

## ICTS Seminar

**Title** : Symmetry-enforced quantum correlations in noisy and disordered quantum matter

**Speaker** : Subhayan Sahu (Perimeter Institute, Canada)

**Date** : Monday, 06 April 2026

**Time** : 3:30 PM (IST)

**Abstract** : Noisy and disordered quantum many-body systems are naturally described as ensembles, whose universal features are organized by how symmetry manifests: exactly (strong) or on average (weak). I show that strong-weak symmetry interplay enforces quantum correlations in two settings spanning quantum information and condensed-matter physics.

First, I analyze noisy quantum dynamics with strong symmetries. While noise typically suppresses entanglement, strong symmetry can protect it even in highly mixed states. For non-Abelian symmetry such as  $SU(2)$ , the steady state spontaneously breaks strong-to-weak symmetry and exhibits logarithmically large entanglement [1]; I also discuss analogous phenomena in symmetric thermal states [2].

Second, I carry this framework into disordered systems, focusing on critical random Hamiltonians with an average Lieb–Schultz–Mattis anomaly. Local operators fall into two universality classes by their strong and weak symmetry charges, with distinct experimental signatures. I confirm this in the random-singlet Heisenberg chain and disordered free-fermions, uncovering novel critical correlations [3].

[1] "Symmetry enforced entanglement in maximally mixed states" - Moharramipour, Lessa, Wang, Hsieh, SS (PRX Quantum 5, 040336).

[2] "Symmetry enforces entanglement at high temperatures" - Negari, Lessa, SS (ArXiv: 2508.20166)

[3] "Quantum criticality at strong randomness: a lesson from anomaly" - Panahi, SS, Manjunath, Wang (ArXiv: 2602.02648)

**Venue** : Online

Zoom Link: <https://icts-res-in.zoom.us/j/96687785362?pwd=boDGugDuXWLRK40z6o8VJGSfIjVhr.1>

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