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STEM in Kondo Lattices: a new window on correlated electron materials¹

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The tremendous developments in scanning tunneling electron spectroscopy over the past decade, applied with tremendous success to the cuprate superconductors, are now beginning to be applied to other strongly correlated electron systems. One area where they offer tremendous potential, is in the context of heavy fermion materials. In the last few years, it has become possible to start probing the physics of the Kondo lattice using STEM methods. In this talk I will review this field, discussing the physics of tunneling into the Kondo lattice, showing how tunneling involves a co-operative process of electron transfer and spin-flip, called “cotunnelling” [1,2]. I will provide an overview of latest results in this field, especially URu₂Si₂ [3,4], YbRh₂Si₂ [5] and CeCoIn₅ [6], discussing how STEM can be used to probe various new theoretical proposals [7,8] for the exotic order and critical behavior.

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[7] Y. Dubi and A.V. Balatsky, Phys. Rev. Lett. 106, 196407 (2011).

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