Quantum critical fluctuations in cuprates and d-wave superconductivity through their coupling to fermions

VIVEK AJI, University of California at Riverside

The phase diagram of the Cuprates is a collection of anomalies that has challenged our understanding of quantum many body physics. An organizing principle proposed to unify the experimental observations is the existence of a quantum critical point near optimal doping separating a phase which has broken time reversal and a renormalized Fermi liquid. I will discuss recent theoretical developments related to the nature of the fluctuations near the quantum critical point. The long wavelength theory of the time reversal violating state belongs to the dissipative 2DXY universality class. The fluctuation spectrum, at the quantum critical point, is local in space and power law in time, precisely of the form observed in the marginal fermi liquid phase near optimal doping. The fluctuations couple to the local angular momentum of the fermions to give a momentum dependence to the coupling which leads directly to pairing attraction in the d-wave channel.