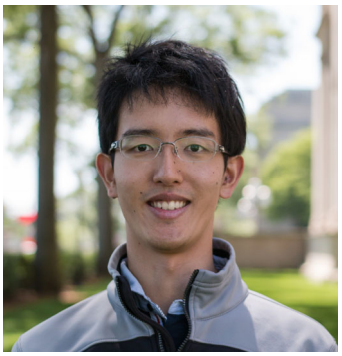
Fundamental Quantum Science Program
Seminar series No.8

●Date & Time : **Monday 6th January 2025 14:00-15:30**
●Venue : # Room309, Frontier Research Laboratory



Dr. Tomohiro Soejima

HARVARD UNIVERSITY
Moore Fellow Postdocs

" Anyon Superconductivity from Topological Criticality in a Hofstadter-Hubbard Model "

The identification of novel mechanisms for superconductivity is a longstanding goal in theoretical physics. In this work, we argue that the combination of repulsive interactions and high magnetic fields can generate electron pairing, phase coherence and superconductivity. Inspired by the large lattice constants of moiré materials, which make large flux per unit cell accessible at laboratory fields, we study the triangular lattice Hofstadter-Hubbard model at one-quarter flux quantum per plaquette, where previous literature has argued that a chiral spin liquid separates a weak-coupling integer quantum Hall phase and a strong-coupling topologically-trivial Mott insulator. We argue that topological superconductivity emerges upon doping in the vicinity of the integer quantum Hall to chiral spin liquid transition. We employ exact diagonalization and density matrix renormalization group methods to examine this theoretical scenario and find that electronic pairing indeed occurs above the half-filled ground states not just near the putative critical point but over a remarkably broad range of coupling strengths on both sides of criticality. On the chiral spin liquid side, our results provide a concrete model realization of the storied mechanism of anyon superconductivity. Our study thus establishes a beyond-BCS mechanism for electron pairing in a well-controlled limit, relying crucially on the interplay between electron correlations and band topology.

・Hosted by : Dr. Naoto Nagaosa
(Fundamental Quantum Science Program)