Departmental Colloquium

“Instrumentation driven science for unraveling emergent phenomena”

3:30 PM January 29, 2015
119 Nicholson Hall

Zahid Hussain
Berkley National Laboratory

HOST: John DiTusa & Ward Plummer

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

Announcements:

Saturday Science @ LSU
“Field Geology”
January 24, 2015
10:00 – 11:15 AM, Room 130 Nicholson Hall

Amy Luther
LSU Dept. of Geology and Geophysics

LANDOLT ASTRONOMICAL OBSERVATORY
Jupiter, Quarter Moon, and Orion
Saturday, January 24, 2015 @ 9:00-10:00 PM CST

Directions to the Observatory
The Landolt Astronomical Observatory is located on the LSU campus on the roof of Nicholson Hall on Tower Dr. immediately west of the LSU Student Union (across Tower Dr.). Convenient parking is located in the lot immediately south of Nicholson Hall (this lot is between Nicholson Hall and Howe-Russell Geoscience Complex). Parking in the lot is free and open after business hours and on weekends. Entry to the building should be by the door in the middle of the south side of Nicholson Hall. People will then be directed to climb the stairs up to the roof.

Special Seminar

Louisiana Consortium for Neutron Scattering
“Magnetism and its coupling to structure and superconductivity in iron pnictides”

Monday, January 26, 2015, 3:00 – 4:30pm
1008B Digital Media Center, LSU

Dr. Qiang Zhang
Ames Laboratory

“Spinon excitations in one dimensional magnet Yb₂Pt₂Pb”

Wednesday, January 28, 2015
1008B Digital Media Center, LSU

Dr. Liusuo Wu
Stony Brook University
Wednesday, January 28
3:30-4:30pm
1008B Digital Media Center
Louisiana State University

Spinon excitations in one dimensional magnet $Yb_2Pt_2Pb$

Emergent fractional excitations in low dimensional magnets have attracted great interest in condensed matter physics. Many studies have focused on Heisenberg spin 1/2 systems, where quantum fluctuations are expected to be strongest. Here I will present measurements on a new low dimensional magnet $Yb_2Pt_2Pb$, where fractional, quantum spinon excitations are realized from one dimensional ladders with classical Yb lsing moments. Both elastic and inelastic neutron scattering data on $Yb_2Pt_2Pb$ single crystals will be presented. In contrast to 1D Heisenberg spin 1/2 chains, the broad continuum of excitations observed in $Yb_2Pt_2Pb$ is extended to much higher energies, indicating four spinon excitations are important in this system.
Joint colloquium with the LSU Dept. of Physics & Astronomy

Thursday, January 29
3:30-4:30pm
119 Nicholson Hall
Louisiana State University

Instrumentation driven science for unraveling emergent phenomena

Sharper and sharper experimental tools are often crucial for understanding of novel physical phenomena and making new discoveries. Today in condensed matter physics we are experiencing need for revolutionary new instrumentation for understanding interplay of many degrees of freedom interacting at different energy, length and time scales. These interactions lead to new phases of matter and emergent phenomena such as high temperature superconductors, topological insulators and thermoelectric materials, to name a few. My talk will focus, through various examples, upon the necessity for advanced techniques and instrumentation to elucidate the basic physics in the arena of soft x-ray synchrotron radiation and free electron laser.
Monday, January 26
3:00-4:00pm
1008B Digital Media Center
Louisiana State University

Magnetism and its coupling to structure and superconductivity in iron pnictides

The discovery of high-temperature superconductivity in the fluorine-doped LaFeAsO has triggered intensive interest in superconductivity and also in itinerant magnetism in general in the “1111” and “122” families of layered iron pnictides. In this talk, I will present the complex magnetic structures in Fe and Ce sublattices determined by the elastic neutron scattering technique in CeFeAsO crystal. We found a spin-reorientation transition of Fe moments prior to long-range ordered Ce moments at lower temperatures, revealing a strong interplay between 4f Ce$^{3+}$ and 3d Fe$^{2+}$. The effect of the strong Ce-Fe coupling on the rearrangement of Fe ordering is yet another example of the vulnerability of the Fe spin density wave to perturbations such as minute doping or relatively low applied pressures.

While the previous studies have focused on the impact of superconductivity on the magnetic and orthorhombic phases, the interplay between these two ordered states has been a topic of intense debate and so far lacks a universal picture. Here, I will also present an evidence of sharp enhancement of the spin fluctuations, in particular the spin-spin correlation length below tetragonal-to-orthorhombic structural transition in LaFeAsO and underdoped Ba(Fe$_{1-x}$Co$_{x}$)$_2$As$_2$ by inelastic neutron scattering measurements, in contrast with what one expects from a typical antiferromagnetic system. Our findings can be consistently described by a model that attributes the structural/nematic transition to magnetic fluctuations, unveils the key role played by nematic order in promoting the long-range stripe antiferromagnetic order in iron pnictides and also indicate the nematicity may help enhancing superconducting temperature in some circumstances in iron pnictides.