Title:
Cooper pairing without superconductivity: Phase fluctuations, Pseudogap state, Superinsulator and Bose Metal

Venue: PHYSICS DEPARTMENT COMMITTEE ROOM

Date and time: 25 May (Wednesday) at 1715 hrs.

Abstract
Cooper pairing, where pairs of electrons with opposite momentum and opposite spins form a singlet bound state is usually associated with the onset of superconductivity. Within the celebrated Bardeen-Cooper-Schrieffer (BCS) theory of superconductivity spin-zero Cooper pairs condense into a phase coherent state, giving rise to the zero resistance. However, an increasing number of experiments suggest that superconductivity is just one of the exotic states made of Cooper pairs. For example, it is now observed that in many superconductors Cooper pairing continues to persist above ***Tc*** even though the zero resistance state is destroyed by phase fluctuations [1]. On the other hand, even at very low temperatures in strongly disordered superconducting films one observes transition to a "superinsulator" under the application of magnetic field, where the conductance instead of resistance appears to vanish at a finite temperature. It is believed that in a superinsulator the Cooper pairs are in an eigenstate of number instead of phase and hence localized. Even more interestingly, when the disorder is not so strong, magnetic-field appears to drive Cooper pairs into a dissipative metallic state, coined as Bose metal. In this talk, I will talk about these various novel states, and show what we believe is the first spectroscopic evidence of Bose metal in an amorphous MoGe thin film [2].

[1] J. Phys.: Condens. Matter 34 083001 (2022)
[2] Phys. Rev. B 105, L140503 (2022)