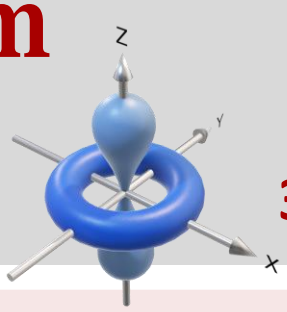
Department of Physics Colloquium

April 17, 2023 **3:00 PM**



Floquet Gauge Pumps and Signatures of Floquet Topology in Josephson Junctions

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Recent theoretical and experimental progress on synthetic quantum systems, such as cold atoms in optical lattices, trapped ions, and solid-state devices subject to periodic potentials in space and time, has ushered in a new era of engineered quantum dynamics out of equilibrium. A central theme of this progress is the exquisite in-situ control allowing the realization and the probing of novel quantum phases of matter. I will review the progress in this field and present our recent work on “Floquet gauge pumps” whereby a dynamically engineered Floquet Hamiltonian is employed to reveal the inherent degeneracy of the ground state in interacting systems. I demonstrate this concept in a one-dimensional XY model with periodically driven couplings and transverse field, a dual model to the celebrated topological superconductor hosting Majorana fermions, with applications to systems of trapped ions. Complementing this view in the solid state is the transport signatures of unpaired Floquet Majorana bound states in the Josephson current of weakly linked, periodically driven topological superconductors. I present a general description of the occupation of the Floquet Majorana modes in the presence of weak coupling to thermal leads analytically and, as a consequence, a “Josephson Floquet sum rule” for driven superconductors.

This colloquium will be held in-person, at SERC 116 unless announced otherwise.