



# Condensed Matter Theory Center Seminar

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Tuesday, January 26  
11:00 AM-12:30 PM  
2202 Physics Building

“Promising new directions in the quest  
for Majorana fermions in condensed  
matter systems”

## Abstract

The experimental realization of Majorana fermions in condensed matter settings poses an important ongoing problem. Interest in Majorana fermions stems from their non-Abelian nature: interchanging two such particles produces not only a phase (as in the case of bosons and fermions), but rather alters nontrivially the quantum state of the system. Apart from revealing something very fundamental about nature, Majorana fermions also hold promise for implementing decoherence-free topological quantum computation. The number of settings predicted to host Majorana fermions has greatly expanded during the past few years. In this talk I will discuss some of these recent developments, and attempt to highlight and contrast the experimental challenges (as seen by a theorist) in several of these proposals. Particular emphasis will be placed on the recent proposal by Sau et al. (arXiv:0907.2239) for realizing Majorana fermions in semiconductor devices. I will describe how the spin-orbit coupling in semiconductors can be suitably engineered to greatly simplify the architecture of such devices and make them more tunable, thus hopefully streamlining the route to their fabrication.