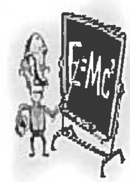

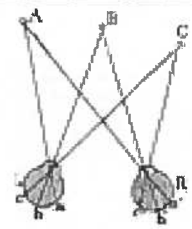

WEEKLY CALENDAR

January 29, 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
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General Seminar

"Quantum Tunneling Dynamics and Metastability of Antiferromagnetic Domains"

3:40PM / Thursday, 1 February 2007 / Room 109

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

Host: Dr. John DiTusa

Eric D. Issaacs, Ph.D.

Director, Center for Nanoscale Materials, Argonne National Laboratory

Measurements of magnetic noise emanating from ferromagnets due to domain motion, first carried out nearly 100 years ago by Barkhausen, have underpinned much science and technology. Antiferromagnets, which carry no net external magnetic dipole moment, yet have a periodic arrangement of the electron spins extending over macroscopic distances, should also display magnetic noise, but this must be sampled at spatial wavelengths of order several interatomic spacings, rather than the macroscopic scales characteristic of ferromagnets. Here we present the first direct measurement of the fluctuations in the nanometre-scale spin- (charge-) density wave superstructure associated with antiferromagnetism in elemental Chromium. The technique used is X-ray Photon Correlation Spectroscopy, where coherent x-ray diffraction produces a speckle pattern that serves as a "fingerprint" of a particular magnetic domain configuration. The temporal evolution of the patterns corresponds to domain walls advancing and retreating over micron distances. While the domain wall motion is thermally activated at temperatures above 100K, it is not so at lower temperatures, and indeed has a rate which saturates at a finite value ñ consistent with quantum fluctuations - on cooling below 40K.

Our results are of general interest because antiferromagnets play a crucial role both in technology, such as pinning layers in spintronic devices, and in fundamental condensed matter physics, such as high temperature superconducting materials. In addition, slow relaxation phenomena of classical as well as quantum origin in complex disordered systems are central to fields from soft condensed matter systems and biology to quantum computation. Finally, coherent X-ray sources, such as the Linac Coherent Light Source (LCLS), are very much under discussion in a variety of scientific and funding communities and we demonstrate their utility for making an unexpected discovery about a common element (chromium).

Special Seminar

"Local Criticality, Time Reversal Violation and The Cuprate Phase Digram"

3:40PM / Monday, 5 February 2007 / Room 109

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

Host: Dr. John DiTusa

Vivek Aji, Ph.D.

University of California-Riverside

The physics of the cuprates has fascinated us for the past twenty years primarily because the behavior in the majority of the phase diagram is unlike any we have encountered before. An organizing principle proposed is that there exists a quantum critical point near optimal doping and that the pseudogap is a result of a symmetry broken state. Furthermore the quantum critical point should give rise to a fluctuation spectrum that is local in space and power law in time to account for the anomalies observed. In the first part of my talk I will show that the dissipation driven transition of a Quantum 2DXY model gives rise to such a spectrum. In the second part I will introduce the symmetry broken states and the neutron scattering results that have observed their principle signature. The long wavelength theory suggested by the symmetries of the time reversal violating states is indeed the dissipative quantum 2DXY model.

Materials Science & Engineering Seminar

"Dripping, Jetting, Drops and Wetting: the Magic of Microfluidics"

3:40PM / Wednesday, 31 January 2007 / Room 109 Nicholson

Host: Dr. Paul Russo, Chemistry

David Weitz, Ph.D.

Department of Physics, Harvard University

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This talk will discuss some of the new opportunities that arise by precisely controlling fluid flow and mixing using microfluidic devices. I describe studies to elucidate mechanisms of drop formation and use these to create new fluid structures that are difficult to achieve with any other method. I also show how the exquisite control afforded by the microfluidic devices provides the enabling technology to use droplets as nanoreactors to qualitatively increase the rate of combinatorial screening of chemical reactions.

Congratulations To:

Dr. Jorge Pullin for being elected corresponding member of the National Academy of Science of Argentina. The Academy, founded only a few years after the US one, in 1869, has counted many prestigious scientists as corresponding members, including Charles Darwin.

Welcome To:

Jaroslaw Nowak, a Postdoctoral Researcher with Professor William Metcalf. Dr. Nowak is in Room 351 Nicholson, 578-2741.

Publications:

"β decay of ^{32}Na," **E. F. Zganjar with TRIUMF-ISAC collaborators**," Physical Review C 75, 017302 (2007).

"Linear optical quantum computing with photonic qubits," **Jonathan P. Dowling**, et al., Reviews of Modern Physics, Vol. 79, January-March 2007.

Special Seminar

Monday, January 29, 2007

3:40 pm in Room 109 Nicholson Hall

Maxim Dzero, Ph.D.
Rutgers University

"How More is Different: Correlated Quantum Matter"

Traditionally, physicists are interested in studying new stable phases of matter.

The phenomena of superconductivity, superfluidity, ferromagnetism, and crystallization are a tribute to the extraordinary capability of matter to acquire new forms and properties. Over the past decade, researchers working in condensed matter physics have revealed a new kind of a phase transition that is driven not by thermal fluctuations but by quantum fluctuations.

The concept of quantum criticality has been very important for our understanding of how quantum matter transforms at ultra-low temperatures. In this talk I shall describe the results of our recent efforts to understand the properties of quantum matter in a variety of physical systems ranging from heavy-fermion compounds to trapped ultra-cold Fermi gases.