

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

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**Condensed Matter Theory Seminar**

"Quantum Effects of Strong Magnetic Fields in Semimetallic Films and Wires"

**Daniel Bulmash**, Stanford University

**Abstract:** Motivated by Weyl and Dirac semimetals, I will show theoretically that strong magnetic fields can induce novel quasi-lower-dimensional physics in semimetallic films and wires. First, I will propose that a thin film of Weyl or Dirac semimetal with a strong in-plane magnetic field becomes a quasi-two-dimensional Fermi liquid displaying quantum oscillations that depend on field angle in a highly unusual way. I will discuss the utility of these oscillations for probing Fermi arcs. Motivated by our Fermi liquid picture, I will then consider a general semimetal in a wire geometry, retaining the strong orbital field, and add interactions. I will show that even thick wires can display several strongly interacting quasi-one-dimensional phases, including a peculiar pseudospin-triplet analogue of the Luther-Emery phase.

**12:00pm**  
**Thursday, January 12, 2017**  
**Duboc Room (4-331)**