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**A fully controllable Kondo system: Coupling a flux qubit and an ultracold Fermi gas** KELLY PATTON, School of Science and Technology, Georgia Gwinnett College — We show that a composite spin-1/2 Kondo system can be formed by coupling a superconducting quantum interference device (SQUID) to the internal hyperfine states of a trapped ultracold atomic Fermi gas. Here, the SQUID, or flux qubit, acts as an effective magnetic impurity that induces spin-flip scattering near the Fermi energies of the trapped gas. Although the ultracold gas and SQUID are at vastly different temperatures, the formation of a strongly correlated Kondo state between the two systems is found when the gas is cooled below the Kondo temperature. We find that the Kondo temperature of this hybrid system is within current experimental limits. Furthermore, the momentum distribution of the trapped fermions is calculated. We find that it clearly contains an experimental signature of this correlated state and the associated Kondo screening length. In addition to probing Kondo physics, the con- trollability of this system can be used to systematically explore the relaxation and equilibration of a strongly correlated system that has been initially prepared in a selected nonequilibrium state.

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