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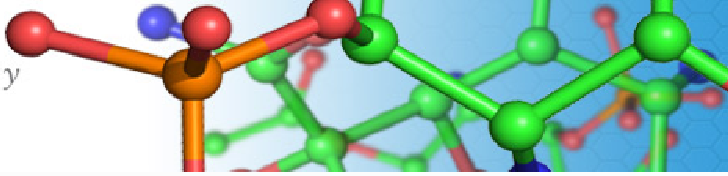

Milton Kahn Annual Lectureship

Prof. Mark Johnson

Mass Spec Meets FTIR: The Genesis of Cryogenic Ion Vibrational Spectroscopy (CIVP)

The coupling between ambient ionization sources, developed for mass spectrometric analysis of biomolecules, and cryogenic ion processing, originally designed to study interstellar chemistry, creates a new and general way to capture transient chemical species and elucidate their structures with optical spectroscopies. Advances in non-linear optics over the past decade allow single-investigator, table top lasers to access radiation from 550 cm-1 in the infrared to the vacuum ultraviolet. When spectra are acquired using predissociation of weakly bound rare gas “tags,” the resulting patterns are equivalent to absorption spectra and correspond to target ions at temperatures below 10K. Taken together, what emerges is a new and powerful structural component to traditional mass spectrometric analysis. Moreover, because the spectral features of the cold ions are sharp, the evolution of bond-specific transitions can be used to follow the docking arrangements of host-guest complexes and the local contact points between the ionic constituents of ionic liquids. Recent applications ranging from the mechanisms of small molecule activation by homogeneous catalysts to the microscopic mechanics underlying the Grotthuss proton relay mechanism in water emphasize the generality and utility of the methods in contemporary chemistry.

September 29th
SMLC 102
4:00 PM

Mark Johnson was born in Oakland, California and graduated from the U.C. Berkeley with a degree in chemistry and a first exposure to fundamental research under the mentorship of C. Bradley Moore. He then earned his Ph.D. from Stanford University in 1983 under Dick Zare, which involved an extensive collaboration with Joëlle Rostas at the Université de Paris-Süd. He was a postdoctoral fellow with Carl Lineberger at JILA/University of Colorado, Boulder from 1983-1985 and joined the Yale faculty in 1985. His laboratory specializes in understanding chemical processes that occur in condensed phases by extracting key species directly from solution, freezing them into well-defined geometries in the gas phase, and then characterizing the potential energy surfaces that govern their reactivity through precision spectroscopic measurements.