DEPARTMENT OF **PHYSICS**

Condensed Matter Seminar Friday, May 24, 2019 11:00 A.M. 1080 Physics Research Building Smith Seminar Room

Mark Fischer

ETH Zurich



"Superconductivity Without Inversion and Time-reversal Symmetries"

Traditionally, in three dimensions, the only symmetries essential for superconductivity are time-reversal symmetry (TRS) and inversion.

In my talk, I will discuss the situation of superconductivity in two dimensions and how TRS and inversion are not required, and having a combination of either symmetry with a mirror operation on the basal plane is sufficient. By combining energetic and topological arguments, superconducting states can be classified when TRS and inversion are not present, a situation encountered in several experimentally relevant systems, such as transition metal dichalcogenides or a two-dimensional Rashba system, when subject to an applied field, and in superconducting monolayer FeSe with Neel antiferromagnetic order. Energetic arguments suggest interesting superconducting states can arise, such as a unique pure intraband pairing state with Majorana chiral edge states in Neel-ordered FeSe.

Employing topological arguments I will show how with only inversion combined with mirror symmetry present, the superconducting states are generically fully gapped and can have topologically protected chiral Majorana edge modes. In all other cases, there are no chiral Majorana edge states, but the superconducting bulk can have point nodes with associated topologically protected flat-band Majorana edge modes.

This analysis thus provides guidance on the design and search for novel two-dimensional superconductors and superconducting heterostructures.

FACULTY HOST: NANDINI TRIVEDI



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