

# Columbia University

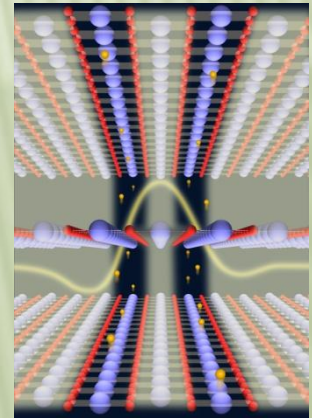
## Department of Physics Colloquium



### “Optical control of High Tc cuprates”

In this talk I will discuss some of our recent work aimed at controlling superconductivity in the High Tc cuprates with light.

High-field THz radiation is used to coherently manipulate low lying excitations, selectively driving them to amplitudes far in excess of thermal fluctuations. This regime of excitation extends the coherent manipulation of quantum matter far beyond the limits explored with microwave technology, notably in NMR or EPR experiments. Yet, we explore a photon energy regime well under that of “ionizing” eV energy scale radiation used in conventional femtosecond spectroscopy. Nonlinear control of broken symmetry states becomes possible with these tools.



In our early work, we have excited large amplitude vibrational excitations to melt competing ordered states with mid infrared light. More recent work has focused on direct control of the interlayer Josephson phase, manipulated with strong THz electric field transients. In some recent experiments have demonstrated coherent oscillations between superconducting and ohmic states of cuprates, in the spirit of the AC Josephson effect.

This dynamics is probed with femtosecond x-ray radiation, and selected examples of the application of Free Electron Lasers to this class of problems will be discussed.

**Andrea Cavalleri, University of Oxford**

Monday, December 10, 2012 : 428 Pupin Hall / 4:10 PM

