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Probing and Controlling Many-Body Quantum Dynamics and Chaos

The notions of chaos and order are central to understanding the statistical physics of many-body systems. Thermalization and the spread of quantum information in chaotic many-body dynamics is presently attracting a lot of attention across various fields, ranging from statistical physics via cold atom physics to quantum gravity. Starting from the concept of a "quantum butterfly effect", this includes questions of how many-body quantum interference affects equilibration, more generally non-classicality in ergodic many-particle quantum physics. Vice versa, it is long known how to harness exponential sensitivity to changes in initial conditions for control purposes in classically chaotic systems. We will generalize this concept, using chaos as a resource for steering many-body quantum dynamics. We will address the above phenomena using semiclassical methods based on interfering Feynman paths, thereby bridging the classical and quantum chaotic many-body world.

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