



College of  
Science  
Department of Physics  
& Astronomy

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## Weekly Calendar

November 10 -14, 2014

### Departmental Colloquium

“The miracle of molecules: quantum magnetism in ultracold matter”

3:30 PM November 13, 2014

109 Nicholson Hall

Kaden Hazzard

Rice University

HOST: Jonathan Dowling

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

"How do large collections of objects produce emergent phenomena that are drastically different from the individual constituents?" This challenging question pervades science. In physics, the components are often quantum -- electrons, quarks, atoms, or photons. NanoKelvin-scale ultracold matter provides unique insights into emergent quantum behavior, because ultracold experiments are extremely flexible and well-characterized. Recently-produced cold molecules add capabilities to the ultracold toolbox that are unavailable with atoms. I will discuss how joint experiment-theory work has harnessed these new capabilities to experimentally realize interacting spin models, and how measuring their far-from-equilibrium dynamics has led us to develop new theoretical methods

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### SPECIAL EVENT:

**The College of Science Fall Faculty & Staff Convocation and Reception**

**Wednesday, November 12<sup>th</sup> at 3pm**

**Commons Area of Art+Design Building  
(located behind Starbucks)**

**Reception with light refreshments to be held immediately following in the  
college of Science Office, Room 124 Hatcher Hall**

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### SPECIAL SEMINAR

**Louisiana Consortium for Neutron Scattering**

**“Ferro-orbital Order and Unexpected Phonon Scattering in the Iron  
Chalcogenide Superconductor Family”**

Monday, November 10, 2014, 3:00-4:00pm  
1008B Digital Media Center, LSU

*David Forbes*

Brookhaven National Laboratory's Condensed Matter Physics & Material Science Dept. – Neutron Scattering

## Fall Seminar

**“The design and characterization of plasmonic nanostructures and photonic crystals”**

**3:30pm – 4:30pm, Wednesday, November 12, 2014**

**1008B, Digital Media Center, Louisiana State University**

**Joseph Herzog**

**University of Arkansas**

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### **ANNOUNCEMENT:**

Congratulation to Professor **Mette Gaarde** who has been elected a 2014 Fellow of the Optical Society of America, "For outstanding experimentally relevant research focused on the production and application of ultrafast ultraviolet and extreme ultraviolet radiation sources that exploits high-performance computing for the solutions of the time-dependent Schrödinger equation and Maxwell's wave equation."

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### **PUBLICATIONS:**

1. "Sudden change in dynamics of genuine multipartite entanglement of cavity-reservoir qubits", Mazhar Ali and A. R. P. Rau, Phys. Rev. A **90**, 042330 (2014).



Louisiana Alliance for Simulation-Guided Materials Applications

## **Fall Seminar**

**3:30pm - 4:30pm, Wednesday, November 12, 2014**

**1008B, Digital Media Center, Louisiana State University**

### **The design and characterization of plasmonic nanostructures and photonic crystals.**

**By**

**Joseph Herzog**

**University of Arkansas**

Computational Electromagnetic modeling has proven to be extremely accurate at simulating the optical properties of nanostructures. This work shows example of how computations simulations have accurately confirmed nanoscale phenomena including hybridized dark plasmonic modes and polarization effects in nanogap structures used for surfaced-enhanced Raman spectroscopy. Additionally, optical models have confirmed the nanoscale plasmonic heating in a single gold nanowire. Recent work has been using these tools to characterize the optical properties of gold nanowires and to investigate and optimize the design of new nanofabrication techniques for plasmonic structures and photonic crystals.



