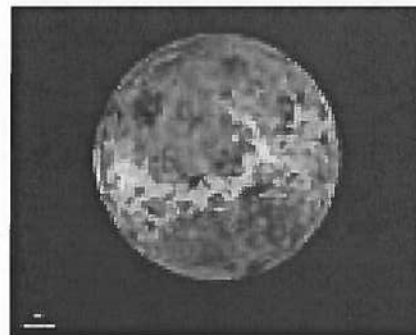




WEEKLY CALENDAR

17 October 2005

Department of Physics and Astronomy
202 Nicholson Hall
Louisiana State University and A&M College
Baton Rouge, Louisiana 70803-4001
Tel: 225-578-2261 / Fax: 225-578-5855
<http://www.phys.lsu.edu>



General Seminar

3:40PM / Thursday, 20 October 2005 / Room 109, Nicholson Hall

Host: Dr. Ilya Vekhter

[Refreshments served at 3:15 PM in Room 229, Nicholson Hall]

Magnetism, Superconductivity and Quantum Criticality in CeRhIn_5

Joe D. Thompson, PhD
Los Alamos National Laboratory

Though a long-standing problem, the relationship between magnetism and superconductivity has become a particularly lively topic, especially in the context of strongly correlated heavy-fermion materials, such as CeRhIn_5 . In these systems, unconventional superconductivity emerges as a magnetic phase transition is tuned by applied pressure toward zero-temperature. Long-range magnetic order, however, terminates abruptly when the magnetic and superconducting transition temperatures become equal, and there is no evidence that the magnetic transition actually reaches $T=0$. It is difficult, then, to understand how the normal state can be dominated by long-ranged, long-lived fluctuations that are expected to arise at a quantum-critical point where the magnetic/non-magnetic boundary is at zero temperature. This mystery has been resolved, in part, by extending the temperature-pressure phase diagram to include a third axis, magnetic field. Recent measurements reveal the emergence of field-induced antiferromagnetism in the superconducting state of CeRhIn_5 . This magnetism, 'hidden' by superconductivity in zero field, reappears in an applied field and terminates at the expected quantum-critical point where the effective mass of quasiparticles diverges and the Fermi-surface volume increases without a change in topology. The relationship between magnetism, superconductivity and quantum criticality found in CeRhIn_5 may be applicable to other strongly correlated systems, such as those based on copper-oxide and plutonium.

Reminder:

There will be a Steering Committee meeting next Tuesday, October 25th, in Room 201, at 3:40 p.m.

Welcome to:

Dr. Hugo Cable, a Postdoctoral Researcher with Dr. Jonathan Dowling.
Dr. Cable is located in Room 460B Nicholson, Ext. 8-0946.

Dr. Kurt Jacobs, a Postdoctoral Researcher with Dr. Jonathan Dowling.
Dr. Jacobs is located in Room 460 B Nicholson, Ext. 8-0946.