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"Atomic-scale fragmentation and collapse of antiferromagnetic order in a doped Mott insulator"

Abstract: A Mott insulator, characterized by the localization of electrons due to strong electron-electron interactions, is typically accompanied by magnetic ordering. The antiferromagnetic Mott insulator has been of particular interest as the low-temperature ground state of numerous transition metal oxides, most notably cuprate high-temperature superconductors. Charge carrier doping can gradually suppress this insulating state, leading to the insulator-to-metal transition (IMT). However, despite decades of research, it is still unclear how the antiferromagnetic order melts with doping at the nanoscale, and what is its relationship to the charge gap closing. In this talk, I will discuss how we use spin-polarized scanning tunneling microscopy (SP-STM) to visualize the antiferromagnetic order in a Mott insulator Sr_2IrO_4. We find that near IMT, the long-range antiferromagnetic order melts into a fragmented state with short-range correlations. Interestingly, we discover that this static short-range antiferromagnetic order is locally uncorrelated with the spectral gap magnitude, reigniting the discussion of origin of electronic inhomogeneity in doped Sr_2IrO_4. I will conclude by discussing the prospects of using SP-STM to other quantum materials.

Wednesday, September 25, 2019

12:00 pm - Room S-122, Sackler Sciences Center