Chez Pierre

Presents ...

**Monday, February 9, 2026**

**12:00 – 1:00 pm**

**Duboc Room – 4-331**

# Chez Pierre Seminar


## Patrick Ledwith, MIT


# "Strong Correlations in Topological Bands"


**Many of the most remarkable phenomena in condensed matter physics emerge in strongly correlated systems, where electron interactions give rise to exotic phases beyond band theory. While most work on strongly correlated systems has focused on correlations generated by tightly localized orbitals, quantum Hall phases show that strong correlations in topological bands can have a very different nature. In this talk, I will present analytical methods that target the wide landscape of topological bands beyond Landau levels. I will begin by showing how a specific geometric aspect of a bands' wavefunctions leads to phenomena spanning electron fractionalization to layer-skyrmion lattices with chiral collective modes. Next, I will introduce a small parameter motivated by the wavefunctions in twisted bilayer graphene. Its systematic expansion reconciles seemingly incompatible observations of band topology and fluctuating moments and predicts the emergence of arbitrarily light three-particle bound states that are topologically protected from mixing with electrons. I will conclude with future directions, including old questions of Mott physics that a systematic expansion parameter may shed light on.**