Date: April 22nd, 2005

Time: 10:30 AM

Location: Olin 305

Speaker: Dr. Katherine McCall
Professor of Physics, University of Nevada

Title: "Simulation of Nuclear Magnetic Resonance in Fluid Filled Pore Spaces: A Tool to Understand Complex Geometries"

Abstract

In a Nuclear Magnetic Resonance (NMR) experiment the magnetization of a system is experimentally manipulated away from thermal equilibrium at t=0 and monitored over time as it returns to thermal equilibrium. In a fluid-saturated porous medium, the magnetization resides in the pore fluid, e.g., proton nuclear magnetic moments on water in rocks. In returning to thermal equilibrium, the magnetization encounters the pore walls, senses the flow of the pore fluid, etc. Consequently the data, magnetization as a function of time, carries information about the nature of the pore space and the fluid flow at the pore scale level. This information may be extracted from the magnetization data with a suitable model. However, the geometric complexity of realistic porous materials precludes solving such models analytically. The lattice Boltzmann technique is a computational scheme that can be used to simulate the behavior of magnetization in the presence of elaborate NMR experimental manipulations and realistic pore spaces. In this talk, the motivation for using NMR as a probe of porous media will be described, and the validity of using the lattice Boltzmann method to understand a variety of experimental situations will be demonstrated.