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Ferromagnetism in ruthenate perovskites[1] HUNG T. DANG, Institute for Theoretical Solid State Physics, RWTH Aachen University, Germany, JERNEJ MRAVLJE, Department of Theoretical Physics, Jozef Stefan Institute, Ljubljana, Slovenia, ANDREW J. MILLIS, Department of Physics, Columbia University, New York, USA — In apparent contrast to the usual rule that stronger correlations favor magnetism and other forms of order, while weaker correlations lead to Fermi liquid metals, it has been experimentally established that $CaRuO_3$, a more correlated material, is a paramagnetic metal with a Fermi liquid ground state while $SrRuO_3$, which is less strongly correlated, is ferromagnetic below a Curie temperature of 160K. We present density functional plus dynamical mean field theory calculations which resolve this conundrum. We show that in these materials ferromagnetism occurs naturally for cubic perovskite systems at moderate correlations but is suppressed both by proximity to the Mott insulating phase and by increasing the amplitude of a $GdFeO_3$ distortion. These factors are strongly related to the differences between Ca and Sr ruthenates and are used as the keys to solve the problem. Placement of the ruthenate materials on the metal-insulator phase diagram and comparison to previous works on the Ruddlesden-Popper materials are also discussed.

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