



# Condensed Matter Theory Center Seminar

**Tuesday, February 22**  
**11am-12:30pm**  
**2205 Physics Building**

**Pouyan Ghaemi, Berkeley**

**“Majorana modes at the ends of superconductor vortices in doped topological insulators”**

Recent experiments have observed bulk superconductivity in doped topological insulators. In this talk I discuss that the vortex Majorana zero modes, previously predicted to occur when superconductivity is induced on the surface of topological insulators, survive even in the doped systems with metallic normal states. We find that Majorana zero modes indeed appear but only below a critical doping. The critical doping is associated with a topological phase transition of the vortex line, where it supports gapless excitations along its length. Generally, it is shown that the critical chemical potential depends only on the orientation of the vortex line, and a Berry phase property of the normal state Fermi surface. We use this criterion and available band structures to argue that n-doped Bi<sub>2</sub>Te<sub>3</sub> under pressure supports vortex end Majorana modes, along with other materials candidates. Surprisingly, even topologically trivial band structures in spin orbit materials, when suitably doped, may lead to surface Majorana fermions.

**All are welcome to attend.**

DEPARTMENT OF  
**PHYSICS**  
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