S N BOSE NATIONAL CENTRE
FOR BASIC SCIENCES
Block JD, Sector III, Salt Lake, Kolkata 700 106

DEPARTMENTAL SEMINAR

Condensed Matter and Materials Physics

03rd December 2025 **4.00 PM** **FERMION**

SPEAKER

Dr. Siddhartha Lal
Professor, Department of Physical Sciences
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"A theoretical physicist, specializing in the field of quantum condensed matter physics."

TITLE OF THE TALK

Mott Criticality as the Confinement Transition of a Pseudogap-Mott Metal

ABSTRACT

The transition between a Fermi liquid metal and the repulsion-induced Mott insulator remains of enduring interest to the quantum matter community. While the existence of this transition is deceptively simple to demonstrate in a model of correlated lattice electrons, the physics behind it has remained somewhat mysterious. Further, doping a Mott insulator reveals new states of quantum matter such as the pseudogap and the strange metal. Based on a new auxiliary model method developed by us, I will present a recent theoretical study that reveals the origin of pseudogap and non-Fermi liquid behaviour within the Mott transition of a particle-hole symmetric extended Hubbard model. I will highlight results that demonstrate the pseudogap as harbouring a novel gapless non-Fermi liquid phase of matter (which we call the Mott metal) that is strongly interacting and long-range entangled. The deconfined holon-doublon excitations of the scale invariant Mott metal undergo a confinement transition in the Mott insulator. This realises Mott's original vision for the repulsion-driven insulator for the very first time.

Reference: Abhirup Mukherjee, S. R. Hassan, Anamitra Mukherjee, N. S. Vidhyadhiraja, A. Taraphder and Siddhartha Lal. arXiv:2507.17201

HOST FACULTY

Prof. Manoranjan Kumar, Professor
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