UNL Department of Physics and Astronomy presents:

Toward symmetry-resolved visualization of quantum materials

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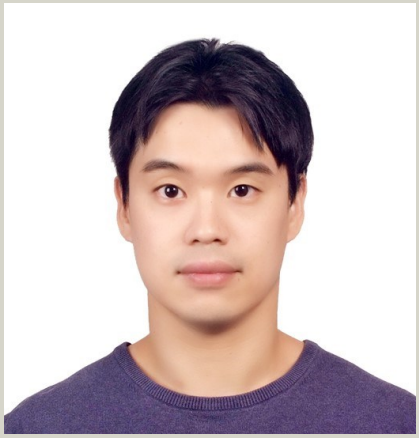

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ABSTRACT

In the era of quantum materials, the understanding of exotic quantum phenomena has been made mainly based on the two pillars of topology of electronic wavefunction and symmetries hosted by material systems. In particular, the role of symmetry has been a beacon for understanding the nature of correlated emergent phenomena, and now shifting to a critical knob to realize a novel quantum state of matter. In this colloquium, I will introduce recent efforts to visualize symmetries of quantum materials with a particular focus on second order nonlinear optics. The experimental capability featuring its high sensitivity to crystallographic and magnetic symmetries will be discussed with two examples of topologically nontrivial systems: (i) a magnetic Weyl semimetal, $Co_3Sn_2S_2$, and (ii) a helical magnet, $Cr_{1/3}NbS_2$. More specifically, I will explain how symmetry information is manifested in rotational anisotropy nonlinear harmonic generation, allowing the detection and visualization of unprecedented symmetry-breaking magnetic orders. Finally, I will briefly describe future research directions exploiting a multimodal probe to comprehensively explore both topology and symmetry in quantum materials.