Relaxation and Thermalization in Many-body Quantum Systems

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This talk addresses three fundamental aspects for the description of isolated many-body quantum systems initially far from equilibrium: (i) the dynamics at short times, (ii) the size of the fluctuations after relaxation, (iii) the conditions to reach thermal equilibrium. It is shown that the relaxation process and the decay of the fluctuations with system size depend on the interplay between the initial state and the Hamiltonian dictating its evolution and may be very similar for both chaotic and integrable systems. The general picture associating chaos with the onset of thermalization is also further elaborated. It is argued that thermalization may not occur in the chaotic regime if the energy of the initial state is close to the edge of the spectrum, and it may occur in integrable systems provided the initial state is sufficiently delocalized.