College of Science
Department of Physics & Astronomy

WEEKLY CALENDAR

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202 NICHOLSON HALL
Louisiana State University
Baton Rouge, Louisiana 70803-4001

WEEKLY CALENDAR

March 10 - 14, 2014

SPECIAL COLLOQUIUM

"Making Structured Metals Transparent to White Light"

3:30 PM Tuesday, March 11, 2014
109 Nicholson Hall

Ru-wen Peng
National Laboratory of Solid State Microstructures & Nanjing University

Host: Rongying Jin

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

Under light illumination, structured metals present unexpected and fascinating phenomena resulting from complex charge patterns. In my talk, I will show how to design structured metals and make them transparent for broadband electromagnetic waves by surface plasmons (SPs).Â First, we demonstrate that the interference between localized and propagating SPs plays the important role on the optical transmission through subwavelength-hole arrays. Second, we illustrate that the transmission enhancement originates not only from the coupling between the incident light and the excited SPs, but also from the coupling among those SPs in multiple nanoaperture stacks.Â Third, we show that the metallic plates with narrow slit arrays can become transparent within extremely broad spectral bandwidths, and high transmission efficiency is insensitive to the thickness of a metal. This phenomenon explicitly indicates the conversion between light and SPs. The investigations provide a guideline to develop many novel materials and devices, such as transparent conducting panels, antireflective solar cells, and other broadband metamaterials.

DEPARTMENTAL COLLOQUIUM

"Strange Bedfellows: Superconductivity Enabling Magnetism"

3:30 PM March 13, 2014
109 Nicholson Hall

Ilya Vekhter
LSU, Physics & Astronomy

Host: Mark Jarrell

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

One of the major undertakings of condensed matter physics is to understand not only the emergence, but also coexistence and competition of ordered phases in electronic matter. In this talk I will discuss one notable example of such cohabitation, that between magnetism and superconductivity. I will introduce the main concepts of the ordering phenomena in solids, discuss their origin, and review the physics of this competition. I will then explain why the case of heavy fermion CeCoIn5 has challenged our understanding: this is the only situation where magnetic order appears under an applied magnetic field in the superconducting state, but vanishes as soon as superconductivity is suppressed. After reviewing various scenarios for this observation and comparing them with the experimental data, I will present a theory for this behavior, and discuss how to test its predictions in experiment.

LA-SiGMA
Louisiana Alliance for Simulation-Guided Materials Applications

Fall Seminar

Serdar Ogut
University of Illinois, Chicago

"Electronic and Optical Excitations in Confined Nanostructures: Density Functional versus Many-Body versus Classical Theories"

3:30pm - 4:30pm, Wednesday, March 12, 2014

1008B, Digital Media Center, Louisiana State University

LA-SiGMA

Louisiana Alliance for Simulation-Guided Materials Applications

Fall Seminar
3:30pm - 4:30pm, Wednesday, March 12, 2014
117, Richardson Building, Tulane University

Electronic and Optical Excitations in Confined Nanostructures: Density Functional versus Many-Body versus Classical Theories

By

Serdar Ogut

University of Illinois, Chicago

Electronic and optical excitations in confined nanostructures have been in the center of an intense research effort for the last two decades. Achieving a detailed understanding of how light interacts with matter at the nanoscale and how it can be manipulated to tune material properties is a challenging endeavor that necessitates a reliably predictive modeling and simulation effort to aid and interpret experiments. Historically, excited state descriptions of chemical species and materials have lagged behind descriptions of the ground state. This is especially true for density functional methods where the initial formalism was developed to describe only ground state properties. However, relatively recent computational work on time-dependent density-functional-theory (TDDFT) and a Green's function-based many-body perturbation theory approach (so-called GWBSE) have provided new methodologies to examine electronic and optical excited states from first principles within similar frameworks as ground state properties. This talk will mainly focus on the applications of these methods to a variety of confined nanostructures.

After a brief discussion of the underlying theoretical and computational methods, I will present a summary of our recent studies on (i) the electronic and optical properties of noble metal clusters Agn, Aun, and Cun (n = 2 – 20) using TDDFT and GWBSE, highlighting the important role that the shallow d electrons play in their optical properties, (ii) the electronic excitations and exciton binding energies in Si nanoshells, and (iii) the nature of the electronic and optical excitations in bulk-truncated rutile TiO2 nanoclusters up to 1.5 nm in size. The first principles results obtained for these systems at various levels of theory will be compared with available experimental data. A common theme that will appear in all these systems is that many of the electronic and optical properties of this wide range of materials systems, which are in the sub-nanometer to a few nm size range, can be reproduced remarkably well by using classical electrodynamics in conjunction with bulk dielectric properties.

Serdar Ogut received his PhD in physics from Yale University in 1995, after which he worked as a postdoctoral research associate at the University of Minnesota, Department of Chemical Engineering and Materials Science. In Fall 2001, he joined the University of Illinois at Chicago (UIC) as an assistant professor, and moved through the ranks (Associate Professor in 2005, Full Professor in 2010).

He is a computational materials and condensed matter physicist with expertise in first principles modeling of structural, electronic, and optical properties of various classes of materials, in particular, transition metal oxides, electronic materials, ceramics, and nanostructures. He served as a member of Physical Review B Editorial Board for 6 years (2008 through 2013), and has worked as a program director in the Division of Materials Research at the National Science Foundation (from 10/2009 through 10/2012, and 12/2013 to present). He is a fellow of the American Physical Society, and the recipient of 3 peer-reviewed Teaching Awards at UIC (2004, 2008, and 2009) and a J. Tinsley Oden fellowship at the University of Texas at Austin (2009).

***UNO** - Liberal Arts Building 234 ~ **LATech** - PML 1015, Center for Instructional Technology, at the Wyly Tower ~ **LSU** – 1008B, Digital Media Center*

Note, this seminar will ONLY be available via abobe connect
https://breeze.tulane.edu/lasigma/