

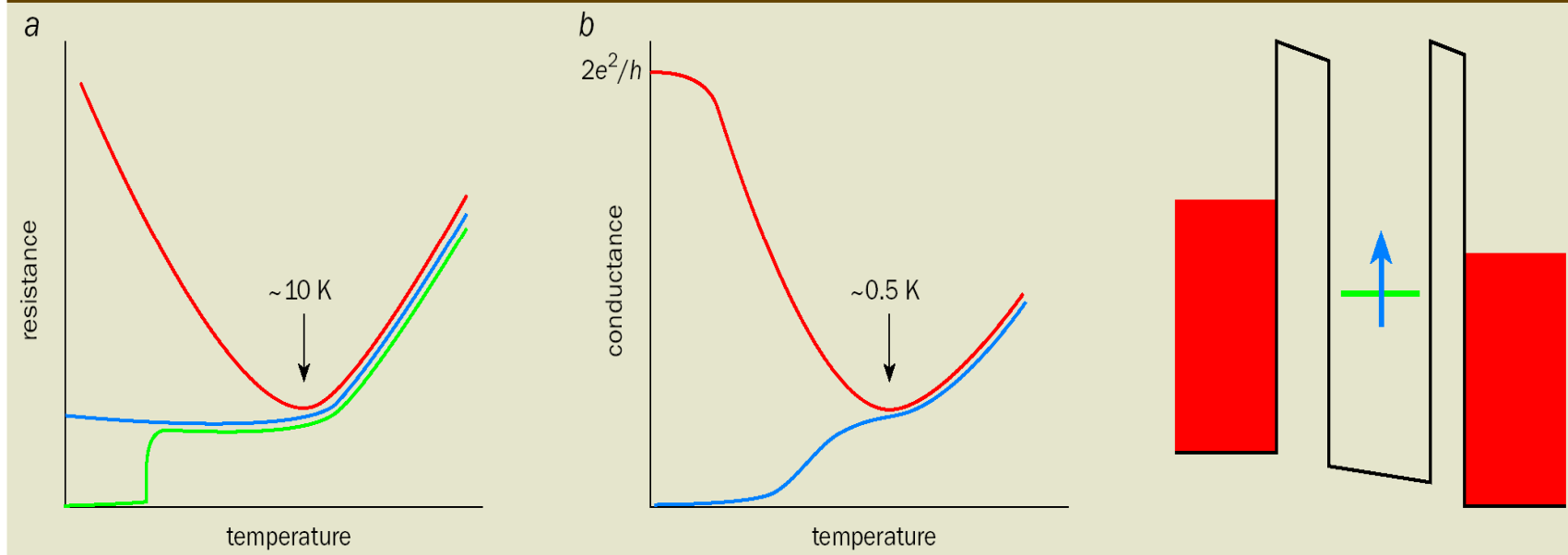
Kondo Effect in Quantum Dots

Revival of the Kondo effect

Leo Kouwenhoven and Leonid Glazman

