Chez Pierre

Presents ...

Tuesday, October 23, 2018

12:00pm Noon

MIT Room 4-331

Special Chez Pierre Seminar

Boris Spivak, University of Washington

"Anomalous metals"

The observation of metallic ground states in a variety of two-dimensional electronic systems poses a fundamental challenge for the theory of electron fluids. I will analyze evidence for the existence of a regime, which we call the "anomalous metal regime," In diverse 2D superconducting systems driven through a quantum superconductor to metal transition by tuning physical parameters such as the magnetic field, the gate voltage in the case of systems with a MOSFET geometry, or the degree of disorder. The principal phenomenological observation is that in the anomalous metal, as a function of decreasing temperature, the resistivity first drops as if the system were approaching a superconducting ground state, but then saturates at low temperatures to a value that can be orders of magnitude smaller than the Drude value. The anomalous metal also shows a giant positive magneto-resistance. Thus, it behaves as if it were a failed superconductor." This behavior is observed in a broad range of parameters. I will exhibit, by theoretical solution of a model of superconducting grains embedded in a metallic matrix, that as a matter of principle such anomalous metallic behavior can occur in the neighborhood of a quantum superconductor-metal transition. However, I will also argue that the robustness and ubiquitous nature of the observed phenomena are difficult to reconcile with any existing theoretical treatment, and speculate about the character of a more fundamental theoretical framework.