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Ming Hsieh Institute Seminar Series
Ming Hsieh Department of Electrical Engineering

Nano Science & Technology

A Hybrid Platform for Quantum Computing

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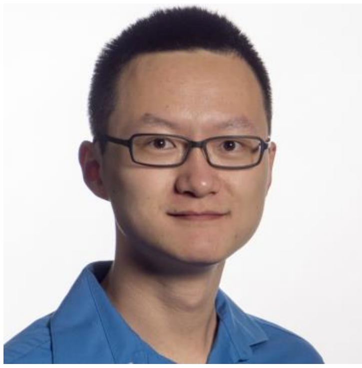
Date: Friday, February 24, 2023
Time: 11:00 am
Location: EEB 248

Abstract: Material defects are ubiquitous. Seven decades ago, defects challenged the new-born semiconductor industry, and today they are one of the major roadblocks for quantum technologies. Solid-state quantum devices, in particular, superconducting qubits, stand out as one of the leading platforms for fault-tolerant quantum computing. However, the performance of superconducting qubits is limited by the presence of various microscopic forms of two-level state (TLS) defects in the amorphous surfaces of the materials that make up the qubits. Previous attempts to address this issue mostly focused on circuit designs that reduced the negative impact of TLS, but advancements have plateaued since around 2012. In this seminar, I will introduce an orthogonal approach that engineers the TLS into a highly useful quantum resource that could positively impact the superconducting qubit's performance. First, I will introduce a hybrid platform which utilizes acoustic bandgap metamaterials to structure phonon modes and significantly enhance the TLS lifetime. Next, I will discuss quantum sensing techniques developed for color centers in diamond, and their applications to this hybrid system to gain further insights into the defect physics. Lastly, I will discuss the prospects of quantum computing based on the hybrid platform.



Biography: Mo Chen is a postdoctoral scholar in the Department of Applied Physics and the Institute for Quantum Information and Matter at the California Institute of Technology. He received his B.S. in Optics from Fudan University in 2012 and his S.M. and Ph.D. in Mechanical Engineering from the Massachusetts Institute of Technology in 2015 and 2020, respectively. His research interests are focused on gaining a fundamental understanding of device physics and applying that knowledge to engineer novel quantum devices, such as qubits, quantum sensors, and quantum memories.

Hosted by Prof. Jianhua (Joshua) Yang, Prof. Han Wang, Prof. Chongwu Zhou, Prof. Stephen Cronin, and Prof. Wei Wu.
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