

Spectroscopy via numerical simulations of the Hubbard and related models: relevance to the cuprates

Tom Devereaux

Stanford University

It is of strong current interest to determine whether the simple Hubbard model contains the rich physics observed across the complex phase diagram of high temperature superconductors. In this talk I will review some recent progress to address this question via numerical simulations of the Hubbard model, as well as electron-phonon coupling via extended Holstein couplings, in 1D and 2D lattices. Using quantum Monte Carlo along with density matrix renormalization group methods, spectral functions and associated correlation functions measuring intertwined fluctuating orders (such as superconducting, spin, and charge) are determined and compared with experiments. While the results can reproduce many of the interesting observations in the cuprates, it will be shown that these numerical models have yet to adequately address high temperature superconductivity itself.