

INDIAN ASSOCIATION FOR THE CULTIVATION OF SCIENCE
2A & 2B, Raja S.C. Mullick Road, Jadavpur, Kolkata-700032, India

Seminar Notice

Org. by
School of Physical Sciences

Title:	Localization from shattering of Hilbert space
Speaker:	Vedika Khemani, Stanford University, USA
Date:	December 19, 2019 (Thursday)
Time:	16:30 Hours
Venue:	C.V.Raman Hall, 2nd Floor, Main Building, IACS
Abstract:	A particularly interesting question in many body quantum dynamics is whether a system can robustly fail to come to equilibrium under its own dynamics. In this talk, I will present a new mechanism for ergodicity breaking whereby a <i>finite</i> number of conservation laws can globally 'shatter' Hilbert space into dynamically disconnected subsectors --- leading to an unexpected dynamics with features reminiscent of both many body localization and quantum scars. A crisp example of this phenomenon is provided by a 'fractonic' model of quantum dynamics in one space dimension constrained to conserve both charge and dipole moment. I show how the Hilbert space of the fractonic model dynamically fractures into disconnected emergent subsectors <i>within</i> a particular charge and dipole symmetry sector. A large number of the emergent subsectors, exponentially many in the size of the system, have dimension one and exhibit strictly localized quantum dynamics—even in the absence of spatial disorder and in the presence of temporal noise. Other emergent subsectors display non-trivial dynamics and may be constructed by embedding finite sized non-trivial blocks into the localized subspace. The key phenomena may be readily observed in near term ultracold atom experiments. In experimental realizations, the conservation laws are approximate rather than exact, so the localization only survives up to a prethermal timescale. I will comment on the implications of these results for recent predictions of Bloch/Stark many-body localization.

All are cordially invited to attend the seminar