MAR15-2014-001857

Abstract for an Invited Paper
for the MAR15 Meeting of
the American Physical Society

Localization protected quantum order

RAHUL NANDKISHORE[1], Princeton University

Many body localization occurs in isolated quantum systems, usually with strong disorder, and is marked by absence of dissipation, absence of thermal equilibration, and a memory of the initial conditions that survives in local observables for arbitrarily long times. The many body localized regime is a non-equilibrium, strongly disordered, non-self averaging regime that presents a new frontier for quantum statistical mechanics. In this talk, I point out that there exists a vast zoo of correlated many body localized states of matter, which may be classified using familiar notions of spontaneous symmetry breaking and topological order. I will point out that in the many body localized regime, spontaneous symmetry breaking can occur even at high energy densities in one dimensional systems, and topological order can occur even without a bulk gap. I will also discuss the phenomenology of imperfectly isolated many body localized systems, which are weakly coupled to a heat bath. I will conclude with a brief discussion of how these phenomena may best be detected in experiments. References: Phys. Rev. B 88, 014206 (2013), Phys. Rev. B 90, 195115 (2014), Phys. Rev. B 90, 064203 (2014)

[1]Collaborators: David Huse, S.L. Sondhi, Arijeet Pal, Vadim Oganesyan, A.C. Potter, Sarang Gopalakrishnan, S. Johri, R.N. Bhatt