledge of both the inorganic chemistry and biology of metalloenzymes proved to be invaluable at Exxon, where he was a principal architect of the monumental cleanup of the Exxon Valdez oil spill in Alaska in 1989. The ingenious approach used to tackle this very large-scale environmental disaster required application of the principles of bioinorganic chemistry and microbiology. Ed played a major role in setting the science direction for Exxon's new corporate research home in Clinton NJ and recruiting biologists and chemists to it. These people formed the scientific team

that developed the successful bioremediation approach to the oil spill clean-up. This team effort reflected Ed's influence across interdisciplinary lines connecting biologists, chemists and engineers. It was achieved through his exceptional clarity in communication and conviction to scientific principles. Ed's genius lay in his ability to "see" complex chemical issues over a wide range of scales, from molecular to cellular to global.

Stiefel was on the Board of Reviewing Editors of *Science* magazine, a Fellow of the American Association for the Advancement of Science, and winner of the national American Chemical Society Award in Inorganic Chemistry in 2000. He chaired a most memorable Metals in Biology Gordon Research Conference in 1993, was the founding co-chair of the "Molybdenum and Tungsten Enzymes" Gordon Research Conference in 1999 and founding co-chair (with François Morel) of the Inaugural Gordon Research Conference on Environmental Bioinorganic Chemistry in 2002 in association with Princeton's Center for Environmental Bioinorganic Chemistry (CEBIC). Since his arrival at Princeton, Ed and his group made important advances into new functions of the iron storage proteins. His research also included studies to develop the potential of iron-containing hydrogenases for renewable hydrogen fuel production as a member of Princeton's BioSolarH2 team, of which he was a founding co-investigator (with Charles Dismukes).

Ed created or co-created three immensely popular courses at Princeton, including a Freshman Seminar entitled "Elements of Life", an innovative multi-departmental course "Life in the Universe" (with Tullis Onstott, Ed Turner, Laura Landweber, and Charles Dismukes) aimed at increasing the number of majors in the sciences, and a graduate class in "Metals in Biology" (with Jay Groves). Ed's students regarded him as an extraordinarily gifted teacher. His evening freshman seminar course was extraordinary. Students were often so stimulated by his lectures that they kept him an extra 2–3 hours longer than scheduled. We recall talking to Ed the day after one of these seminars lasted until 1 AM. Ed's descriptions of these marathon sessions overflowed with the exhilaration he felt about his students' enthusiasm for learning. While most instructors limit the time of their instruction to the classroom and office hours, he thrived on these experiences. There have been many gifted instructors at Princeton, but few have welcomed students to cross the line of familiarity, from pupil to fellow discoverer. Stiefel gave his students confidence and inspiration along with knowledge. His passion reached students on a personal level. They confided in him their dreams and their fears. He stayed in regular contact with many of his freshman seminar students throughout their four years at Princeton. He had a profound impact on some of them. Many of them loved him. Parents have sent family photographs, testimonials or invited him to their home in recognition of what he meant to their children.

Ed Stiefel was a joyful man, a compassionate friend, an inspiring mentor and a generous colleague. He will be remembered with great fondness. He is survived by his wife Jeannette, a frequent visitor and friend of the Chemistry Department, their daughter Karen and brother George.

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