

**CMP Seminar
Michigan State University**

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Formation of time-reversible helical channels in the quantum Hall regime

Search for non-Abelian excitations is motivated by both scientific curiosity and a practical desire to alleviate decoherence problems of conventional qubits. While current efforts are primarily focused on the discovery of Majorana fermions, it is understood that braiding of Majoranas is not sufficient to perform universal quantum operations. Proposals to realize higher order non-Abelian excitations with denser rotation group require properties not yet demonstrated in real systems. I will discuss development of new materials where quantum Hall ferromagnetic (QHFM) transitions can be induced locally by electrostatic gating. Helical domain walls (h-DW), formed at phase boundaries in the integer quantum Hall effect (QHE) regime, are similar to helical channels at the edges of two-dimensional topological isolators and, coupled to an s-wave superconductor, should support Majorana fermions. In the fractional QHE regime h-DW are predicted to support parafermions and, possibly, Fibonacci fermions, higher order non-Abelian excitations required for the realization of a fully protected topological quantum computer.

**Monday, April 11, 2016
4:10 p.m.
BPS 1400
Prof. Norman Birge - Host**