

DAMOP15-2015-000923

Abstract for an Invited Paper  
for the DAMOP15 Meeting of  
the American Physical Society

### **Topology and localization in dipolar spin systems**

NORMAN YAO, University of California Berkeley

Statistical mechanics is the framework that connects thermodynamics to the microscopic world. It hinges on the assumption of equilibration; when equilibration fails, so does much of our understanding. In this talk, I will discuss the non-equilibrium dynamics of strongly-entangled systems. Owing to their natural isolation, quantum optical systems of atoms, ions and molecules are attractive building blocks for probing such many-body phenomena. In the first half, I will present an overview, covering many-body localization and topological bandstructures. In the second half, I will focus on describing how the  $\nu = 1/2$  fractional Chern insulator arises naturally in a two-dimensional array of driven, dipolar-interacting spins. This topological phase constitutes a fundamentally new state of matter, exhibiting fractionalized excitations, robust chiral edge modes, and lattice-symmetry-protected phase transitions.