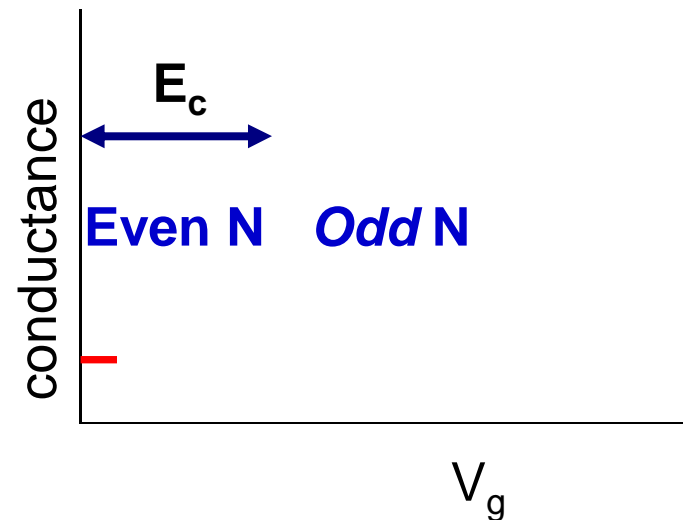
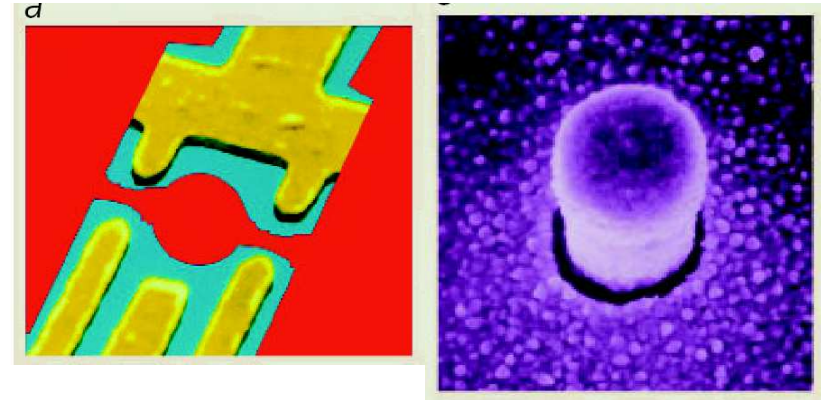
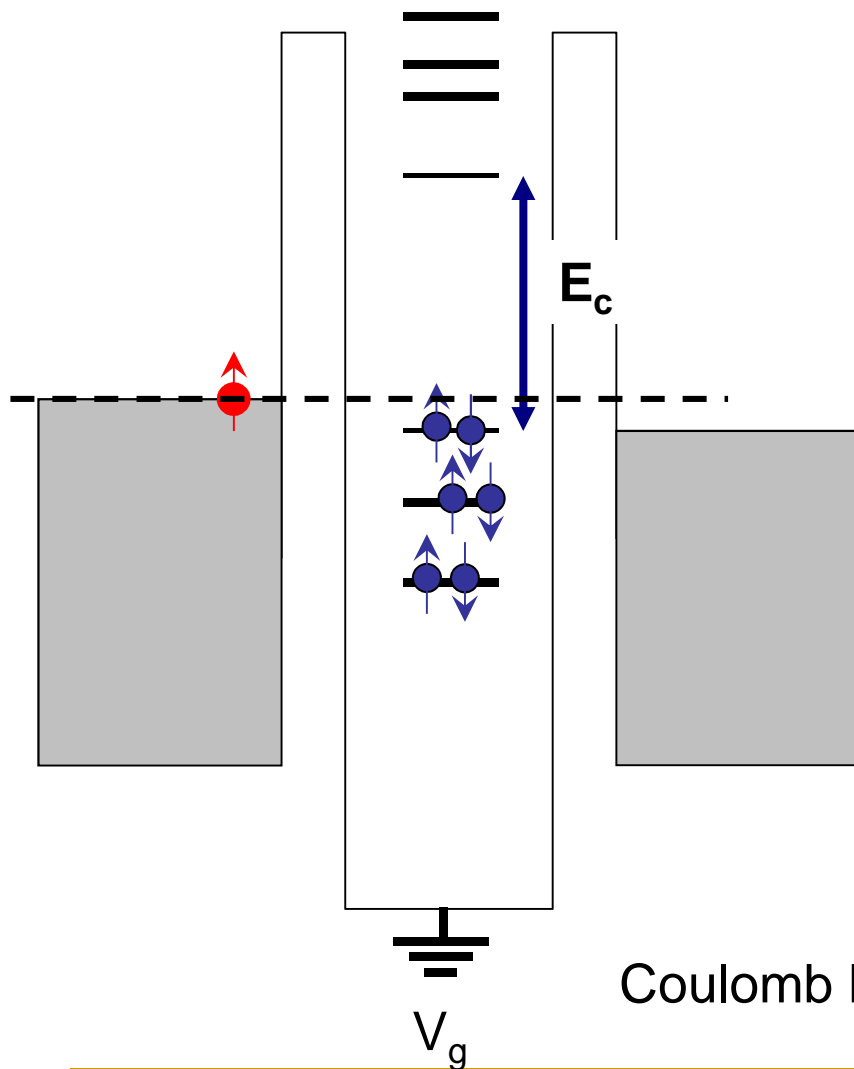


