SEMINAR NOTICE

Department of Physics and Engineering Physics
University of Saskatchewan

SPEAKER: Dr. Robert Green
Dept of Physics and Engineering Physics

TOPIC*:* *Unlocking Correlated Quantum Materials for Next-Generation Technologies*

DATE: Tuesday March 31st, 2026

TIME: 3:30-4:30 p.m.

Advances in materials have repeatedly driven technological revolutions, with the transistor—enabled by early developments in quantum mechanics and materials processing—standing as a defining example of how fundamental physics can reshape society. Today, attention is turning toward a new class of materials in which strong electron–electron interactions give rise to emergent phenomena, including unconventional magnetism, superconductivity, and complex charge dynamics. These correlated quantum materials offer exciting opportunities for next-generation technologies, but their behavior often lies beyond the reach of conventional theoretical and experimental approaches.

In this seminar, I will introduce the central role of electron correlations in determining material properties, highlighting both their transformative potential and the challenges they pose for predictive understanding. I will then outline how our group combines computational quantum many-body methods with synchrotron-based x-ray spectroscopy and scattering techniques to probe and model these systems at a microscopic level. Finally, I will present selected case studies from our recent work, including investigations of transition metal oxides relevant to high-capacity lithium-ion batteries and materials for catalytic energy conversion such as water splitting. Together, these examples illustrate how a coordinated theoretical–experimental approach can provide new insight into complex materials and guide the development of future technologies.