

**Massachusetts Institute of Technology**  
**Department of Physics**

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**Condensed Matter Theory Seminar**

“Parity-controlled Josephson effect on InSb-Al island”

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**Abstract:** Semiconductor nanowires coupled with superconductors are a promising platform to construct Majorana zero modes as well as to build up topological fault-tolerant quantum computers. In semiconductor nanowire/superconductor hybridized island, charging energies are introduced and thus even/odd parity of two Majorana zero modes exhibit as a two-level quantum system, which could work as topological qubits. By embedding such hybridized islands into superconducting circuit, not only can trivial Andreev bound states and Majorana bound states be distinguished via the supercurrent phase of the island, but also topological-qubit readout and operation can be performed by supercurrent measurement. Here, we insert an InSb/Al hybridized island into NbTiN superconducting circuit forming a superconducting interference device (SQUID). In such a device, we find switching current of the InSb/Al island depends on its parity and the corresponding superconducting phase also show parity-dependent behaviours. In this way, the parity of bound state residing in hybridized island can be read out, which paves the way for parity read out of Majorana superconducting qubits.

**12:00pm noon**  
**Tuesday, March 3, 2020**  
**Duboc Seminar Room (4-331)**

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Host: Constantin Schrade