LMU LUDWIG-MAXIMILIANS-UNIVERSITÄT MÜNCHEN

ARNOLD SOMMERFELD CENTER FOR THEORETICAL PHYSICS

Sommerfeld Theory Colloquium

Prof. Boris Spivak

University of Washington

Quantum superconductor-metal transition

We derive the theory of the quantum (zero temperature) superconductor to metal transition in disordered materials when the resistance of the normal metal near criticality is small compared to the quantum of resistivity. This can occur most readily in situations in which ``Anderson's theorem'' does not apply.

We explicitly study the transition in superconductor-metal composites, in an s-wave superconducting film in the presence of a magnetic field, and in a low temperature disordered d-wave superconductor. Near the point of the transition, the distribution of the superconducting order parameter is highly inhomogeneous. To describe this situation we employ a procedure which is similar to that introduced by Mott for description of the temperature dependence of the variable range hopping conduction. As the system approaches the point of the transition from the metal to the superconductor, the conductivity of the system diverges, and the Wiedemann-Franz law is violated. In the case of d-wave (or other exotic) superconductors we predict the existence of (at least) two sequential transitions as a function of increasing disorder: a d-wave to s-wave, and then an s-wave to metal transition.

Tuesday, 15th July 08, 16:15 h, Room 348 / 349, Theresienstr. 37 / III

Prof. V. Mukhanov