Yale Institute for Nanoscience and Quantum Engineering

Friday- September 27, 2013

12:00 to 1:00 p.m.

Becton Seminar Room

Light lunch will be served at 11:45 a.m.

Matthew S.J. Marshall

Department of Applied Physics, Yale University

"Modulating the electronic properties of a conducting channel oxide using a ferroelectric"

The ferroelectric field effect modulates the carrier density in an adjacent channel in a non-volatile manner. The electrical polarization of the ferroelectric can couple to the properties of the channel. Because the polarization of the ferroelectric can be switched with an applied voltage, we can therefore modulate the properties of the channel material using electric fields. Here, we show that the structure and properties of channel materials comprised of rare-earth perovskite nickelates (ReNiO3) can be modulated using a ferroelectric. The polarization of the ferroelectric changes not only the carrier concentration of the nickelate, but also modifies the interfacial atomic structure of the channel material. The consequence is a shift in the metal-insulator transition temperature as well as a change in the carrier mobility of the rare earth nickelate layer.

Nathan Flowers-Jacobs

Department of Physics, Yale University

" Optomechanics in a Fiber-Cavity"

A number of nanomechanical experiments have recently reached the quantum regime. Many of these experiments are based on a linear optomechanical coupling between a nanomechanical resonator and a cavity, where the motion of the resonator changes the resonance frequency of the cavity. We have made such an optomechanical device consisting of a mechanical resonator inside an optical cavity formed between the ends of two optical fibers. I will discuss two different types of mechanical resonators. First, we have incorporated a silicon nitride membrane into the cavity and used light in the cavity to couple and transfer energy between two mechanical modes of the membrane. This is a first step towards realizing theoretical proposals for creating non-classical mechanical states and storing quantum information. Second, I will describe our progress towards using a very different type of mechanical resonator and coupling the acoustic modes in superfluid liquid helium to the fiber-cavity.

HOST: Paul Fleury