The ultimate size limit of a magnetic bit is a single atom. Despite long lasting research efforts of several groups, and despite the spectacularly large orbital moments and anisotropy energies reported on single surface adsorbed atoms, all investigated systems were paramagnetic down to lowest temperatures. This changed in 2016, where two systems with magnetic remanence were identified. We report on these systems where indeed single atoms are stable magnets. We show how their magnetization can be read and written and we elaborate on the mechanisms that limit their stability. These involve electron and phonon scattering, but also the interaction between electron and nuclear spins. Our results show that single atom magnetic information storage is feasible with coercitive fields and temperatures that outperform the best molecular magnets. We discuss the features that need to be met for single atom magnetic quantum bits, i.e., for single atoms that enable coherent manipulation of the wave function describing their magnetic quantum state.