凝縮系物理学ゼミナール

Condensed Matter Seminar

Location: **Room 413**, School of Science Bldg. 5 (理学 5 号館 413 号室)

Date: **13:30-15:00**, Wednesday, 5 July 2017

A chemically driven Quantum Phase Transition

Speaker:

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Abstract:

The magnetic properties of nanostructures are at present in the focus of an intense research effort in physics, chemistry and materials science. The reason is the drive to design miniaturized spin-based devices, for example, for spintronics or quantum computation. In this context, dimers of two atoms or molecules constitute important model systems, because they are simple and yet embody the crucial physics: the competition of interactions within the nanostructure with those between the nanostructure and its environment.

In the beginning of this talk, I present a general overview of Quantum Impurity Systems and a short explanation of the Kondo effect [1]. Furthermore, a brief introduction to the Numerical Renormalization Group (NRG) method [2] is given. Afterwards, it is shown that non-magnetic, chemical interactions can have a decisive effect on the magnetic properties of nanostructures.

This is demonstrated for dimers of metal–molecule complexes on a Au(111) surface [3]. A changing wavefunction overlap between the two monomers drives a surface-adsorbed dimer through a quantum phase transition from an underscreened triplet to a singlet ground state [4].

References:

[1] J. Kondo, Prog. Theor. Phys. **32** (1), 37 (1964)

[2] R. Bulla, T. Costi, and T. Pruschke, Rev. Mod. Phys. **80**, 395 (2008)

[3] T. Esat et al., Phys. Rev. B **91**, 144415 (2015)

[4] T. Esat et al., Nature Physics **12**, 867 (2016)