1 The Kondo effect in metals and in quantum dots



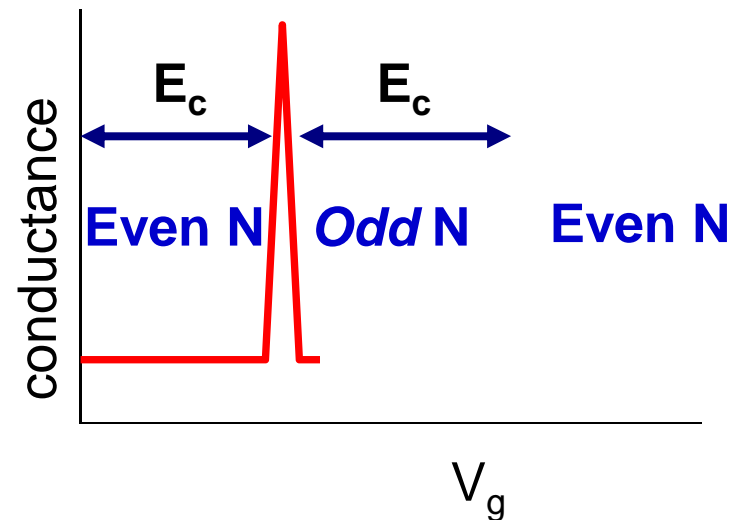
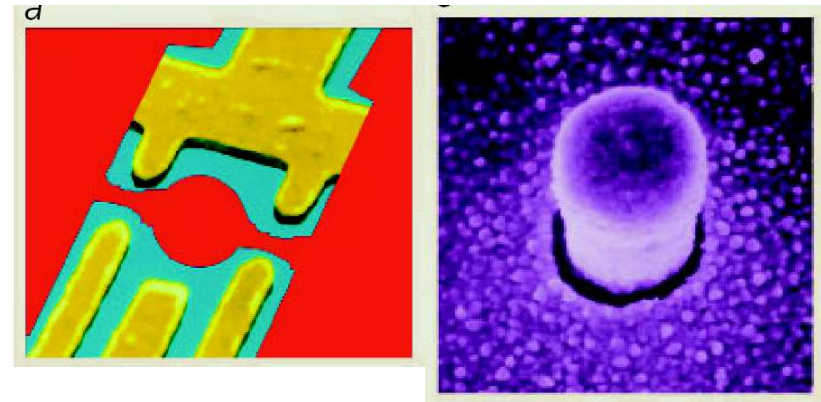
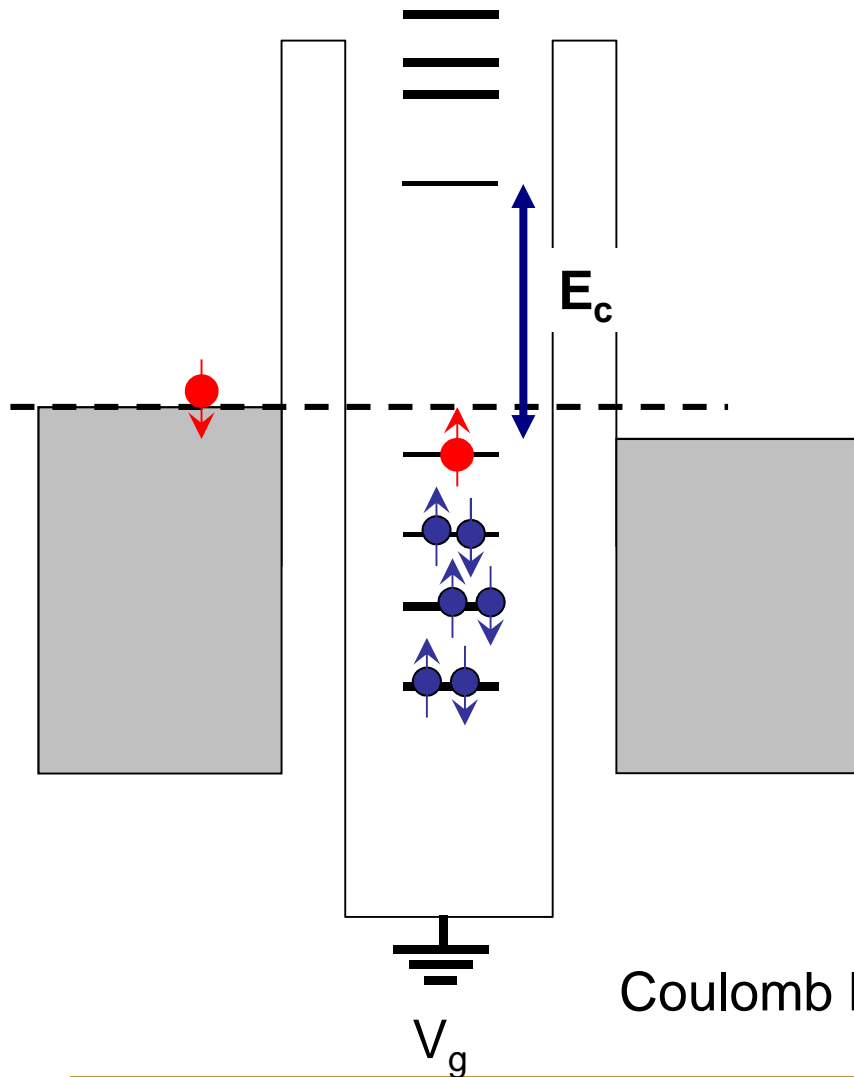
Kouwenhoven and Glazman *Physics World* – Jan. 2001.

