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Electronic Duality in the Pressure-tuned Quantum Critical Metal $CeRhIn_5$[1] TUSON PARK, M.J. GRAF, LEV BOULAEVSKII, J.L. SARRAO, J.D. THOMPSON, Los Alamos National Laboratory — The heavy fermion compound $CeRhIn_5$ is a prototypical strongly correlated antiferromagnet where the localized 4f electron of Ce hybridizes weakly with ligand electrons. Applying pressure to this material increases hybridization and induces bulk unconventional superconductivity that arises from pressure-enhanced itinerancy of 4f electrons and that simultaneously coexists with large-moment antiferromagnetic order among localized 4f electrons. This microscopic coexistence of local-moment magnetic order and superconductivity in $CeRhIn_5$ is distinctly different from conventional models that attribute coexisting spin-density wave magnetism and superconductivity to a Fermi-surface instability. Electronic duality, which is unambiguously revealed in the single 4f electron of cerium in $CeRhIn_5$, is a new framework emerging from strongly correlated electron matter, ranging from the high-T_c cuprates and heavy fermion superconductors to plutonium.

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