Condensed Matter Theory Center Seminar

Wednesday, March 7, 11:00-12:30pm
2205 Physics Building

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"Topological Nematic States and Non-Abelian Lattice Dislocations"

Abstract:
An exciting prospect in condensed matter physics is the possibility of realizing fractional quantum Hall (FQH) states in simple lattice models without a large external magnetic field. A fundamental question is whether qualitatively new states can be realized on the lattice as compared with ordinary fractional quantum Hall states. Here we propose new symmetry-enriched topological states, "topological nematic states," which are a dramatic consequence of the interplay between the lattice translation symmetry and topological properties of these fractional Chern insulators. When a partially filled flat band has a Chern number N, it can be mapped to an N-layer quantum Hall system. We find that lattice dislocations can act as wormholes connecting the different layers and effectively change the topology of the space. Lattice dislocations become defects with non-trivial quantum dimension, even when the FQH state being realized is by itself Abelian. Our proposal leads to the possibility of realizing the physics of topologically ordered states on high genus surfaces in the lab even though the sample has only the disk geometry.

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