Low-energy kinks and high-temperature resistivity.

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In this talk, I will present the results from two recent papers[1,2]. In Ref. (1), we examine the low-energy kink observed in angle-resolved photoemission experiments on a wide variety of strongly-correlated materials. We extract the kink energy and momentum from the experimental data. We discuss two theoretical models, both of which produce the kink. The first is free electrons coupled to a Bosonic excitation at the kink energy. The second is the Extremely Correlated Fermi Liquid Theory (ECFL), in which the kink is generated purely through electron-electron correlations. We identify experimental features which can distinguish between the two mechanisms and do a direct comparison between the data and the ECFL predictions.

In Ref. (2), using both the high-temperature series and Dynamical Mean-Field Theory (DMFT), we compute the dc resistivity, optical conductivity, self-energy, and local density of states of the single-band Hubbard model for arbitrary filling $n < 1$. We find excellent agreement between the analytical high-temperature series and the numerically exact DMFT for $T \gtrsim D(1-n)$ (the 'bad-metal' regime), where D is the half-bandwidth. The dc resistivity vs. temperature curve can be understood in terms of a competition between the kinetic energy (or compressibility), which represents the effective carrier number, and the scattering rate (or diffusion constant). To a very good approximation, the resistivity behaves like $\rho(n,T) \approx \frac{\rho(n=0,T)}{1-n}$, with $\rho(n=0,T) \propto \frac{T}{D}$ at high-temperatures. The saturation of the resistivity at small n occurs due to a cancellation between a vanishing number of carriers and a divergent scattering time.

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[1] K. Matsuyama, E. Perepelitsky, and B. S. Shastry, Phys. Rev. **B95**, 165435 (2017).
[2] E. Perepelitsky et al, Phys. Rev. **B94**, 235115 (2016).