KONDO EFFECT IN NANOSTRUCTURES

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Kondo effect arises whenever a coupling to a Fermi gas induces transitions within otherwise degenerate ground state multiplet of an interacting system. Both coupling to a Fermi gas and interactions are naturally present in a nanoscale transport experiment. At the same time, many nanostructures can be easily tuned to the vicinity of a degeneracy point. This is why the Kondo effect in its various forms often dominates the low temperature transport in nanoscale systems.

In this talk we will review the theory of the Kondo effect in transport through nanostructures[1], concentrating on the so-called lateral quantum dot systems[2], formed by gate depletion of a two-dimensional electron gas at the interface between two semiconductors. A Coulomb-blockaded quantum dot behaves in many aspects as an artificial ``magnetic impurity" coupled via exchange interaction to two conducting leads. Kondo effect in transport through such an impurity manifests itself in the lifting of the Coulomb blockade at low temperatures.

Many of the ideas and results presented in this talk are directly applicable to other systems as well. The list (by no means exhaustive) includes vertical quantum dots[3], Coulomb-blockaded carbon nanotubes[4], single-molecule transistors[5], and magnetic atoms on metallic surfaces[6].

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