PHYSICS
COLORADO STATE UNIVERSITY

# CSU Condensed Matter Physics Seminar

## Spin Transport in Thin Insulating Antiferromagnets

**Andrew Kent**

**Center for Quantum Phenomena,**

**Department of Physics, New York University**

March 19, 2019 at 10 a.m.
Lory Student Center 376

## Abstract

Thin insulating antiferromagnetic layers have been demonstrated to transport spin-angular momentum efficiently into adjacent heavy metal layers. In this talk I will present several of our recent spin-transport experiments on thin ($t$=2 to 10 nm thick) NiO films, both polycrystalline and epitaxial NiO layers. In one series of experiments, ferromagnetic resonance is excited in a YIG/$t$ NiO/Pt trilayer with a microwave frequency magnetic field and spin-transport detected with the inverse spin-Hall effect (ISHE) in the Pt layer [1]. The ISHE signal is found to decay exponentially with NiO thickness with a characteristic decay length of 4 nm. In another set of experiments, we studied the temperature dependence of thermally induced spin transport through measurements of the spin-Seebeck effect [2], both on similar samples, YIG/$t$ NiO/Pt, and spin-valve like samples consisting of NiO inserted between ferrimagnetic layers, i.e. YIG/$t$ NiO/YIG. We correlate the transport results with x-ray studies in which x-ray magnetic linear and circular dichroism is used to determine the ordering and blocking temperature of the NiO films. A peak in the spin-Seebeck response is found near the NiO blocking temperature, suggesting that fluctuations in the antiferromagnetic order are efficient in transporting spin-angular momentum.

These studies were done in collaboration with Mingzhong Wu's group at CSU and done by Egecan Cogulu, Eason Chen, Debangsu Roy, and NYU with Hendrik Ohldag at the ALS.

PHYSICS

COLORADO STATE UNIVERSITY

Andrew Kent is a Professor of Physics and Director of the Center for Quantum Phenomena at New York University. He received his Ph.D. from Stanford University in 1988 and conducted post-doctoral research at the University of Geneva in Switzerland and the IBM T. J. Watson Research Center. His research interests are in the physics of magnetic nanostructures, nanomagnetic devices and magnetic information storage. Kent has expertise in thin film growth and characterization, device nanofabrication and high frequency measurements including, ferromagnetic resonance, electron paramagnetic resonance and time-resolved studies of magnetization dynamics. In 2007 he founded Spin-Transfer Technologies, a startup company developing spin torque magnetic random access memory devices. The company is based in Fremont, California and has raised over $150 million in funding from Allied Minds and Invesco Asset Management

Kent is a fellow of the American Physical Society (APS), has served as chair of APS topical group on magnetism and its applications (GMAG) and is an advisory board member of the Committee of Concerned Scientists. He served on the executive committee of the APS Division of Condensed Matter Physics (DCMP) and Program Co-Chair of the 58th Annual Magnetism and Magnetic Materials conference (MMM 2013). Kent accomplishments were recognized by an Honorary Doctorate from the University of Lorraine ("Docteur Honoris Causa" de l'Universite de Lorraine), in September 2013. He received the French Jean d'Alembert Research Fellowship in 2017.