

# Condensed Matter Theory Center Seminar



Tuesday, May 9  
11:00 am – 12:15 pm  
2205 John S. Toll Physics Building

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UVA

## “Many-Body Localization: Stability and Instability”

**Abstract:** In recent years, substantial theoretical, experimental, and numerical work has been under way, with a goal of understanding the many-body analog of Anderson localization. Remarkably, even in presence of interactions and at finite energy density, disordered quantum systems can remain permanently out-of-equilibrium. Many-body localization (MBL) can be understood in terms of an extensive set of non-trivial conservation laws. We describe a non-perturbative construction of local integrals of motion (LIOMs) for a weakly interacting spin chain, under a physically reasonable assumption on the statistics of eigenvalues. The analysis elucidates how rare regions with weak disorder (Griffiths regions) have the potential to spoil the MBL phase. We discuss ideas about the situation in higher dimensions, where one can no longer ensure that interactions involving the Griffiths regions are much smaller than the typical energy-level spacing for such regions. We argue that ergodicity is restored in dimension  $d > 1$ , although equilibration should be extremely slow, not unlike the dynamics of glasses.

Host: Dong-Ling Deng

Web: <http://www.physics.umd.edu/cmte/seminars.html>

