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How bad metals turn good: spectroscopic signatures.

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Many materials with strong electronic correlations display metallic-like resistivity up to very high temperature, with values exceeding the Ioffe-Regel-Mott (IRM) criterion. Yet, at low enough temperature, good metallic conductivity obeying Fermi liquid behaviour can be recovered. In this talk, I will explore how this crossover takes place. I will show that the Fermi liquid scale, which is strongly suppressed by strong correlations, should not be confused with the much higher Brinkman-Rice scale, at which incoherent transport sets in.
In between these two scales, an extended regime of metallic transport applies, in which the resistivity is smaller than the IRM value but does not follow a T2 Fermi-liquid law. Well-defined quasiparticle excitations do exist in this regime, as manifested in the one-particle spectral function and optical conductivity, with properties distinct from Landau and Drude theories.
For a hole-doped Mott insulator, a strong particle-hole asymmetry applies down to low-energy: electron-like excitations are much longer lived, placing these quasiparticle excitations on the 'dark side' for ARPES spectroscopy. This also has implications for the temperature dependence of the thermopower.

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