LSU College of Science
Department of Physics & Astronomy
WEEKLY CALENDAR

TEL: 225-578-2261
FAX: 225-578-5855
http://www.phys.lsu.edu

202 NICHOLSON HALL
Louisiana State University
Baton Rouge, Louisiana 70803-4001

WEEKLY CALENDAR

October 7-11, 2013

DEPARTMENTAL COLLOQUIUM

"Breakup of the H^2 Molecule by Ultrashort XUV Laser Radiation: A Time-Dependent Treatment"

3:30 PM October 10, 2013
109 Nicholson Hall

Xiaoxu Guan
Drake Unviersity

Host: Kenneth Schafer

• Refreshments served at 3:10 PM in 232 (Library) Nicholson Hall •

Attosecond (10^{-18} s) physics provides a unique way to monitor and control the electronic motion of atoms and molecules in the time domain. Together with new computational techniques, experimental advances in producing strong ultrashort xuv light sources and vastly improved particle-detection techniques have opened the door to explore the complete breakup of few-body atomic and molecular targets governed by the long-range Coulomb interaction. I will discuss recent theoretical and computational progress towards the treatment of double ionization of the hydrogen molecule by few-photon absorption. Through solving the time-dependent Schrödinger equation on a large space-time grid, we can achieve real-time observation (illustrated by movies) of the breakup process on time scales from about 50 to 200 attoseconds. I will present benchmark results for one- and two-photon breakup problems, which were recently obtained in our group. Challenges and opportunities when going beyond the fixed-nuclei approximation will also be addressed.

LA-SiGMA

Louisiana Alliance for Simulation-Guided Materials Applications

Fall Seminar
3:30pm - 4:30pm, Wednesday, October 9, 2013
1008B, Digital Media Center, Louisiana State University

Exploratory Crystal Growth using Metal Fluxes

By

Theo M. Siegrist
Florida Agricultural and Mechanical University
Florida State University

Discovery of novel phases in the laboratory is often serendipitous and not always predictable. There are, however, techniques that have proven useful in the search for new phases. An overview of our activities in the discovery and crystal growth of novel phases in our laboratory will be given, with a examples of new (and known) phases that have been structurally characterized.

Theo M. Siegrist currently holds a joint faculty position with Florida Agricultural and Mechanical University (FAMU) and Florida State University (FSU) within the Department of Chemical and Biomedical Engineering. Prior to settling at FAMU-FSU he worked at Bell Laboratories as a Technical Staff Member and a number of other reputable domestic and international labs. In 2008, he received the Alexander von Humboldt Research Prize and in 2006 he was recognized as a Fellow of the American Physical Society. During the mid to late 90s he acquired three patents and has authored/co-authored over 200 publications.

__UNO__ - Liberal Arts Building 234 ~ __LATech__ - PML 1015, Center for Instructional Technology, at the Wyly Tower

Note, this seminar will ONLY be available via abobe connect
http://connect.lsu.edu/la-sigma/

LA-SiGMA

Louisiana Alliance for Simulation-Guided Materials Applications

Fall Seminar
3:30pm - 4:30pm, Wednesday, October 16, 2013
1008B, Digital Media Center, Louisiana State University

What role does nematicity play in the high-temperature superconductivity of the iron pnictides?

By

Rafael M. Fernandes

University of Minnesota

Five years after their discovery, much of the interest in the iron pnictides remains in understanding not only their high-temperature superconducting phase, but also the nature of their normal state. In this context, recent experiments have provided strong evidence for the existence of an unusual correlated state in the phase diagram of these materials, dubbed electronic nematic. Below the nematic transition temperature, the tetragonal symmetry of the system is broken down to orthorhombic not by lattice vibrations, but by electronic degrees of freedom. However, two questions remain open: What is the origin of this nematic state? What is its relationship to the superconducting state? In this talk we will explore these two issues via a microscopic theoretical model in which the nematic instability is caused by magnetic fluctuations arising from a degenerate ground state. A key consequence of this model is that lattice fluctuations and magnetic fluctuations are not independent. Instead, they follow a simple scaling relation, which we will show to be satisfied by elastic modulus and NMR experimental data. We will also demonstrate that, in general, nematic order competes with the unconventional sign-changing s^{+-} superconducting state. However, when the s^{+-} instability is in close competition with a d-wave instability – as it has been suggested in several iron pnictides – we find that nematic and superconducting degrees of freedom are strongly coupled. As a result, not only T_c can be significantly enhanced by nematic order, but also nematicity itself can be used as a diagnostic tool to search for novel unconventional superconducting states.

Rafael M. Fernandes - received his Bachelor degree (2003) and my PhD in Physics (2008) from the State University of Campinas, in Brazil. Before joining the University of Minnesota, he was a postdoc in Ames Laboratory and a joint postdoc in Columbia University/Los Alamos National Lab.

His research areas are strongly correlated electron systems, unconventional superconductivity, competing phases and emergent order, and disorder effects in quantum phase transitions.

His current research activities are in theoretical condensed matter physics, particularly in strongly correlated electronic many-body systems. Dr. Fernandes is interested in clean and disordered systems in which the collective behavior of the electrons give rise to ordered states that break different symmetries of the system, such as superconductivity, magnetism, nematic ordering, and orbital ordering. His aim is to understand not only the impact of these individual phases on the electronic structure and macroscopic properties of the system, but also how they interact with each other. To achieve this goal, he relies not only on the theoretical methods from quantum statistical mechanics and many-body theory, but also on the invaluable empirical information obtained from a variety of experimental techniques, such as x-ray diffraction, neutron scattering, optical spectroscopy, thermodynamic measurements, and angle-resolved photo-emission spectroscopy.

Here are some of the topics I have been working on:
- Unconventional superconductivity (iron-based materials)
- Emergent phases in magnetic systems (nematics, smectics)
- Transport in strongly correlated systems
- Quantum criticality in disordered systems
- Phase diagram of doped graphene
- Finite temperature Mott transition

__UNO__ - Liberal Arts Building 234 ~ __LATech__ - PML 1015, Center for Instructional Technology, at the Wyly Tower
Note, this seminar will ONLY be available via abobe connect http://connect.lsu.edu/la-sigma/