Physics Seminar

Speaker: Professor Andrew Kent
NYU, Dept. of Physics

Time: 4 pm on Monday 3/8/2010

Location: Brooklyn College Ingersoll Hall Room 3438

Title: Spin Dynamics in Molecular Nanomagnets

Abstract:

Research on molecule-based-nanomagnets has progressed rapidly in recent years in materials known as single molecule magnets, which exhibit a host of remarkable quantum phenomena. Single molecule magnets represent a molecular or 'bottom-up' approach to the study of the dynamics of individual (nanometer) scale ferromagnetic domains, with advantages that include chemical control of molecular structure, spin, magnetic anisotropy as well as intra- and intermolecular magnetic interactions. They display properties of much larger ferromagnetic particles prepared by conventional methods but in a manner that enables fundamental physics studies. For example, SMM typically have a large Ising or uniaxial anisotropy, with a magnetization direction that preferentially points “up” or “down” along one axis. Quantum tunneling of the collective magnetization direction (from magnetization “up” to “down”) and quantum phase interference have been clearly demonstrated and studied experimentally in these materials. In this talk I will present an overview of this field, highlighting key experimental and theoretical developments—particularly, the quantum tunneling phenomena. I will then discuss recent studies we have conducted on SMM Mn12-acetate single crystals that show evidence for magnetic ordering due to intermolecular dipole interactions and quantum tunneling. In a large transverse field (which promotes quantum tunneling) crystals of this type appear to be an experimental realization of a random field Ising ferromagnet.