Luca Delacretaz January 27, 2025 Seminar

Title: Precision tests of thermalization and Planckian bound from hydrodynamic EFT

Abstract:

Interacting systems thermalize. They can do so arbitrarily slowly, but not arbitrarily fast: the time scale necessary for a quantum many-body system to reach local thermal equilibrium has been conjectured to be bounded below by the Planckian time, \hbar/T. I will show that consistency of fluctuating hydrodynamics (or diffusion), which generically emerges at late times, implies that this local equilibration time indeed has a lower bound. The key tool is the derivation of universal intermediate time corrections to diffusion using EFT techniques: when these corrections are large the system cannot have thermalized. For the special case of transport in quantum field theories, combining this argument with causality constraints establishes the conjectured Planckian bound. I will also discuss spin chains, where the knowledge of these universal corrections to diffusion can allow for precision tests of thermalization, and a more accurate identification of a thermalizing system's dissipative universality class with limited numerical resources.