



Sommerfeld Theory Colloquium

Prof. Boris Spivak

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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 magnetoresistance. 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.

Wednesday, 8 February 2023, 16:15h, Room A348, Theresienstr. 37/III

Prof. Slava Mukhanov