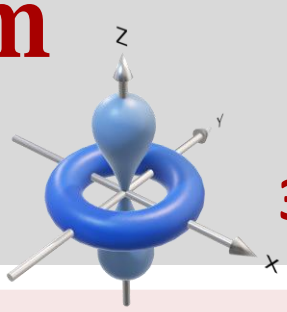
Department of Physics Colloquium

January 30, 2023 **3:00 PM**



New pathways for control of structure, symmetry, and functionality in condensed matter

Dr. Guru Khalsa

Cornell University

The interplay between structure, symmetry, and function is a fundamental and long-standing paradigm in condensed matter and materials physics; dictating how we access physical properties, revealing hidden order, and guiding the search for new physical phenomenon. The recent development of flexible, intense mid- and far-infrared light sources has provided a new pathway for structural control of crystalline materials on picosecond (10^{-12} seconds) timescales. The striking experimental observations of light-induced ferroelectricity, magnetism, metallicity, and superconductivity – dramatic changes to some of the most well-studied and well-understood properties in condensed phases of matter – have forced our community to revisit light-matter interactions in the infrared.

In this talk, I will discuss our theoretical perspective on the far-from-equilibrium design of functionality of condensed matter systems enabled by the direct excitation of phonons – the principle vibrations of the crystal lattice – with modern light sources. I will show that structural distortions of arbitrary symmetry and of arbitrary length scale can be induced in crystals, giving a new perspective on the control of functionality and new routes for far-from-equilibrium materials design on ultrafast timescales.

This colloquium will be held in-person, at SERC 116 unless announced otherwise.