Graduate Student Seminar

Hyperpolarized Gases: Atomic Physics, Molecular Chemistry, Xenon-Protein Interactions, and Imaging Rocks

(Research Opportunities in the Saam Group)

Brian Saam

Despite the constraints of the Boltzmann factor, nuclear magnetic resonance (NMR) has been enormously successful using tiny (ppm) thermal polarizations to generate the signal. By comparison, enormous non-equilibrium nuclear-spin polarizations (of order 10%) can be achieved in ^{3}He and ^{129}Xe via spin-exchange optical pumping, greatly enhancing the NMR sensitivity of these nuclei. These *hyper*polarized (HP) gases are being applied to a broad range of problems in physics, chemistry, biology, and even medicine. I will discuss the physics of this process, which is the overriding theme of the research in the Saam Group. I will also discuss the broad (some might even say eclectic) range of interdisciplinary applications to which we apply these gases using magnetic resonance techniques. These include the study of the relationship between quantum mechanics and chaos (if indeed such a relationship exists), the study of xenon-protein binding, and the use of magnetic resonance imaging (MRI) to study the oil in oil shale.

Thursday March 15, 2007
11:00 in JFB 206