



UNIVERSITY OF MIAMI  
COLLEGE of  
ARTS & SCIENCES

## University of Miami, Physics Department Colloquium

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**Date:** Wednesday, Feb 14, 2024  
**Time:** 4:00 pm – 5:00 pm  
**Location:** Wilder Auditorium – Rm 112, Knight Physics Building

### CrSBr: A New Platform for Opto-Magnonics

**Dr. Geoffrey Diederich**

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#### **Abstract**

The interaction between distinct excitations in solids is of both fundamental interest and technological importance. One such interaction is the coupling between an exciton, a Coulomb bound electron-hole pair, and a magnon, a collective spin excitation. The recent emergence of van der Waals magnetic semiconductors provides a platform for exploring these exciton-magnon interactions and their fundamental properties, such as strong correlation, as well as their photo-spintronic and quantum transduction applications. In this talk, I will present a new layered magnetic semiconductor CrSBr and demonstrate precise control of its coherent exciton-magnon interactions. I will show how varying the direction of an applied magnetic field relative to the crystal axes breaks the rotational symmetry of the magnetic system. Thereby, one can tune not only the exciton coupling to the bright magnon, but also to an optically dark mode via magnon-magnon hybridization. Further, I will show modulation of the exciton-magnon coupling and the associated magnon dispersion curves through the application of uniaxial strain. Finally, I will present new results that demonstrate our ability to measure and tune the nonlinear response of the magnonic system. The work I will present shows unprecedented control of the opto-mechanical-magnonic coupling, and a step towards the predictable and controllable implementation of hybrid quantum magnonics.