UCLA Department of Physics & Astronomy

COLLOQUIUM

Thursday, May 11 at 4 p.m.
1-434 PAB

The Rise of Silicon Quantum Electronics

Prof. Jason R. Petta
UCLA

Over twenty years ago, Daniel Loss and David DiVincenzo proposed using the spin of a single electron as a quantum bit. At the time of the proposal, it was not possible to trap a single electron in a semiconductor device and measure its spin, let alone demonstrate control of spin coherence. In this colloquium, I will give a broad overview of the physics of semiconductor spin qubits, highlighting mechanisms for coherent spin-spin interactions. At short distances, the exchange interaction allows for coherent coupling on ~100 nm length scales with fidelities up to 99.8% - a performance competitive with superconducting qubits. Our research group is also exploring the use of microwave frequency photons as mediators of long-range (centimeter-scale) spin-spin interactions. In addition to enabling fundamental studies of quantum coherent processes in the solid state, silicon spin qubits can potentially be scaled to large system sizes using industrial fabrication techniques.

Refreshments at 3:30 p.m. on the PAB Patio. Undergraduates Welcome!