Massachusetts Institute of Technology
Department of Physics

Condensed Matter Theory Seminar

"Signatures of information scrambling in the dynamics of the entanglement spectrum"

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Abstract: While it is known that quantum many-body systems that obey the Eigenstate Thermalization Hypothesis reach thermal equilibrium states at long times, their rich behavior at intermediate times has only recently begun to be explored. In particular, it has been shown that the thermalization process is characterized by a set of different timescales, due to the fact that different aspects of quantum information travel at distinct, well-separated speeds. In my talk I will show that signatures of these different velocity scales can be identified in the entanglement spectrum of a local subsystem, a quantity known for its ability to characterize ground states. In particular, I will show that the onset of level repulsion in the evolving entanglement spectrum occurs on different timescales depending on the "entanglement energy", and that this dependence reflects the way operators spread in the system. The time for level repulsion to develop across the entire entanglement spectrum is set by the so-called 'butterfly' velocity and is much shorter than that for full thermalization of the subsystem. We provide an analytical understanding of this phenomenon and show supporting numerical data for both random unitary circuits and a microscopic Hamiltonian.

2:00pm
Wednesday, February 27, 2019
Duboc Room (4-331)

Host: Cecile Repellin