LSU LOUISIANA STATE UNIVERSITY

PHYSICS & ASTRONOMY
WEEKLY CALENDAR

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WEEKLY CALENDAR

November 28, 2011

DEPARTMENTAL COLLOQUIUM

"Iron-based high-temperature superconductors, a new "favorite" family in condensed matter physics"

3:40 PM, December 1, 2011
109 Nicholson Hall

Wei Ku
Brookhaven National Laboratory

Host: Ward Plummer

• Refreshments served at 3:15 PM in 232 (Library) Nicholson Hall •

Recent discovery of iron-based high temperature superconductors has generated intense research activities in the fields of condensed matter physics, materials sciences and physical chemistry. While only very limited solid understandings have been obtained and more puzzles are being unveiled, it has become clear that this new class of materials is a perfect host for the complex and rich condensed matter physics involving multiple physical effects with similar energy scales.

This talk will address the electronic and magnetic structure of the iron based superconductors, focusing on effects of the symmetries (and their violations) in the spin, charge, orbital and the translation degree of freedoms. First, the rich magnetic structure will be discussed in connection with a hidden ferro-orbital order. Second, the rich variety of magnetic orders found in the families of the parent compounds will be explained using a simple unified picture. Third, the current confusion concerning the translational symmetry will be clarified, with a surprising conclusion that the widely discussed electron pockets are only created by the broken translational symmetry. This suggests a serious reexamination of current theoretical understandings of the magnetism and superconductivity. Finally, the ordering of the iron vacancy in the newest KFe_2Se_2 family will be investigated.

Publications:

1. "Quantum scalar field in quantum gravity: the propagator and Lorentz invariance in the spherically symmetric case", Rodolfo Gambini, **Jorge Pullin**, Saeed Rastgoo, General Relativity Gravity (2011) 43:3569-3592.