

PHYSICS COLLOQUIUM

Martin Greven

Stanford University

“Crystal Growth, Neutron Scattering and Spin Correlations: A Tale of two Complex Oxides”

Monday, October 29th, 2007

4:00 PM, Ronald Geballe Auditorium, A-102, PAA

Reception at 3:45 P.M. in the lobby

SEMINARS



October 29- Nov 2, 2007

**Abstract:** The study of quantum phase transitions in the presence of disorder is at the forefront of research in the field of correlated electron systems, yet there have been relatively few experimental model materials. We have succeeded in the growth of large single crystals of the randomly-diluted spin-1/2 square-lattice Heisenberg antiferromagnet  $\text{La}_2(\text{Cu,Zn,Mg})\text{O}_4$  up to high dilution concentrations. Our neutron scattering measurements of the instantaneous antiferromagnetic (AF) spin correlations, complemented by numerical experiments, demonstrate that this compound is an excellent system for the study of site percolation in the quantum spin-1/2 limit, and they provide valuable quantitative information for tests of theories [1]. High transition-temperature  $T_c$  superconductivity develops near AF phases, and it is possible that magnetic excitations contribute to the superconducting pairing mechanism. In order to assess the role of antiferromagnetism, it is essential to understand the doping and temperature dependence of the two-dimensional AF spin correlations. The phase diagram is asymmetric with respect to electron and hole doping, and for the comparatively less-studied electron-doped materials, the AF phase extends much further with doping and it appears to overlap with the superconducting phase: the archetypical compound  $\text{Nd}_{2-x}\text{Ce}_x\text{CuO}_{4\pm\delta}$  shows bulk superconductivity above  $x \approx 0.13$ , while evidence for AF order has been found up to  $x \approx 0.17$ . However, our recent inelastic magnetic neutron scattering measurements point to the distinct possibility that genuine long-range antiferromagnetism and superconductivity do not co-exist. Our measurements furthermore demonstrate that the pseudogap phenomenon in the electron-doped materials arises from a build-up of spin correlations [2].

[1] O.P. Vajk *et al.*, Science **296**, 1691 (2002)

[2] E.M. Motoyama *et al.*, Nature **455**, 186 (2007)

**INT Seminar**

10:30 AM, Rm. C-421, PAT

Winfried Leidemann, University of Trento

Recent Results with the LIT Method for Nuclei in the Mass Range  $A=3-7$

Tuesday, October 30, 2007

**INT Seminar**

10:30 AM, Rm. C-421, PAT

Brian Serot, Indiana University

“A Covariant, Chiral, Effective Field Theory for Nuclei”

**Condensed Matter Seminar**

4:00 PM, Rm. C-421, PAT

Riccardo Zecchina

“TBA”

Wednesday, October 31, 2007

**INT Seminar**

10:30 AM, Rm. C-421, PAT

Nigel Orr, IN2P3

“Structure and Correlations at and beyond the Neutron Dripline”

**Thursday, November 1, 2007**

**INT Seminar**

10:30 AM, Rm. C-421, PAT

Achim Richter, Technical University-Darmstadt

“Nuclear Structure in Astrophysics---Recent Examples from the S-DALINAC”

**Astronomy Colloquium**

4:00 PM, Rm. A-102, PAA

Andrew West, University of California, Berkeley

“Big Science from Little Stars: The Activity and Kinematics of Low-Mass Stars”

**Friday, November 2, 2007**

**INT Seminar**

12:00 PM, Rm. C-421, PAT

Carlo Barbieri, GSI

“Applications of Green's Function Theory to Nuclei and Atoms”

**Particle Astrophysics Seminar**

3:30 PM, Rm. A-110, PAA

TBA