Bar Ilan University , Colloquium

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Universal Dynamics and Topological Order in Many-Body Localized States

Abstract:

It has been argued recently that, through a phenomenon of many-body localization, closed quantum systems subject to sufficiently strong disorder would fail to thermalize. In this talk I will discuss the nature of the dynamics in the localized state. I will show that rather than being a dead state, the localized phase supports highly non trivial modes of quantum dynamics. Most spectacularly, many-body localization can facilitate the existence of topological order in the entire many-body spectrum rather than in the ground state alone. I will demonstrate with a concrete model of a quantum magnet how this leads to protected quantum-bits that retain perfect coherence even when the system is at arbitrarily high energy.