Chez Pierre

Presents ...

**Monday, April 8, 2024**

**12:00 pm -1:00 pm**

**Duboc Room – 4-331**

# Chez Pierre Seminar


## Phillip Kim, Harvard University


## "Radiofrequency reflectometry measurement of superfluid stiffness of 2D superconductors ".


Superfluid stiffness measurements are a primary means of characterizing the pairing symmetries of superconductors. While penetration depth experiments can be used to extract superfluid stiffness in bulk materials, alternative methods are required for two-dimensional materials with small sample volumes. In this talk, we discuss the radiofrequency reflectometry technique for measuring superconducting kinetic inductance in low-dimensional materials and apply it to 2D superconductors, including twisted multilayer graphene. We study the superfluid stiffness as a function of carrier density and temperature and provide interpretations for possible pairing symmetries. We also explore the measurement of superfluid stiffness as a function of current bias and apply it to twisted multilayer graphene. We show that the combination of current bias and temperature provides more detailed insights into pairing symmetries and allows subtle distinctions between anisotropic gaps, nodal gaps, and disorder-induced behavior. We show how the base-temperature superfluid stiffness evolves as a function of doping and relates to the critical temperature and normal-state resistance in twisted multilayer graphene, revealing its unusual superconducting nature. Our experiments reveal a nodal superconducting phase in most of the superconducting dome, with an interesting distinction between the underdoped and overdoped regimes of the superconducting dome tuned by moire superlattice filling.