**J. B. Herzog** completed his PhD at the University of Notre Dame in Dr. James Merz's Nano-Optics lab, where Herzog performed single-molecule spectroscopy on colloidal semiconductor nanostructures. Before coming to Arkansas, Herzog was a postdoc at Rice University in Houston, TX where he worked with Dr. Douglas Natelson on plasmonic devices for surface enhanced Raman spectroscopy (SERS) and thermo plasmonics. He started at the University of Arkansas (Fayetteville) in the summer of 2013 as a Visiting Assistant Professor in the Department of Physics. In just over a year he has established an active research lab with graduate and undergraduate student researcher. At the University of Arkansas, Herzog is also a faculty member of the Micro-electronics and Photonics Program, is a member of the Institute for Nanoscience and Engineering, and is the student chapter faculty advisor of SPIE – the international society for optics and photonics. His current research interests include plasmonic nanostructures and photonic crystals. For more information and current research updates, visit his website: [comp.uark.edu/~jbherzog](http://comp.uark.edu/~jbherzog).

**UNO** – 234, Liberal Arts Building ~ **LA Tech** – 122, Nethken Hall

**SUBR** – 211 J.B. Moore Hall ~ **Xavier** – 226 Qatar Pavillion

**Tulane** – 600, Lindy Boggs



Louisiana Consortium for Neutron Scattering

# Lecture Series

## Ferro-orbital Order and Unexpected Phonon Scattering in the Iron Chalcogenide Superconductor Family

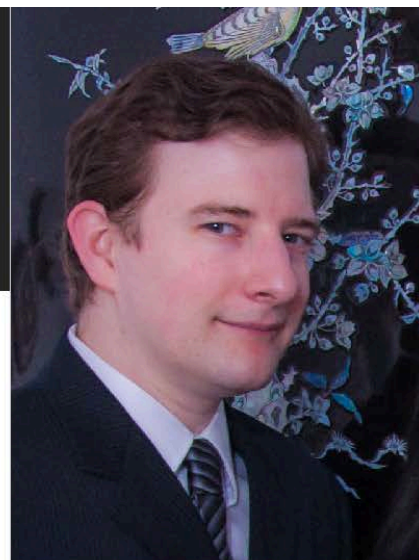
Mon, Nov 10

3:00-4:00pm

1008B Digital Media Center

Louisiana State University

**ABSTRACT:**  $\text{Fe}_{1+y}\text{Te}$ , a parent compound of the iron-chalcogenide superconductor family, structurally the simplest of the iron-based superconductors, is extremely sensitive to non-stoichiometric Fe at interstitial sites.  $\text{Fe}_{1+y}\text{Te}$  with  $y < 0.05$  exhibits a first-order phase transition on cooling to a state with a lowered structural symmetry, bicollinear antiferromagnetic order, and metallic conductivity. However, with  $y \sim 0.09$ , frustration effects caused by interstitial Fe decouple the different orders, resulting in a sequence of transitions. Neutron scattering combined with physical property measurements reveal that below structural and magnetic transitions lies a third transition characterized by the onset of a bond order wave (BOW) that drives the system from an incommensurate magnetic order to the bicollinear ordered ground state. The BOW state suggests ferro-orbital ordering, where electronic delocalization in ferromagnetic zigzag chains decreases local spin and results in metallic transport. Observed near the characteristic Bragg peaks of the BOW state is an unexpected acoustic phonon dispersion, which should be forbidden by symmetry. The unexpected acoustic mode is also conspicuously present in superconducting iron chalcogenide  $\text{FeTe}_{1-x}\text{Se}_x$ , in which the structural and magnetic transitions have been suppressed, and contains only negligible concentrations of interstitial Fe, and indicating that this mode is likely an intrinsic property, independent of excess Fe, and may be associated with a dynamical symmetry breaking.



*Guest Speaker*

# DAVID FOBES

Research Associate

Brookhaven National  
Laboratory's  
Condensed Matter  
Physics and  
Materials Science  
Department -  
Neutron Scattering  
Group

*Free and open to the public*





SAVE *the* DATE



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*Wednesday, November 12th at 3pm*

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(located behind Starbucks)

*Reception with light refreshments to be held immediately following in  
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We would like to showcase the printed publications of our faculty during the reception. If you would like to have your publications featured, please deliver a copy to Dawn Jenkins, room 329, Hatcher Hall, no later than Monday, November 10th. The publications will be returned after the reception.