Departmental Colloquium

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

3:30 PM Thursday, March 26, 2015
435 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.

Special Seminar
Louisiana Consortium for Neutron Scattering

“Studies of Polyelectrolyte Multilayers with the SNS Liquids Reflectometer”
Monday, March 23, 2015, 3:00 – 4:00pm
1008B Digital Media Center, LSU
John Ankner
Oak Ridge National Laboratory

Publications:

Monday, March 23
3:00-4:00pm
1008B Digital Media Center
Louisiana State University

Studies of Polyelectrolyte Multilayers with the SNS Liquids Reflectometer

Layer-by-Layer (LbL) assembly performed via alternating adsorption of water-soluble polymers at surfaces enables fabrication of films on almost any substrate, with nano-scale control over film composition, structure, and properties. Neutron reflectivity offers a window into the internal structure of Layer-by-Layer grown films. The dependence of neutron refractive index on nuclear rather than electronic scattering allows one to substitute deuterons (2H) for protons (1H) to highlight features of interest within a film. Deuterated precursors are available for a wide range of polyelectrolytes and the polymers themselves for commonly used species, such as poly(styrene sulfonate) and poly(methacrylic acid). By imposing rigorous mass balance and employing simplified block models, one can reduce the number of model parameters and extract meaningful structural information from reflectivity data. We will describe how to construct and constrain multilayer models and present application of these methods to various LbL structural problems, such as environmental response, the dependence of film quality on deposition parameters, adsorption of protein layers, asymmetric and salt-mediated diffusion, and the formation, structure, and pH-response of hydrogels.

Guest Speaker

JOHN ANKNER
Liquid Reflectometer Instrument Scientist
Oak Ridge National Laboratory

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