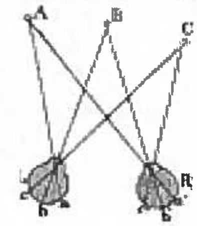

WEEKLY CALENDAR

February 12, 2007

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

"Multi-Photon and Entangled-Photon Imaging and Lithography"

3:40PM / Thursday, 15 February 2007 / Room 109

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

Host: Dr. Jonathan Dowling

Malvin C. Teich, Ph.D.

Boston University and Columbia University

Nonlinear optics, which governs the interaction of light with various media, offers a whole raft of useful applications in photonics, including multiphoton microscopy and multiphoton lithography. It also provides the physicist with a remarkable range of opportunities for generating light with interesting, novel, and useful properties. As a particular example, entangled-photon beams generated via spontaneous optical parametric down-conversion exhibit unique quantum-correlation features, and coherence properties, that are of interest in a number of contexts, including imaging. Photons are emitted in pairs in an entangled quantum state, forming twin beams. Such light has found use, for example, in quantum optical coherence tomography, an imaging technique that permits an object to be examined in section. Quantum entanglement endows this approach with the remarkable property that it is insensitive to the dispersion inherent in the object, thereby permitting sectioning to be achieved at higher resolution, and greater depths, than can otherwise be achieved. Although based on an esoteric feature of quantum mechanics, this technique is expected to have useful applications in biology and medicine. We discuss a number of techniques in which multiphoton and entangled-photon interactions offer advantages.

Material Science & Engineering

"Heavy-electron Physics: New Ways to Break Old Rules"

3:40PM / Wednesday, 14 February 2007 / Room 109

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

Host: Dr. Phil Adams

Johnpierre Paglione, Ph.D.

University of California-San Diego

Over the last thirty years, the concept of the nearly-free electron gas - the basis of our textbook understanding of metallic solids - has been pushed to the extreme with the discovery of the so-called "heavy-fermion" class of materials. In these systems, strong interactions between electrons impose a "drag" effect which can slow them down by as much as 1000 times, but still allow them to retain the essence of the standard model of electrons in metals - Landau's Fermi liquid theory. However, a growing list of Ce- and U-based heavy-fermion systems have been shown to strongly deviate from the this picture when "pushed" toward an absolute-zero-temperature, or quantum, phase transition. For instance, the CeMIn5 system (M=Co, Rh, Ir) is host to many exotic phases which appear in the vicinity of experimentally tunable quantum instabilities. In this talk, I will give an overview of my experimental investigations of this system, focusing on our use of ultra-low-temperature heat and charge transport measurements to test the most basic aspect of the quasi-particle paradigm directly at a quantum phase transition. Our studies have uncovered the first profound breakdown of Landau's theory, as manifested in the violation of a robust physical law which has stood for over 150 years.

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Special Seminar

"The Superfluid Phases of Fermionic Atomic Gases"

3:40PM / Tuesday, 13 February 2007 / Room 109 Nicholson

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

Host: Dr. John DiTusa

Daniel Sheehy, Ph.D.

Iowa State University

In recent years, numerous atomic physics experiments have observed phenomena from the realm of condensed matter physics, including Bose-Einstein condensation and superfluidity. I will discuss one of the most exciting recent achievements, namely the creation of superconductivity in an ultracold gas of two species of atomic fermions. Although sharing much in common with well-known analogues from condensed-matter physics (such as superconductivity in metals and superfluidity in helium), certain novel features make fermionic atomic gases particularly interesting, including a precise experimental tunability of the fermionic interaction strength and the individual densities of the two fermion species. I will present results for the theoretical phase diagram of fermionic superfluids, and discuss the comparison to recent experiments.

Welcome To

Assistant Professor Polad Shikhaliev. He is located in Room 459-A, 578-4289.

Publications:

"Giant magnetoresistance behavior of an iron/carbonized polyurethane nanocomposite," Zhanhu Guo, Sung Ark, H. Thomas Hahn, Suying Wei, **Monica Moldovan, Amar B. Karki** and **David P. Young**, Appl. Phys. Lett. 90, 05311 (2007).

"Uniform discretizations: A new approach for the quantization of totally constrained systems," Miguel Campiglia, Cayetano Di Bartolo, **Rodolfo Gambini**, and **Jorge Pullin**, Physical Review D 74, 124012 (2006).