



CHEMICAL AND BIOLOGICAL ENGINEERING DEPARTMENT SEMINAR SERIES  
In Conjunction with BCPS

## ***Quantum Phase Transition and Stability of Atomic and Molecular Systems***

Presented by: Sabre Kais, Professor of Chemistry and Computer Science  
Department of Chemistry and Birck Nanotechnology Center  
Purdue University

Time: Wednesday, September 5; 3:15 – 4:30 pm

Location: Perlstein Hall Auditorium

### Abstract:

The study of quantum phase transitions, which are driven by quantum fluctuations as a consequence of Heisenberg's uncertainty principle, continues to be of increasing interest in the fields of condensed matter and atomic and molecular physics. In this field we have established an analogy between symmetry breaking of electronic structure configurations and quantum phase transitions. Furthermore we have developed the finite size scaling method for quantum systems. In this case, the finite size corresponds not to the spatial dimension but to the number of elements in a complete basis set used to expand the exact wave function of a given Hamiltonian. In this lecture I will discuss how finite size scaling works in quantum mechanics and how to calculate quantum critical parameters for stability of atomic, molecular and quantum dot systems.

### Biography:

Sabre Kais is a Professor of Chemistry and Computer Science (courtesy). He was a Postdoc in the Chemistry Department at Harvard University with Professor Dudley Herschbach (Nobel Laureate in Chemistry 1986), and joined the faculty of the Department of Chemistry at Purdue in 1994. He and his students and postdoctoral associates have published 114 papers in peer-reviewed journals. His research interests include: Electronic structure and dynamics of atoms, molecules and quantum dots; quantum information and computation; stability of matter in superintense laser fields. He received the National Science Foundation Career Award; Purdue University Faculty Scholar Award 2004-2009; 2005 Guggenheim Fellowship Award and was elected this year as Fellow of the American Physical Society.