**DEPARTMENT OF PHYSICS AND ASTRONOMY**

***(Special Seminar)***

# Correlated Quantum Systems Away From Equilibrium: Driving Quantum Phenomena and Advancing Quantum Technologies

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Correlated quantum many-body systems exhibit remarkable properties emerging from the collective behavior of entangled quantum particles. These phenomena can be probed and manipulated using nonequilibrium methods, such as laser pulses, bias voltages, or magnetic fields, which are central to advancements in quantum information science, nanotechnology, and quantum materials engineering. However, the exponential complexity of correlated degrees of freedom and the impact of nonequilibrium driving on the underlying entanglement structure pose significant theoretical challenges, complicating predictions and the interpretation of experiments.

In this presentation, I will review the principles of correlated quantum systems and recent advances in Quantum Monte Carlo methods for modeling driven microscopic systems, mesoscopic devices, and quantum materials, providing key insights into nonequilibrium correlations across scales. I will also discuss future directions, emphasizing numerical methods for modeling nonequilibrium phenomena, their applications in condensed matter physics, and their role in advancing quantum technologies. Additionally, I will explore the mutual benefits between computational condensed matter physics and quantum information science, including hardware benchmarking and solving strongly correlated systems.

**Wednesday, February 5, at 10:30 AM,**
**Physics Conference Room 204B**

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