Coulomb Blockade in Quantum Dots



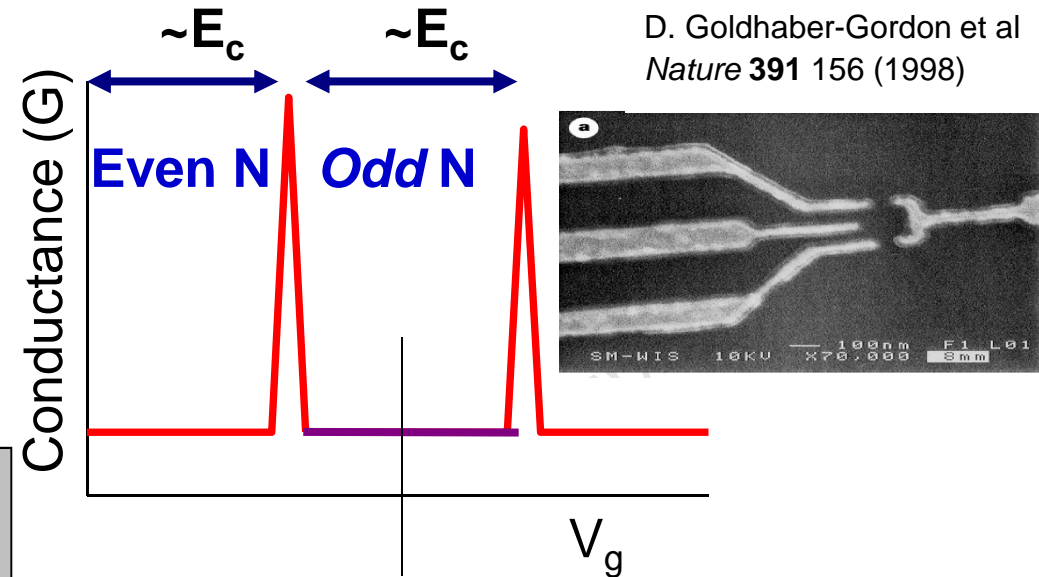
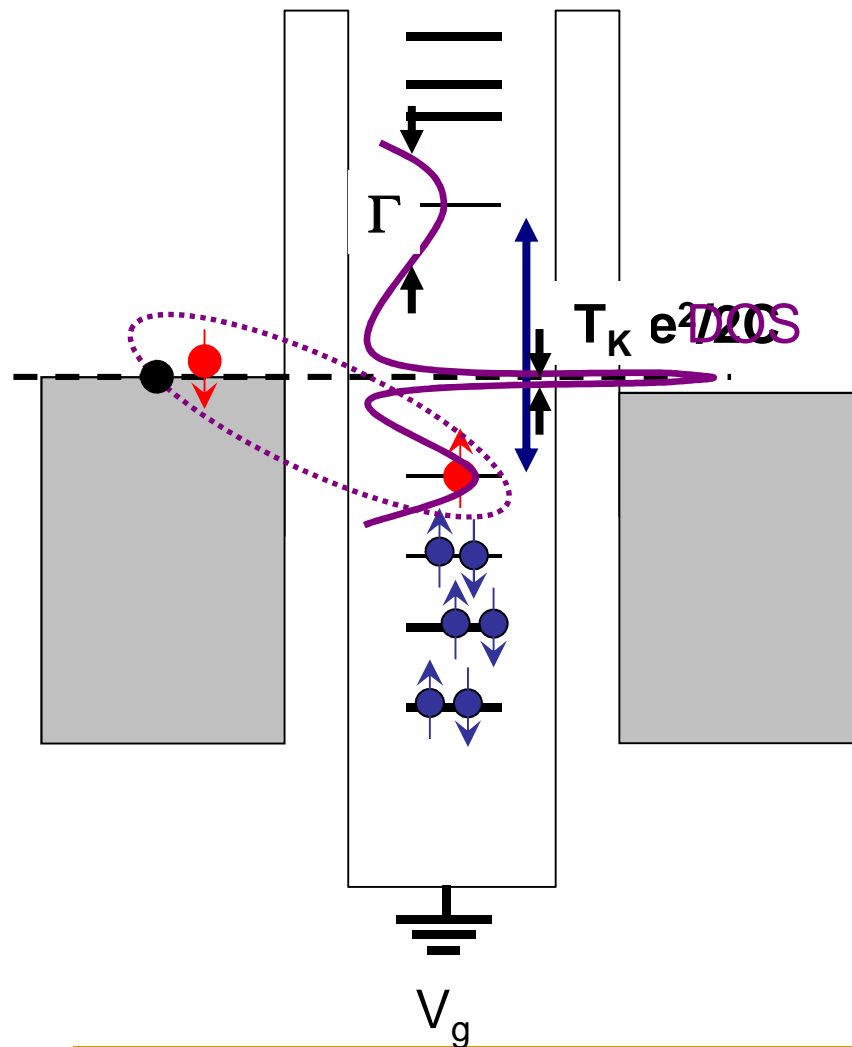
Coulomb Blockade in Quantum Dots

