

Condensed Matter Theory Seminar

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Impact of Eigenstate Thermalization on the Route to Equilibrium

The eigenstate thermalization hypothesis (ETH) and the theory of linear response (LRT) are celebrated cornerstones of our understanding of the physics of many-body quantum systems out of equilibrium. While the ETH provides a generic mechanism of thermalization for states arbitrarily far from equilibrium, LRT extends the successful concepts of statistical mechanics to situations close to equilibrium. In our work, we connect these cornerstones to shed light on the route to equilibrium for a class of properly prepared states. We unveil that, if the off-diagonal part of the ETH applies, then the relaxation process can become independent of whether or not a state is close to equilibrium. Moreover, in this case, the dynamics is generated by a single correlation function, i.e., the relaxation function in the context of LRT. Our analytical arguments are illustrated by numerical results for idealized models of random-matrix type and more realistic models of interacting spins on a lattice. Remarkably, our arguments also apply to integrable quantum systems where the diagonal part of the ETH may break down.

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