



Richard N. Zare

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Adventures in Chemical Analysis

One of the great challenges in chemistry is to penetrate the world of the ultra small, to view nearly infinitesimal spaces, and to recognize their importance. Indeed, the analysis and manipulation of volumes so tiny that they are almost beyond comprehension is a critical element of the emerging field of chemical nanosciences and nanotechnology. These capabilities unlock secrets of nature. These secrets underlie how cells function, how reactions occur, how energy and information is stored and transported, and how such structures can be tailored to be useful devices for mankind from sensors to motors to computers. I want to take this opportunity to present my own adventures in exploring how to analyze complex mixtures for their chemical constituents. I hope to touch on laser induced fluorescence, chemical separations in capillaries and microchips, and the use of optical techniques as well as mass spectrometry.

Bio

Richard N. Zare is the Marguerite Blake Wilbur Professor in Natural Science and Chair of the Department of Chemistry, Stanford University. He was born on November 19, 1939 in Cleveland, Ohio, and is a graduate of Harvard University, where he received his B.A. degree in chemistry and physics in 1961 and his Ph.D. in chemical physics in 1964. In 1965 he became an assistant professor at the Massachusetts Institute of Technology, but moved to the University of Colorado in 1966, remaining there until 1969 while holding joint appointments in the departments of chemistry, and physics and astrophysics. In 1969 he was appointed to a full professorship in the chemistry department at Columbia University, becoming the Higgins Professor of Natural Science in 1975. In 1977 he moved to Stanford University. This September he will become Chair of the Stanford Chemistry Department.

Professor Zare is renowned for his research in the area of laser chemistry, resulting in a greater understanding of chemical reactions at the molecular level. By experimental and theoretical studies he has made seminal contributions to our knowledge of molecular collision processes and contributed very significantly to solving a variety of problems in chemical analysis. His development of laser induced fluorescence as a method for studying reaction dynamics has been widely adopted in other laboratories.

Professor Zare has received numerous honors and awards. They include: Phi Lambda Upsilon's Fresenius Award (1974), Michael Polanyi Medal, the Gas Kinetics Group of the Royal Society of Chemistry (1979), the APS Earle K. Plyler Prize (1981), Spectroscopy Society of Pittsburgh Award (1983), the National Medal of Science (1983), the Evans Award and Lectureship, Department of Chemistry, The Ohio State University (1984), the ACS (Maryland Section) Remsen Award (1985), the ACS (Rochester Section) Harrison Howe Award (1985), the APS Irving Langmuir Prize (1985), the ACS (New Haven Section) Kirkwood Medal (1986), Michelson-Morley Award, Case Western Reserve University (1986), the ACS (Chicago Section) Willard Gibbs Medal (1990), the ISCO Award for Significant Contributions to Instrumentation for Biochemical Separations (1990), The National Academy of Sciences Award in Chemical Sciences (1991), the ACS Peter Debye Award in Physical Chemistry (1991), The Harvey Prize (1993), the Dannie-Heineman Preis (1993), the ACS (Puget Sound, Oregon and Portland Sections) Pauling Award (1993), the ACS Division of Analytical Chemistry Award in Chemical Instrumentation (1995), NASA Exceptional Scientific Achievement Award (1997), the California Scientist of the Year Award (1997), the Eastern Analytical Symposium Award for Outstanding Achievements in the Field of Analytical Chemistry (1997), National Science Board's Distinguished Service Award (1998), the ACS (Auburn Section) G. M. Kosalapoff Award (1998), the ACS Award in Analytical Chemistry (1998), the Centennial Medal, Graduate School of Arts and Sciences, Harvard University (1998), the ACS E. Bright Wilson Award in Spectroscopy (1999), the Welch Award in Chemistry (1999), the APS Arthur L. Schawlow Prize in Laser Science (2000), the ACS (North Alabama Section) Madison Marshall Award (2000), The California Separation Science Society Scientific Achievement Award (2000), the ACS Nobel Laureate Signature Award for Graduate Education (2000), Royal Society of Chemistry Faraday Medal (2001), the ACS Charles Lathrop Parsons Award (2001), the ACS (Sierra Nevada Section) Distinguished Chemist Award (2002), the ACS (New York Section) Nichols Medal (2004), and the Wolf Prize in Chemistry (2005).

Teaching awards: Stanford University's Dean's Award for Excellence in Teaching (1987), the Bing Fellowship Award, "to recognize excellence in teaching and commitment to undergraduate education," Stanford University (1996), the Allan V. Cox Medal for Faculty Excellence Fostering Undergraduate Research, Stanford University (1997), the Laurance and Naomi Carpenter Hoagland Prize for excellence in undergraduate education, Stanford University (2003), and the ACS (Northeastern Section) James Flack Norris Award for Outstanding Achievement in the Teaching of Chemistry (2004).

Professor Zare holds honorary degrees from: the University of Arizona (1990), Northwestern University (1993), Eidgenössische Technische Hochschule Zürich (1993), Uppsala University (2000), Columbia University (2000), The University of York (2001), The State University of West Georgia (2001), Hunan University (2002), and Université Paul Sabatier (2003).

Member of the American Philosophical Society, the National Academy of Sciences, the American Academy of Arts and Sciences, and the American Chemical Society. Fellow of the American Physical Society, American Association for the Advancement of Science, California Academy of Sciences, and the World Jewish Academy of Sciences. Honorary Fellow of the Royal Society of Chemistry. Non-Resident Fellow of the Joint Institute of Laboratory

Astrophysics (JILA). Foreign Member of the Royal Society, the Chinese Academy of Sciences, and the Swedish Royal Academy of Engineering Sciences.

Professor Zare served as the Chair of the President's National Medal of Science Selection Committee 1997-2000, chaired the National Research Council's Commission on Physical Sciences, Mathematics, and Applications, 1992-1995, and was Chair of the National Science Board the last two years of his 1992-1998 service. He currently acts as Chairman of the Board of Directors at Annual Reviews, Inc.

Professor Zare has given named lectures at numerous universities, has authored and co-authored over 700 publications and more than 50 patents, and he has published four books.