Coulomb Blockade in Quantum Dots



Coulomb Blockade in Quantum Dots

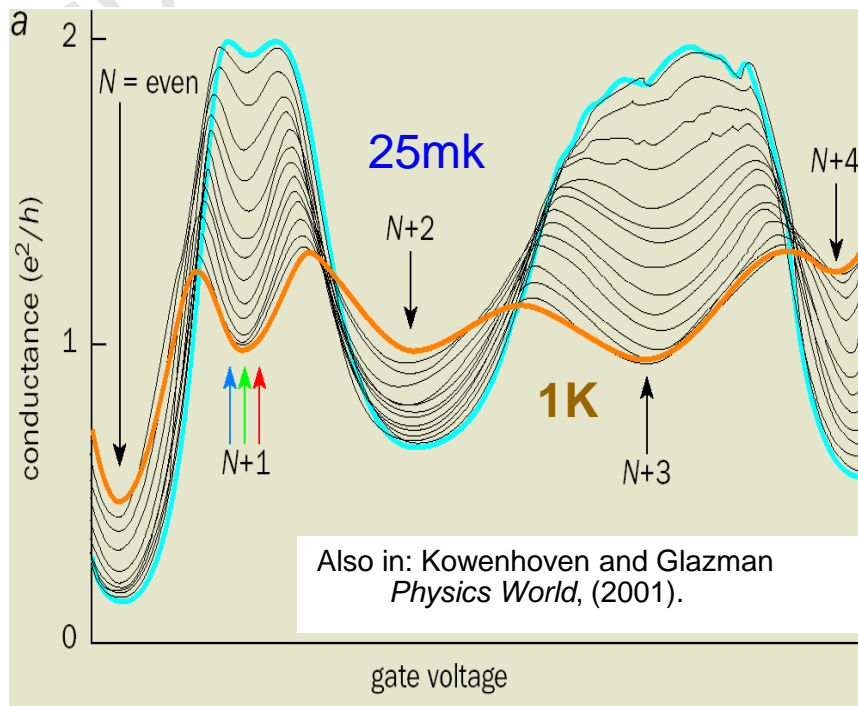
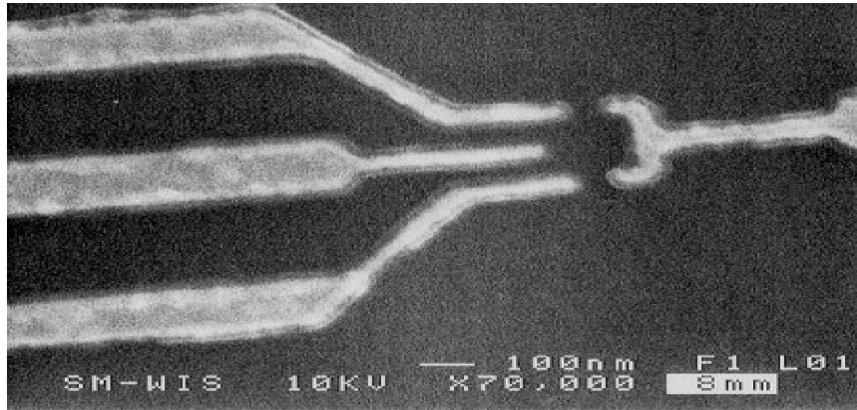
Kondo Effect in Quantum Dots



