

University of Miami, Physics Department Colloquium

Date: Wednesday, Feb 19, 2025
Time: 4:00 pm – 5:00 pm
Location: Wilder Auditorium – Rm 112, Knight Physics Building

Nonequilibrium Quantum Dynamics — From Simulation to Metrology

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Abstract

The development of quantum computers and simulators has opened new avenues for studying nonequilibrium quantum many-body dynamics through quantum simulation. After a brief introduction to the methods, algorithms, and limitations of quantum simulation, I will discuss how quantum simulation has deepened our understanding of quantum many-body chaos, thermalization, and their breakdown, with a focus on ergodicity breaking due to quantum many-body scar states. I will then discuss a recently proposed nonequilibrium quantum phase—strong-to-weak spontaneous symmetry breaking—uncovered through quantum simulations of open systems. Finally, driven by the potential applications of weak ergodicity breaking and quantum simulators in quantum metrology and sensing, I will highlight our recent proposed methods to combat the noise in quantum metrology.

Biography

Dr. Cheng-Ju Lin is currently an RQS (Robust Quantum Simulation) postdoctoral fellow at the University of Maryland. He received his PhD in physics from Caltech and was a postdoctoral researcher at Perimeter Institute before his current position. His research lies at the intersection of quantum information and condensed matter physics, with a focus on quantum simulations of nonequilibrium dynamics, including quantum ergodicity, its breakdown, and nonequilibrium quantum phases. He also has a research interest in the quantum technology applications of these nonequilibrium dynamics in quantum metrology.