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Emergence of Particle-Hole Symmetry near Optimal Doping in High-Temperature Copper Oxide Superconductors SHILADITYA CHAKRABORTY, University of Illinois at Urbana-Champaign, DIMITRIOS GALANAKIS, University of Cincinnati, PHILIP PHILLIPS, University of Illinois at Urbana-Champaign — High-temperature copper oxide superconductors (cuprates) display unconventional physics when they are lightly doped whereas the standard theory of metals prevails in the opposite regime. For example, the thermoelectric power changes sign abruptly near optimal doping in a wide class of cuprates, a stark departure from the standard theory of metals in which the thermopower vanishes only when one electron exists per site. We show that this effect arises from proximity to a state in which particle-hole symmetry is dynamically generated. The operative mechanism is dynamical spectral weight transfer from states that lie at least 2eV away from the chemical potential. The emergence of this symmetry close to optimal doping points to pairing in the cuprates being driven by high-energy electronic states.

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