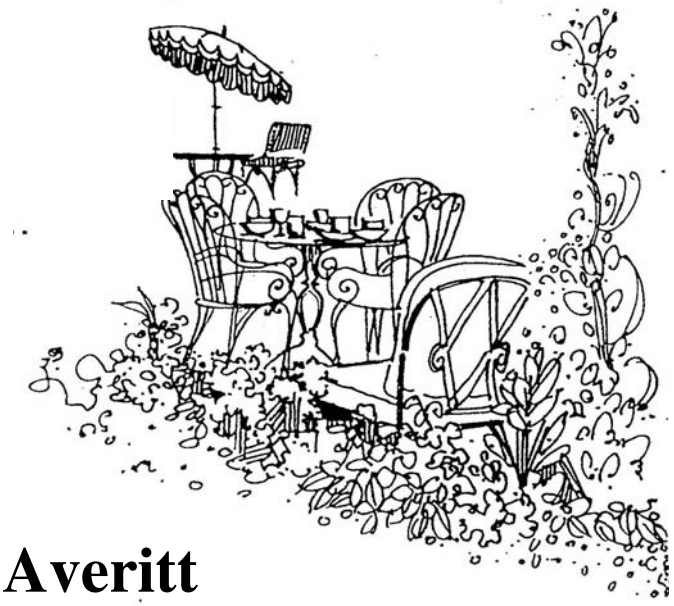
Chez Pierre

Presents ...

Monday, November 2, 2009
12:00pm
MIT Room 4-331



Richard D. Averitt

Boston University

"Terahertz Spectroscopy of Complex Materials"

Terahertz time-domain spectroscopy is a powerful tool to investigate complex materials broadly defined. This includes correlated electron materials where interplay between microscopic degrees of freedom leads to phenomena such as superconductivity or metal-insulator transitions and artificial electromagnetic composites such as metamaterials. I will discuss our recent results in these areas.

The emerging field of photoinduced phase transitions relies on optical techniques to initiate a cooperative response in a given material with a view towards creating new macroscopically ordered phases. Various correlated electron materials are under active investigation in this regard given their well-known sensitivity to external perturbations. We have been investigating V2O3 which undergoes a transition from antiferromagnetic insulator at low temperatures to a strongly correlated metal above ~160K. Optical-pump THz-probe studies on V2O3 thin films reveal coherent oscillations in the far-infrared conductivity. The ~100 ps conductivity oscillations result from optically induced strain and are suggestive of an induced decrease of the one-electron bandwidth thereby driving V2O3 from the correlated metallic state towards a paramagnetic insulating phase.

I will also briefly present results on creating reconfigurable terahertz metamaterials. Specifically, we have been able to demonstrate reconfigurable anisotropic metamaterials where artificial ‘‘atoms’’ reorient within unit cells in response to an external stimulus. This is accomplished by fabricating planar arrays of split ring resonators on bimaterial cantilevers designed to bend out of plane in response to a thermal stimulus. In this way we can control the electric and magnetic response of these metamaterials.