

University of Pittsburgh

Petersen Institute of NanoScience and Engineering Seminar

- Speaker:** Professor Tamar Seideman
Department of Chemistry, Northwestern University
- Title:** *Current-Driven Phenomena in Molecular Electronics*
- Time/Date:** 12:00 noon, Thursday, May 3, 2007
(refreshments at 12:00 - 12:15pm)
- Place:** Kresge Conference Center, 1175 Benedum Hall

Inelastic electron tunneling via molecular-scale junctions can induce a variety of fascinating dynamical processes in the molecular moiety. These include vibration, rotation, inter-mode energy flow and reaction. Potential applications of current-driven dynamics in heterojunctions range from new forms of molecular machines and new modes of conduction, to new directions in surface nanochemistry and nanolithography.

Interface reactions play a central role in determining not only the structure and the conductivity of molecular heterojunctions but also the likelihood, nature and outcome of current-driven dynamics in nano-devices. Whereas strong molecule-electrode coupling often gives rise to delocalized electronic orbitals, small equilibrium displacements and at most weak vibronic coupling, weak molecule-electrode interactions tend to spatially localize the molecule-derived orbitals and thus enhance the equilibrium displacements, increase the resonance lifetimes, and encourage inelasticity.

In the talk I will discuss the qualitative physics underlying current-driven dynamics in molecular-scale devices, outline the theory we developed to explore these dynamics, describe the results of ongoing research on surface nanochemistry and molecular machines, and sketch several of our dreams and plans in these areas.

Biographical Sketch

Dr. Tamar Seideman is Professor of Chemistry and Physics, Northwestern University. Professor Seideman received her PhD degree in Theoretical Chemical Physics from Weizmann Institute of Science in 1990. She is a Fellow of the American Physical Society and is a recipient of Alexander von Humboldt Senior Research Award, Berlin, 2004 and Guggenheim Award, 2004. The Seideman group is engaged with theoretical and computational research at the broad interface between chemistry, physics and material science. Problems of specific interest include: current-driven dynamics in molecular-scale devices with applications to molecular machines and surface nanochemistry; coherent control of matter by light and of light by matter; intense-pulse alignment and three-dimensional alignment in the gas and solution phases; molecular optics; and coherence spectroscopies.