

Chez Pierre

Presents ...

Monday, December 1, 2014

12:00pm

MIT Room 4-331

Chez Pierre Seminar

Shahal Ilani

Weizmann Institute of Science

“Quantum Design in Carbon Nanotubes ”

Recent years have seen the development of several experimental systems capable of tuning local parameters of quantum Hamiltonians, including ultracold atoms, trapped ions, superconducting circuits and photonic crystals. These systems excel in studying the physics of bosons in disorder-free settings. A solid state analog, in which Hamiltonians of interacting electrons are designed and studied, remains a major open challenge, since in conventional solids electrons exist inside an imperfect host material that generates uncontrolled disorder. In this talk I will describe our newly-developed platform for realizing in suspended carbon nanotubes such disorder-free, locally-tunable electronic systems. This platform becomes possible due to a new technique for nano-assembly of one or several carbon nanotubes on complex electrical circuits without damaging the nanotubes' pristine electronic behavior. I will demonstrate how these systems allow us to localize individual electrons at arbitrary positions along suspended nanotubes, shape their wavefunctions, tailor their coupling to the nanotube's mechanical motion, and fundamentally modify their mutual interactions, leading to the realization of new physics in these artificially engineered systems.

