

## **Many-Body Quantum Reaction Dynamics near the Fusion Barrier**

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Understanding the interactions of weakly bound nuclei and heavy nuclei at energies close to the fusion barrier is a challenging problem, as outcomes are sensitively dependent on the quantum nature of the colliding nuclei. Coupling-enhanced tunneling can result in orders of magnitude enhancement in cross-sections at energies below the average barrier – however, inhibition of fusion is also observed, which is not yet quantitatively understood. The latter may be related to the onset of irreversibility, which can reduce the effects of quantum superposition at energies well-below the barrier. Indeed, nuclear collisions may be a unique probe of the quantum dynamics of many-body systems as they are isolated from external environments. Experiments and theoretical developments in these areas have progressed hand-in-hand, as improved experimental techniques have revealed new facets of reaction dynamics. I will discuss recent experiments which highlight the role of time-scales of processes that are fast enough to compete with fusion.