UNH Materials Science/Physics Seminar

16:00-17:00, Monday, Jan. 31, 2011
DeMeritt 240
University of New Hampshire

Stability in a Turbulent (Fermi) Sea: The Ever More Remarkable High Temperature Superconductors

Prof. Eric Hudson

MIT

For over two decades high temperature superconductivity has captured the attention of scientists the world round. However, rather than finding a simple explanation for the properties of these materials, as was done for their low temperature cousins half a century ago, intensive research has instead led to an increasingly complex picture of materials characterized by an intricate phase diagram, full of competing or coexisting states, yet still dominated by a superconducting state which persists, at least in some materials, almost half way to room temperature.
In this talk I will describe nanoscale investigations of the electronic structure of high temperature superconductors using scanning tunneling microscopy (STM). We have recently found that a still not understood high temperature phase in these materials, the pseudogap, is characterized by strong charge inhomogeneity. Surprisingly, although this disorder persists into the superconducting state, it does not seem to perturb coexisting homogeneous superconductivity. The resolution of this apparent contradiction gives new insight into the onset of superconductivity and its relationship with the pseudogap phase.

Eric Hudson received a B.A. in Physics/Linguistics in 1992 from the University of Chicago, and completed his Ph.D. at the University of California, Berkeley, in 1999. After a brief postdoctoral tenure at UC-Berkeley, he became an NRC Postdoctoral Research Associate at the National Institute of Standards and Technology (NIST), studying spin polarized scanning tunneling microscopy (STM). For the past eight years he has been a professor in the physics department at MIT. His main interests lie in nanoscale investigations of strongly correlated electron systems, such as high temperature superconductors (HTSC). In particular, he is interested in the fundamental question of how defects and disorder affect these systems, as well as the more practical question of what observations about these effects at the microscopic level can tell us about the macroscopic nature of these systems.

Host: Prof. Karsten Pohl, ×4197