Dear Colleagues & Students, You are cordially invited to a special seminar

Enabling Scientific Discovery via Advanced Electron Microscopy: From Energy Materials to Quantum Matter

Presented by:

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Professor of Mechanical Engineering and Materials Science at Duke University

Date: **26th August 2026, Wednesday** Time: **11am–12pm**
Venue: **U-Hall AUDITORIUM** (U-Hall Lee Kong Chian Wing, Level 2)

Abstract: Many of the phenomena that govern the functionality of materials, including electrochemical reactions, phase transformations, and emergent quantum states, occur only under specific environmental conditions and involve coupled structural, electronic, and magnetic degrees of freedom. Understanding these phenomena requires experimental approaches that can directly correlate local structure, chemistry, and physical properties under the conditions in which they emerge. Recent advances in electron microscopy are creating unprecedented opportunities to probe these phenomena in situ and at cryogenic temperatures.

This lecture will discuss how emerging electron microscopy and spectroscopy capabilities enable new approaches for investigating functional materials under operating and cryogenic conditions. Examples from energy storage and quantum materials will demonstrate how multimodal electron microscopy directly correlates atomic structure with materials functionality, revealing interfacial degradation and guiding interface redesign in solid-state batteries, resolving phase competition between charge-density-wave and superconducting states, and uncovering how twistonic heterostructures can tailor spin ordering and emergent quantum phenomena in 2D materials. Looking ahead, advances in imaging and spectroscopy, AI-assisted data acquisition and analysis, and next-generation event-based detectors are paving the way toward autonomous, multimodal electron microscopy that can quantitatively probe dynamic materials behavior and accelerate the discovery and design of complex functional materials.

Biography: Miaofang Chi is a Corporate Fellow at Oak Ridge National Laboratory (ORNL) and Professor of Mechanical Engineering and Materials Science at Duke University. She is internationally recognized for her contributions to the development and application of advanced electron microscopy for materials research. Her research integrates the development of cutting-edge electron microscopy and spectroscopy techniques with fundamental studies of energy, catalytic, magnetic, and quantum materials to reveal atomic-scale structure–property relationships. She currently leads efforts at ORNL to develop and apply cryogenic scanning transmission electron microscopy (STEM) and monochromated electron energy-loss spectroscopy (EELS) for investigating quantum materials at atomic resolution.

Dr. Chi is a Fellow of the Materials Research Society (MRS), the Microscopy Society of America (MSA), and the Royal Society of Chemistry (RSC). Her honors include the Materials Research Society Innovation in Materials Characterization Award, the Microscopy Society of America Burton Medal, the Microanalysis Society Kurt F. J. Heinrich Award, and the U.S. Department of Energy Office of Basic Energy Sciences Early Career Award.

Looking forward to seeing all of you! (Seminar hosted by A/Prof He Qian)