

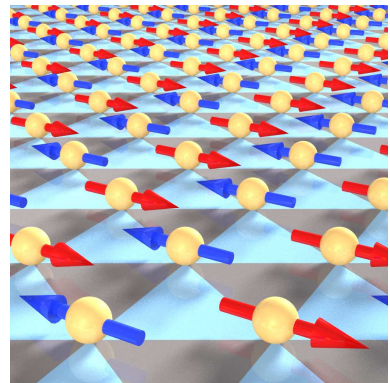
Electronic Functionality of Atomically Defined Nanostructures and Interfaces

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Recent developments in the epitaxy of atomically defined structures on surfaces have opened new opportunities to realize specific electron interaction regimes. Depending on the architecture and dimensionality, the charge carriers may be affected by, e.g., strong electron correlations or spin interactions. These effects can be accessed experimentally by high-resolution angle-resolved photoemission, which can detect the characteristic many-body spectra including spin. This is complemented by low-temperature scanning tunneling spectroscopy as a local atomic probe. The talk presents an overview of the state-of-the-art of such tunable electron systems, and gives examples for the various phenomena.

Atom chains synthesized by self-assembly may take the electron confinement to the extreme limit. For the first time, spectra with universal scaling behavior are observed, which clearly deviate from conventional Fermi liquid physics, and instead represent a one-dimensional electron liquid [1]. In turning to two-dimensional nanostructures, spin-orbit coupling can drive a large spin-splitting of the electronic states. For a noble-metal-induced interface on a semiconductor, one finds an unexpectedly rich spin texture with out-of-plane and radial spin components [2]. Latest developments show that even spin states of topological nature can be achieved in epitaxial layers. Atom lattices can also be modified to exhibit strong Coulomb interactions. Surprisingly, for a realization on a silicon surface, one observes a collinear antiferromagnetic spin pattern [3]. This finding of magnetism in an atom lattice made of otherwise non-magnetic components can offer new ways of controlling spins on surfaces.



[1] C. Blumenstein, J. Schäfer, *et al.*, *Nature Physics* **7**, 776 (2011).

[2] P. Höpfner, J. Schäfer, *et al.*, *Phys. Rev. Lett.* **108**, 186801 (2012), Editors' Suggestion.

[3] G. Li, P. Höpfner, J. Schäfer, *et al.*, *Nature Commun.* **4**, 1620 (2013).