

Memorial Resolution of the Faculty of the University of Wisconsin-Madison On the Death of Professor Emeritus Stephen F. Nelsen

Stephen F. Nelsen, Professor Emeritus of Chemistry, died at the age of 77 on September 23, 2017 in Madison, Wisconsin. Steve was born April 17, 1940, in Chicago and brought up in the South Shore district. He attended Chicago public schools and received his B.S. degree (with honors) from the University of Michigan in 1962. Steve and Adrienne Housour met in Michigan and were married before moving to Cambridge, Massachusetts, where Steve attended graduate school. He received his Ph.D. from Harvard University in 1965, working in the research group of noted physical-organic chemist P. D. Bartlett. Immediately upon completing his Ph.D. degree, Steve began his independent academic career at the University of Wisconsin-Madison in 1965. He was promoted to Associate Professor in 1971, to Professor in 1975, and named P.D. Bartlett Professor of Chemistry in 1989. He taught extensively in undergraduate organic chemistry courses (Chemistry 343, 345 and 346) and his graduate student classroom instruction includes years of teaching the Physical Organic Chemistry course (Chemistry 641) and several special topics courses in organic chemistry.

Steve Nelsen was a brilliant intellect and a prolific scholar (over 290 publications; well over half in the premier chemistry journal, the *Journal of the American Chemical Society*). Through his seminal research accomplishments, he maintained a position at the forefront of mechanistic organic chemistry throughout his career. His students have been unusually productive, averaging seven research papers per Ph.D. student. Steve was a marvelous mentor to his students, setting high standards for scholarly accomplishment and independence, and striking just the right blend of enthusiasm, encouragement, and sage advice for the students to achieve those high standards. Steve's work dealt with conformation, structure, spectroscopy, reactivity, and/or theory of both the neutral precursors and the radical cations of alkenes, amines, sulfenamides, peroxides, hydroxylamines, haloamines and especially the finely tunable hydrazines, in many cases using Bredt's rule kinetic protection to stabilize radical species. His important discoveries have been the result of careful design of molecular frameworks suitable for accurate and meaningful measurements of physical properties. His work has relevance to a broad range of electron transfer processes in redox chemistry, biological processes and molecular electronics.

Steve's major scientific contributions have been in the areas of both intramolecular and intermolecular electron transfer. His group synthesized a number of elegantly designed "mixed valence" compounds of the M-(Bridge)-M^{+/-} type, where he used hydrazines, diazeniums, nitro groups, and amines as the "charge-bearing unit" M and a variety of connecting frameworks, both alicyclic and aromatic (the Bridge), to tune the electron transfer properties these molecules. This work created examples of all three classes of mixed valence systems - localized, borderline, and fully delocalized, and established unambiguous and quantitative connections between optical spectroscopy (charge transfer bands) of these systems, their rates of intramolecular electron transfer, and the underlying molecular orbital theory in ways not possible previously. Nelsen's efforts provided a much-improved understanding and some of the cleanest tests, and best validation of Marcus-Hush-Jortner electron transfer theory.

Steve's accomplishments have, in part, been the result of fruitful collaborative work with a number of physical, analytic and theoretical chemists, especially those with state-of-the-art skills and equipment to make measurements and/or do sophisticated computations, but without the infrastructure and knowledge of organic chemistry needed to create the materials for productive

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studies. These collaborations have included electrochemistry (Dennis Evans), stopped-flow kinetics (Jack Pladziewicz), pulse radiolysis (Dieter Asmus), and heterogeneous kinetics (Michael Weaver). In addition, a wide range of spectroscopic methods have been applied by his collaborators to Nelsen's many interesting organic structures: ENDOR spectroscopy (Fabian Gerson, Harry Kurreck and Franz Neugebauer), ESR spectroscopy (João Telo), SQUID experiments (Yoshio Teki), and Resonance Raman spectroscopy (Joseph Hupp, Jeffrey Zink). Steve was also an accomplished scholar in an entirely unrelated area. His long interest in Wisconsin's nature eventually morphed into an intensive study of mushrooms and other fungi of Wisconsin, including a collection of thousands of stunning photographs of the many species of mushrooms Steve has found and identified in his numerous mushroom "forays" into Wisconsin's parks and nature preserves. He was a member of the local mycology group, and has a publication in the journal *Mycologia*.

Steve is survived by his loving wife, Adrienne, and daughter, Erika, both of Madison.

MEMORIAL COMMITTEE

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