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Correlated Spin Phenomena in Molecular Systems

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While a great deal of work has been carried out on molecular magnets, the spatial distribution of the spin wave function and the many body interactions between the delocalized molecular spin and its surrounding electrons can now be obtained with atomic scale resolution with the scanning tunneling microscope (STM). The combination of surface science, self-assembly, and STM enables correlated spin phenomena, such as the Kondo state, to be probed in a wide range of well characterized systems from single molecules to a two-dimensional lattice of interacting spins. Nonlocality, Kondo gap, and the Kondo lattice in correlated electron physics are revealed by the atomic-scale spatial resolution and high energy resolution spectroscopy and imaging with the STM from oxygen to porphyrins and phthalocyanine molecules adsorbed on metal and oxide surfaces.