- $T > T_K$: Coulomb blockade (low G)
- $T < T_K$: Kondo singlet formation
- Kondo resonance at E_F (width T_K).
- New conduction channel at E_F :
Zero-bias enhancement of G

Kondo effect in Quantum Dots

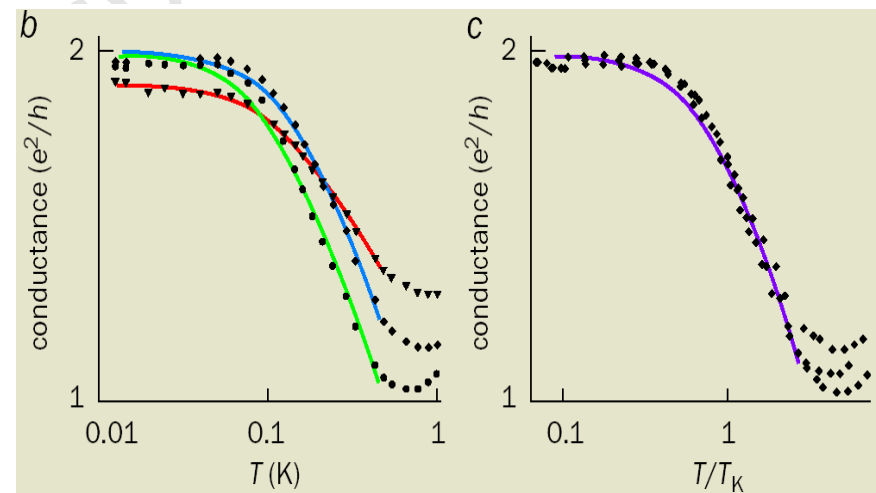
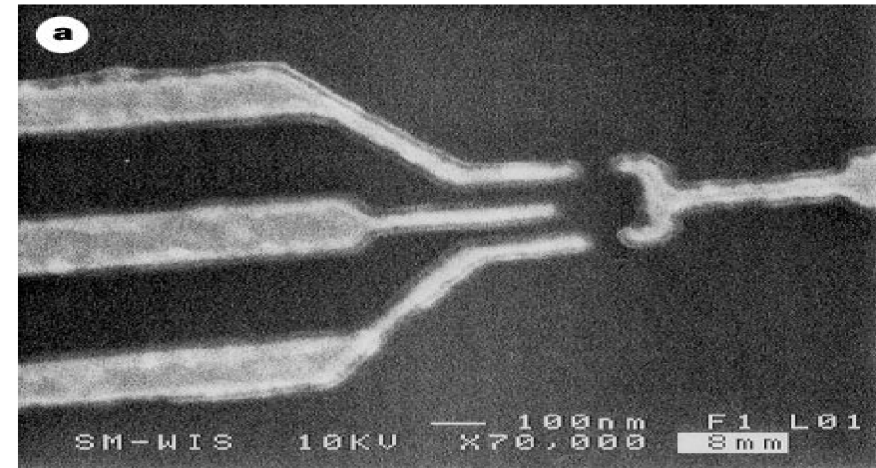
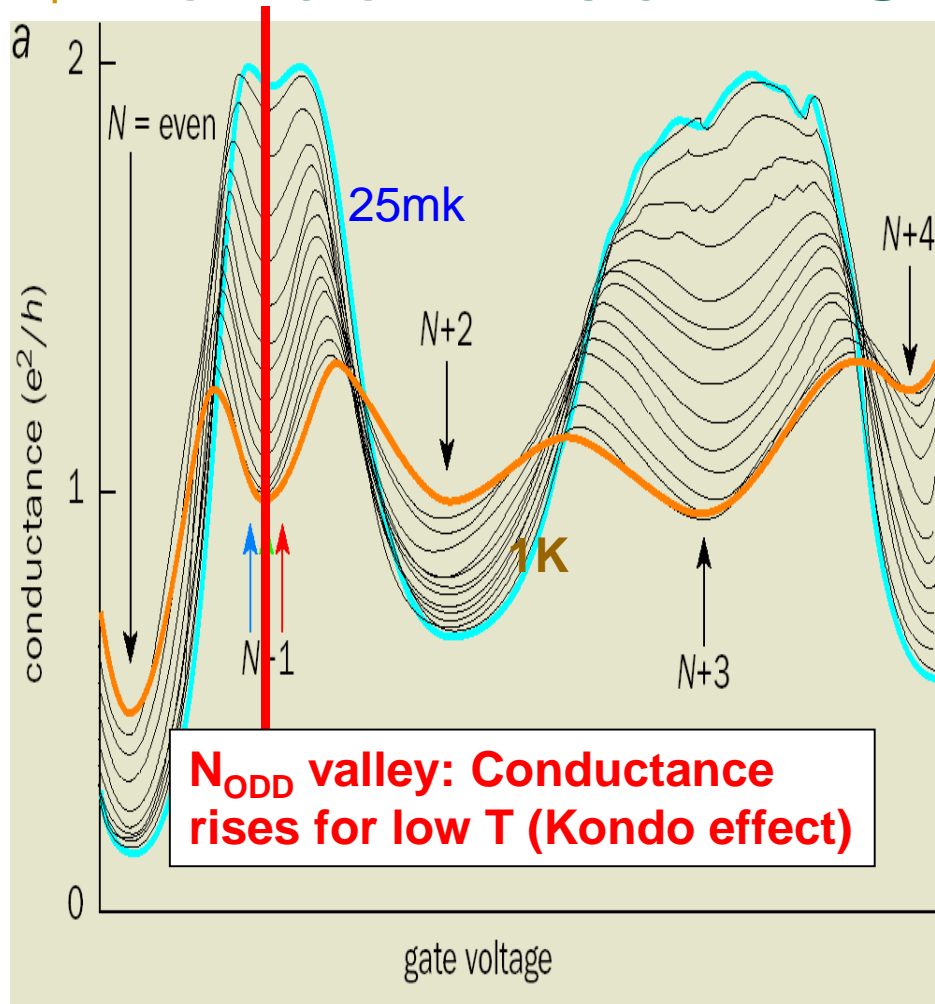
D. Goldhaber-Gordon et al. Nature **391** 156 (1998)



Semiconductor Quantum Dots:

- Allow for systematic and *controllable* investigations of the Kondo effect.
- QD in N_{odd} Coulomb Blockade valley: realization of the Kondo regime of the Anderson impurity problem.

Kondo Effect in CB-QDs



Kondo Temperature T_K : only scaling parameter ($\sim 0.5\text{K}$, depends on V_g)

Kowenhoven and Glazman *Physics World* – Jan. 2001.

From: Goldhaber-Gordon *et al. Nature* **391** 156 (1998)