The Physics of Hunds metals and its relevance for ruthenades, iron pnictides and chalchogenides

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I will discuss the physics of Hund's metals. In these systems the Coulomb interaction among the electrons is not strong enough to fully localize them, but it significantly slows them down, such that the low-energy emerging quasiparticles have a substantially enhanced mass. This enhanced mass emerges not because of the Hubbard interaction U, but because of the Hund's rule interactions J that tend to align electrons with the same spin but different orbital quantum numbers when they find themselves on the same atom. I will show a few examples of such Hund's metals, including Sr2RuO4, iron pnictides and iron chalchogenides materials. The electronic structure, computed by the Dynamical Mean Field Theory in combination with Density Functional Theory, successfully reproduces several experimental results and explains the key properties of these material: such as the mass renormalizations and anisotropy of quasiparticles, the crossover into an incoherent regime above a low temperature scale, the magnetic moments in iron compunds, etc. While at very low temperature our simulations predict these materials to be Fermi liquids, at finite temperature they strongly deviate from Fermi liquid prediction and can be characterized by self-energy which follows a powerlaw, with non-integer fractional exponents. The origin of this non-Fermi liquid exponents will be discussed.