Chez Pierre

Presents ...

Monday, March 30, 2020

12:00pm Noon

Broadcast via Zoom (link tba)

Chez Pierre Seminar

Douglas Natelson – Rice University

"New Surprises in High Tc Tunnel Junctions"

High temperature superconductivity remains one of the major open problems in physics. Atomically precise, epitaxial tunnel junctions are a means to examine these materials in a nominally simple configuration that minimizes disorder and surface effects. We use c-axis epitaxial junctions to examine tunneling between La(2-x)Sr(x)CuO4 source and drain electrodes separated by a 2 nm barrier of the undoped, Mott-insulating parent compound La2CuO4, over a broad range of doping, temperature, and bias. Measurements of shot noise in the tunneling current reveal evidence for pairing of charges at temperatures above the superconducting transition, and at bias scales large compared to the superconducting gap [Nature 572, 493-498 (2019)]. Despite their high degree of structural perfection, tunneling spectroscopy of these junctions reveals marked deviations from expectations of the Bardeen-Cooper-Schrieffer (BCS) picture, including complete suppression of the Josephson current, strong residual conductance at zero bias in the T=0 limit, strongly suppressed coherence peaks, and non-conservation of transverse momentum in tunneling. I will discuss these results, their implications, and next steps in these and related systems.