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Probing spectral and transport properties of atomic Fermi-Hubbard systems[1] BENJAMIN SPAR, PETER BROWN, ELMER GUARDADO-SANCHEZ, DEBAYAN MITRA, PETER SCHAUSS, WASEEM BAKR, Princeton University — In the past thirty years, there has been much scientific interest in the cuprates, with the discovery of their high temperature superconducting state. The normal states of the doped cuprates are particularly poorly understood, featuring phases with anomalous transport and spectral properties. It is thought that much of the behavior of these materials can be qualitatively described by the Fermi-Hubbard Model, which can be realized with ultracold fermionic atoms in an optical lattice. Using a lithium quantum gas microscope, we are able to probe the dynamic properties necessary to observe the strange metal and pseudogap phases of a Fermi-Hubbard system. First, we perform diffusion measurements in a doped Mott insulator and use the Nernst-Einstein equation to extract the resistivity. We observe a linear-in-temperature resistivity, characteristic of a strange metal. Next, we have developed techniques for performing angle resolved photoemission spectroscopy (ARPES) in Fermi-Hubbard systems and used it to study the pseudogap in an attractive Hubbard system. Looking forward, we would like to perform ARPES measurements on the doped repulsive system, which can directly reveal the d-wave nature of the pseudogap.

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