

Chez Pierre

Presents ...

Monday, September 24, 2018

12:00pm Noon

MIT Room 4-331

Chez Pierre Seminar

Mallika Randeria, Princeton University

“Imaging nematic quantum Hall states and their interacting boundary modes”

Two-dimensional quantum Hall systems offer a versatile platform to explore the interplay between topology and symmetry breaking facilitated by Coulomb interactions. In this talk, I discuss the novel phenomena that arise from spontaneous valley ordering of bismuth surface states in a large magnetic field. Specifically, we observe the emergence of a nematic phase which breaks the rotational symmetry of the underlying crystal and a ferroelectric phase that carries an in-plane electric dipole moment. We use a scanning tunneling microscope to identify and directly image the wavefunctions of these broken-symmetry quantum Hall phases. Furthermore, we explore the boundary between distinct nematic domains, which host counter-propagating 1D modes. By changing the number of modes, we realize strikingly different regimes where the boundary is either metallic or insulating, constrained by Coulomb interactions between these 1D modes.

