Confining correlated states in single-layer MoS_2

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Electrons are prone to strong correlations when confined into one-dimensional (1D) or 0D cavities. Many exotic ground states can emerge, depending on the type of interactions. Examples are Peierls transitions, Tomonaga-Luttinger liquids, Jahn-Teller distortions, or Anderson impurities.An ideal experimental testbed for the observation of correlated electronic behaviour is found in 0D vacancies and 1D mirror twin boundaries (MTBs) of the two-dimensional material MoS_2. Both types of defects function as structurally perfect cavities, are only weakly coupled to the environment and accessible to spatially resolved spectroscopic investigations using scanning tunnelling microscopy.In my talk I will show that the confined quasiparticles within vacancies undergo a Jahn-Teller transition when charged by a single electron [1]. In addition, I will describe the correlated properties of confined states within 1D MTBs, in which we observed a Kondo resonance when the highest occupied state is filled by a single electron [2]. The unique construction of our Kondo system enables us to test the predictive power of the Anderson impurity model, which is the basis of our microscopic understanding of Kondo physics.

[1] Jansen et al., *submitted* arXiv:2401.09931v1 (2024).
[2] van Efferen et al., *Nat. Phys.* **20**, 82-87 (2024).