I S T AUSTRIA
Institute of Science and Technology

Physical Sciences Seminar

Does a Single Eigenstate of a Hamiltonian Encode the Critical Behaviour of its Finite-Temperature Phase Transition?

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Host: Misha Lemeshko

A central question in the subject of isolated quantum dynamics is whether an isolated quantum system, initially prepared in a pure, out of equilibrium state, will come to thermal equilibrium under its own internal dynamics. Recent experiments have shown that quite generically, isolated quantum systems can and do come to a state of local thermal equilibrium, in which measurements made on subsystems are indistinguishable from those made on a system described by a thermal density matrix. The Eigenstate Thermalization Hypothesis has been proposed as the mechanism for such a phenomenon when the global time evolution is unitary, thus preventing true thermalization of the global quantum state [1]. The striking conclusions of ETH is that individual energy eigenstates of a non-integrable quantum system contain information about the thermodynamics of the system at the relevant energy scale [2]. Our focus concerns what this information reveals about the behaviour of a quantum, nonintegrable system with a second-order phase transition at finite temperature. Previous work has suggested that ETH should also be expected to hold in such systems [3-5], and in our most recent work [6], we argue that if such a system satisfies ETH, then there should exist individual energy eigenstates of this system that can diagnose the existence of its phase transition, and which also contain quantitative information about its critical behaviour, without any knowledge of the original Hamiltonian itself. In this seminar, I will discuss ETH in broad detail, along with our recent work on the subject of extracting critical phenomenon from one energy eigenstate. [1] Srednicki Phys Rev E 50 (1994) 888

[2] Garrison and Grover Phys. Rev. X 8, 021026 (2018)
[3] Fratus and Srednicki Phys. Rev. E 92, 040103 (2015)
[4] Mondaini et al Phys. Rev. E 93, 032104 (2016)
[5] Fratus and Srednicki arXiv:1611.03992 [6] Fratus and Truong arXiv:1810.11092

Tuesday, February 19, 2019 11:00am - 12:30pm

IST Austria Campus Big Seminar room Ground floor / Office Bldg West (I21.EG.101)

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