

**ICTS**

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TATA INSTITUTE OF FUNDAMENTAL RESEARCH

ICTS Synopsis Seminar

- Title** : Interplay of Microscopic symmetries and Entanglement in effective theories of correlated quantum matter
- Speaker** : Ankush Chaubey (ICTS-TIFR, Bengaluru)
- Date** : Friday, 12 September 2025
- Time** : 2:30 PM (IST)
- Abstract** : Traditional framework based on spontaneous symmetry breaking is insufficient to describe novel phases such as quantum spin liquids, topological states, and non-Fermi liquids, which require understanding many-body entanglement and the non-trivial implementation of microscopic symmetries at low energies. This thesis addresses three particular examples of the above interplay. First, we study the superconductivity of $J = 3/2$ electrons on the honeycomb lattice in the context of transition metal tri-halides in presence of strong spin-orbit coupling. We identify a host of novel superconductors that includes gapped, nodal, and pair-density-wave states. Second, we study Z_2 fractionalized fermionic systems, where the projective action of symmetries is crucial to identifying phases arising from frustration among fractionalized degrees of freedom. The interplay of frustration and emergent gauge structures lead to dimer models exhibiting both topologically ordered phases and dimer crystals, resulting in a rich phase diagram. Third, we develop a wave-functional approach for correlated metallic phases that captures quantum fluctuations of the Fermi surface and describes both Fermi liquid and non-Fermi liquid phenomenology. Together, these studies demonstrate the interplay of symmetries and entanglement in correlated quantum matter.
- Venue** : Feynman Lecture Hall
- Zoom link: <https://icts-res-in.zoom.us/j/94868518177?pwd=5LCsLx5XRRE7TVg2onvPWTbG90iOWh.1>
- Meeting ID: 948 6851 8177
- Passcode: 302010