

What is thermal equilibrium and how do we get there?

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We discuss the foundation of equilibrium statistical mechanics in terms of isolated macroscopic quantum systems. We shall characterize thermal equilibrium based on "typicality" picture and a large-deviation point of view. We then present a simple (and hopefully realistic) condition based on the notion of effective dimension which guarantees that a nonequilibrium initial state evolves into the thermal equilibrium. We shall argue that strong entanglement in energy eigenstates may lead to a necessary large effective dimension. We also discuss a related scenario based on ETH (energy eigenstate thermalization hypothesis).