

Chez Pierre

Presents ...
Monday, May 4, 2026
12:00 – 1:00 pm Duboc
Room – 4-331



Chez Pierre Seminar

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”Real-space Imaging of Quantum Hall Quasiparticles”

Abstract: Quantum Hall systems host emergent quasiparticles with unusual charge, spin, and statistics, such as fractionally charged anyons. Although transport measurements have revealed many of their collective properties, directly visualizing individual quasiparticles and identifying their microscopic origin remain major challenges. Here we use scanning tunneling spectroscopy (STS) to image quantum Hall quasiparticles in high-quality graphene heterostructures. Within incompressible quantum Hall states, we observe spatial variation of Landau level energies arising from electrostatic potentials from charged impurities in graphene and hBN substrate. The impurity Coulomb potential lifts the degeneracy of Landau orbitals, producing discrete energy splittings that reveal individual Landau orbit wavefunctions. In quantum Hall ferromagnetic states, quasiparticles bind to impurity sites and produces distinct spectroscopic signatures. In the fractional quantum Hall regime at filling factor $\nu = 1/3$, we further observe spectra consistent with three fractionally charged quasiparticles bound to a single impurity. These observations establish spectroscopic fingerprints of quantum Hall quasiparticles and provide a pathway toward imaging and manipulating individual anyons in real space.