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Many-body delocalization: Keldysh sigma model approach YUNXIANG LIAO, Rice University, ALEX LEVCHENKO, University of Wisconsin-Madison, MATTHEW FOSTER, Rice University — Disordered, interacting quantum systems can exhibit many-body localization (MBL), a remarkable interference phenomenon that can preserve quantum mechanical coherence across a macroscopic sample at finite, even large energy densities. An isolated MBL system is non-ergodic and cannot thermalize, i.e., it cannot serve as its own heat bath and can act as a quantum memory. Although much has been recently clarified about the MBL phase, the nature (or even the existence) of the transition between MBL and the ergodic phases remains unclear, especially in dimensions higher than one. In this work, we reformulate the Keldysh approach to interacting non-linear sigma models for Anderson localization in order to approach the transition from the metallic (ergodic) side in two spatial dimensions. We study a system that can undergo a metal-insulator transition at zero temperature. Our goal is to explore the MBL-ergodic transition across a many-body mobility edge by deforming the quantum critical point to finite temperature. We will discuss the prospects for a dephasing catastrophe that signals the onset of MBL, as encountered by approaching from the ergodic side.

Yunxiang Liao
Rice University

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