

Chez Pierre

Presents ...

Wednesday, November 29, 2023

12:00 noon- 1:00 pm

Duboc Room 4-331



Special Chez Pierre Seminar

Donna Sheng, California State University Northridge

“Emerging D-Wave and Pairing Density Wave Superconductivity by Doping Square-Lattice Mott Insulators”

The Hubbard and t-J models have been demonstrated as exciting platforms for interaction-driven new states of matter. In this talk, I will review recent progress and challenges in identifying ground states of the t-J model in the parameter regime most relevant for high- T_c cuprates. I will present a new phase diagram for the t-J model and demonstrate a unified picture for unconventional superconductivity (SC) based on advanced density matrix renormalization group simulations. The pure t-J model with only the nearest neighbor hopping hosts an exotic SC state where the d-wave and unidirectional pair density wave (PDW) co-exist with spin/charge orders. Furthermore, a small next nearest neighbor hopping suppresses PDW and other orders, leading to a d-wave SC phase in both electron- and hole-doped cuprate model systems. I will present evidence of the development of Cooper pair, its connection to RVB state, and identify the cooperative interplay between electron hoppings and spin exchange interactions, which may provide some new insights into the mechanism of cuprate superconductivity.