Abstract: Since the development of the laser some 40 years ago, a long standing dream has been to utilize this special source of radiation to manipulate dynamical events at the atomic and molecular scales. Hints that this goal may become a reality began to emerge in the 1990's, due to a confluence of concepts and technologies involving (a) control theory, (b) ultrafast laser sources, (c) laser pulse shaping techniques, and (d) fast pattern recognition algorithms. These concepts and tools have resulted in a high speed instrument configuration capable of adaptively changing the driving laser pulse shapes, approaching the performance of thousands of independent experiments in a matter of minutes. Each particular shaped laser pulse acts as a “Photonic Reagent” much as an ordinary reagent would at the molecular scale. Although a Photonic Reagent has a fleeting existence, it can leave a permanent impact. Current demonstrations have ranged from manipulating simple systems (atoms) out to the highly complex (biomolecules), and applications to quantum information sciences are being pursued. In all cases, the fundamental concept is one of adaptively manipulating quantum systems. The principles involved will be discussed, along with the presentation of the state of the field.

Tuesday, May 6, 2008
11:00 AM
Bryan Hall, Room 305
Light Refreshments: 10:45 AM

Host: Dr. Jr-Shin Li

Bio: Herschel A. Rabitz graduated from Harvard University in 1970, with a Ph.D. degree in chemical physics. This was followed by post-doctoral work at the University of Wisconsin. In 1971, Professor Rabitz joined the faculty of the Department of Chemistry at Princeton University, and from July, 1993 to July, 1996 was Chairman of the Department. He is also an affiliated member of Princeton's Program in Applied and Computational Mathematics. Professor Rabitz's research interests lie at the interface of chemistry, physics, and engineering, with principal areas of focus including molecular dynamics, biophysical chemistry, chemical kinetics, and optical interactions with matter. An overriding theme throughout his research is the emphasis on molecular scale systems analysis. Professor Rabitz has over 700 publications in the general area of chemical physics.