



University of Miami, Physics Department Colloquium

Date: Wednesday, Sep 16, 2026
Time: 4:00 pm – 5:00 pm
Location: Physics Library – Rm 335, Knight Physics Building

Unlocking Quantum Potential at the Molecular Scale: Design, Function, and Beyond

Dr. Kun Wang
University of Miami

Abstract

What if a single molecule, the smallest unit of chemical matter, could act as a wire, a diode, a switch, or even a quantum bit? In molecular electronics, we treat individual molecules as perfect, designer quantum materials: chemically tunable, atomically precise, and endlessly versatile. Understanding and controlling their quantum properties is central to building the next generation of miniaturized electronic, spintronic, sensing, and quantum information technologies. But before molecules can be put to work this way, we need to answer a foundational question: how does a molecule's structure dictate the way electrons move through it, and how can we control that quantum-mechanical process by design?

In this colloquium, I will describe how our lab has taken on that challenge. I will begin with a brief introduction to the field and the experimental techniques we use to probe quantum transport through single molecules. I will then discuss new design strategies that have enabled transport phenomena long considered impossible, including ultralong-range quantum transport, air-stable spin topological states, and scalable molecular rectification. I will close by discussing the opportunities and open challenges ahead, and where this work is headed next.

This talk is designed to be accessible to all audiences.

Biography

Dr. Kun Wang is an Assistant Professor of Physics and Chemistry at the University of Miami. He received his Ph.D. in Physics from the University of Georgia in 2016 and completed postdoctoral training at the University of Michigan in 2020. His research focuses on developing advanced experimental and theoretical tools to uncover emerging quantum phenomena in the atomic and molecular scale material systems. His work has resulted in more than 70 peer-reviewed journal publications and three book chapters, including papers in Science, Nature Chemistry, JACS, Angew Chem, and Nano Letters. Dr. Wang is a recipient of the NSF CAREER Award (2026), DOE Early Career Award (2021), and multiple Emerging Investigator recognitions from Nanoscale, Journal of Materials Chemistry, ACS Applied Electronic Materials, etc. His honors also include the University of Miami Provost's Research Award and the College of Arts and Sciences Dean's Excellence Award.