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Guest Lecture

Title: "Epitaxial Design and Spectroscopy of Low-Dimensional Electronic Materials with Spin-Controlled Properties"

Speaker: Dr. Jörg Schäfer

Address: Institute of Physics, Julius Maximilians University of Würzburg, Germany

Date: Friday, 21st of November 2014

Time: 14:30

Place: Seminar Room CBEG02 (387, Photonics); Gußhausstraße 27

Abstract:

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.

In 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



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radial spin components. 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. This finding of magnetism in an atom lattice made of otherwise non-magnetic components can offer new ways of controlling spins on surfaces.

Latest advances show that even spin states of topological nature can be achieved in epitaxial systems. Such so-called "Topological Insulators" exhibit metallic states at their surface which are protected against backscattering, and promise a new avenue for fault-proof computing. The talk will address possibilities to grow such materials, will inspect the topological states, and gives a perspective on their importance for envisioned applications.