

Abstract

Quantum materials, whose quantum properties dominate their behavior, have recently taken center stage in condensed matter physics research, providing a wealth of new physical phenomena as well as the promise of next generation technologies that leverage those phenomena. In particular, quantum information technologies stand to make great strides as new materials with unique properties are discovered. In this talk, I will introduce the field of quantum materials with emphasis on quasiparticles as transducers in hybrid quantum information schemes and how ultrafast spectroscopy can help unravel their couplings. I will then present recent results from my postdoctoral research which reveal unprecedented control over exciton-magnon and magnon-magnon coupling in the layered antiferromagnet CrSBr, which opens avenues for magnons as transducers in hybrid quantum information systems as well as efficient optical modulators. I will finish with a brief overview of the proposed plans for my future research, which will focus on the measurement and control of quantum materials with advanced ultrafast spectroscopies such as multidimensional coherent spectroscopies.