

Next Breath & WFF 2021

From Water to Air; Scientific Pathways towards a Clearer, Cleaner Future.

Richard Zare

Marguerite Blake Wilbur Professor of Natural Science & Professor of Physics
School of Humanities & Sciences, Stanford University



Talk Title — Effect of Relative Humidity in Air on the Transmission of Viral Respiratory Infections

"Respiratory diseases, caused for example by influenza A or SARS-CoV-2 virus, are known to be seasonal, peaking in the wintertime and falling off in the summertime. The physical and chemical basis for this behavior is suggested in this presentation."

Richard Zare

A pioneer in the use of lasers to study chemical reactions at the molecular level, Marguerite Blake Wilbur Professor Richard N. Zare pursues diverse theoretical and experimental interests in physical chemistry and nanoscale chemical analysis. The Zarelab has made a broad impact in analytic chemistry with development of laser-induced fluorescence to study reaction dynamics, and seminal contributions to understanding of molecular collision processes. The group continues to invent tools and measurement techniques to study phenomena from reaction in microdroplets to drug delivery.

Born in 1939 in Cleveland, Ohio, Professor Zare trained in chemistry and physics at Harvard University (B.A. 1961, Ph.D. 1964). His doctoral study under Professor Dudley Herschbach explored photodissociation dynamics. After faculty positions spanning chemistry at the Massachusetts Institute of Technology, chemistry, physics and astrophysics at the University of Colorado, and chemistry at Columbia University, he joined the Stanford chemistry faculty in 1977. He has taught an introductory chemistry class every year since. As a Howard Hughes Medical Institute Professor since 2006, Professor Zare has also developed a course introducing undergraduates to hands-on interdisciplinary research, combining physics, and biology to explore how living systems use molecular interactions with light for vision, photosynthesis and more. Professor Zare served as chair of the Department of Chemistry from 2005 to 2011, and has helped to guide scientific policy as chairman of several national and international science boards. His dedication to research and teaching has been recognized in many awards, including the National Medal of Science, the Wolf Prize in Chemistry, and the Presidential Award for Excellence in Science, Mathematics, and Engineering Mentoring. Among other honors, Professor Zare is a member of the National Academy of Sciences, the American Academy of Arts and Sciences, and the American Philosophical Society. He has also received 11 honorary doctorates.

Current research in the Zarelab explores wide-ranging questions in physical and analytical chemistry, from the study of elementary chemical reactions to chemical analysis of extraterrestrial materials. The major focus of these efforts is chemical analysis on the nanoscale. The team has devised tools and techniques to examine molecules in extremely tiny volumes – the volumes characteristic of what is found in heterogeneous structures in mineral samples or in the contents of cells and subcellular compartments. Group members have also made contributions to the chemical analysis of liquid samples separated using a capillary format by electrophoresis or electrochromatography. Some "firsts" include the use of cavity ring-down spectroscopy to analyze trace species in solution, development of detectors for capillary electrophoresis based on the techniques of laser-induced fluorescence, and CCD imaging, and the use of mass spectrometric imaging of tissue samples by means of desorption electrospray ionization.

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