Subject: MSD Colloquium, Dai, Thurs, 9/20, 11am, 212, A-157
From: Suzanne Kokosz <kokosz@anl.gov>
Date: Tue, 28 Aug 2007 16:17:16 -0500
To: Materials Science Division <msd@anl.gov>

MATERIALS SCIENCE COLLOQUIUM

SPEAKER: DR. PENCHENG DAI
University of Tennessee, ORNL

TITLE: ^{3}Nature of the quantum spin correlations through the superconducting-normal phase transition in electron-doped superconducting Pr0.88LaCe0.12CuO4-d^{2}

DATE: Thursday, September 20, 2007
TIME: 11:00 a.m.
PLACE: Building 212, Room A-157

HOST: Stephan Rosenkranz

Refreshments will be available at 10:45 a.m.

Abstract:
The quantum spin fluctuations of the S = 1/2 Cu ions are important in determining the physical properties of the high-transition temperature (high-Tc) copper oxide superconductors, but their possible role in the electron pairing for superconductivity is still an open question. The principal feature of the spin fluctuations in optimally doped superconductors is a well defined magnetic resonance whose energy (ER) tracks Tc (as the composition is varied) and whose intensity develops like an order parameter in the superconducting state. Here we use neutron scattering and specific heat measurements to show that the strength of the resonance in the electron-doped high-Tc superconductor, Pr.88LaCe.12CuO4-d (Tc = 24 K), decreases smoothly with increasing field and vanishes in the normal state, identical to the behavior of the superconducting condensation energy. The suppression of superconductivity is accompanied by the concomitant emergence of static antiferromagneitc (AF) order. Our results demonstrate that AF order competes with superconductivity and AF spin fluctuations are intimately related to the electron pairing and superconductivity.
