LA-SiGMA

Louisiana Alliance for Simulation-Guided Materials Applications

Fall Seminar Series

3:30pm - 4:30pm, Wednesday, October 31, 2012

Johnston Hall, Room 338

Time-resolved spectroscopy in correlated electron materials

by

Brian Moritz

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Abstract: The development of ultra-fast and ultra-bright laser sources ranging from the THz to the x-ray portion of the spectrum, either on the tabletop or at large scale user facilities such as the Linac Coherent Light Source (LCLS), offers a unique opportunity to investigate temporal dynamics of electronic states using a variety of spectroscopies. These time-resolved, pump-probe techniques are uniquely capable of disentangling the strongly intertwined degrees of freedom that give rise to novel, emergent phases of matter and can cause temporal and spatial fluctuations over multiple time and length scales. I will introduce several of these techniques, including time- and angle-resolved photoemission spectroscopy and time-resolved resonant x-ray scattering, and their application to condensed matter materials, such as stripe-ordered nickelates, charge density wave compounds, high-temperature superconductors, and topological insulators. I will discuss our efforts to analyze these experiments and utilize large-scale, massively parallel simulations to study the behavior of different model systems by diagrammatic, dynamical mean-field, and exact diagonalization techniques extended to the time-domain.

Biography: Dr. Brian Moritz is an Adjunct Assistant Professor at the University of North Dakota, a Visiting Scholar in the Stanford Institute for Materials and Energy Sciences (SIMES) at Stanford University and SLAC National Accelerator Laboratory, and a Postdoctoral Scholar at Northern Illinois University. Brian uses a number of numerical techniques, including exact diagonalization, quantum Monte Carlo, and dynamical mean-field theory, to study the behavior of various models for strongly correlated materials and simulate different spectroscopies, including photoemission, Raman spectroscopy, and resonant x-ray scattering. He currently focuses on understanding the physics revealed by pump-probe experiments, including those performed using the soft x-ray (SXR) end-station at the Linac Coherent Light Source LCLS. Brian is a member of the Time-Resolved Spectroscopies research team of the Computational Materials and Chemical Sciences Network (CMCSN) and serves as a Basic Energy Sciences representative on the National Energy Research Scientific Computing Center (NERSC) Users' Group Executive Committee (NUGEX).