SEMINAR NOTICE

Department of Physics and Engineering Physics
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SPEAKER: Patrick Braun, PhD Candidate
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TOPIC*:* ***Analysis of State-Dependent Fluorescence Effects in Multivalent Manganese Oxides and Determination of Electronic Structure***

DATE: Tuesday December 6th

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

PLACE: ***Physics 103***

Abstract:

In recent years, the advancement of technology has led to a significant development of consumer devices such as smart phones, computers, and televisions among others. This new development of highly-capable, faster, and always better technology likely had the most remarkable impact on mankind during the last century. Its origin dates back to the discovery of quantum mechanics and the transistor. To no surprise, modern material science is devoted to research new and enhanced materials for use in existing and future technology applications. Finding and tailoring materials with unique properties will ultimately allow to discover and fabricate new devices capable of solving more complex problems such as the behaviour of solids when considering full interactions of all atoms in the material. Materials exhibiting electronic structures with a partially occupied 3d shell are affected by strong repulsive electron-electron interactions as orbitals are highly localized, causing a wide range of fascinating phenomena and useful emergent properties governing the electric transport in the material. Therefore, the physics of this material class makes it promising for advanced technology applications such as anode material for batteries and supercapacitors. X-ray spectroscopy alongside ligand field multiplet calculations are employed to study manganese, a multivalent element that can exhibit different stable valence states. We present x-ray absorption, non-resonant x-ray emission, and resonant inelastic x-ray scattering spectra for manganese oxides at the Mn L2,3 edges and investigate their spectral shape with multiplet ligand-field calculations. The collected spectra are sensitive to valence state, local environment, and hybridization. Least-squares optimization allows us to determine the electronic structure of the studied compounds. In this study we shed further light on the comparison of different x-ray absorption techniques and attempt to analyze state-dependent fluorescence probabilities due to the strong interdependence of the manganese fluorescence yield and correlation effects.