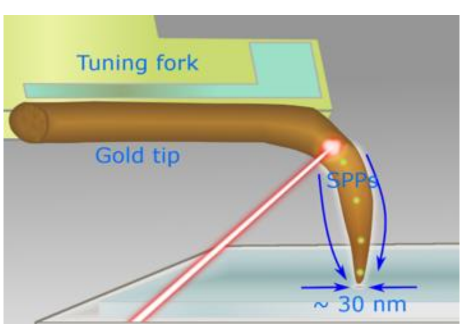
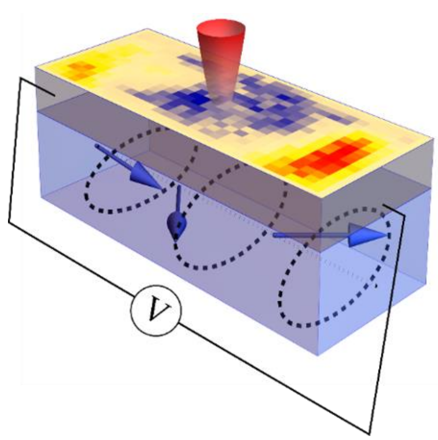
Speaker: **Jason Bartell**

Sensitive imaging of magnetization structure and dynamics using picosecond heating

Abstract: Advanced magnetic microscopies are key to advancing our understanding and application of novel magnetic phenomenon such as skyrmions, spinwaves, and domain walls. However, due to the diffraction-limit of light, achieving the 10 – 100 nanometer spatial resolution and 10 – 100 picosecond temporal resolution required to image these phenomenon is beyond the reach of table-top techniques. To circumvent the diffraction limit, we have developed a stroboscopic magnetic microscopy that uses picosecond thermal gradients to transduce magnetization into a voltage. In magnetic metals, this is accomplished via the anomalous Nernst effect and in ferromagnetic insulator/heavy metal bilayers the signal is due to the longitudinal spin Seebeck effect detected via the inverse spin Hall effect. In the far-field, we demonstrate that magneto-thermal microscopy is capable of time resolution in the range of 10-100 ps, spatial resolution of less than a micron, and sensitivity to the in-plane moment of 0.1-0.3°/√Hz. This sensitivity and spatiotemporal resolution has enabled phase-sensitive ferromagnetic resonance imaging revealing spatial variation of resonance field, amplitude, phase, and linewidth in ultrathin YIG/Pt bilayers. In spin Hall devices, we have used magneto-thermal imaging to measure spatial variation of the magnetic torque vector which suggests all-electrical FMR measurements of the spin Hall efficiency can produce a systematic error as large as 30%. To conclude, I will discuss our most recent efforts to extend magneto-thermal microscopy to the nanoscale using nanofocused light from a plasmonic tip. We demonstrate, both theoretically and experimentally, optical near-field heating as an effective route to a tabletop spatiotemporal magnetic microscope with nanoscale resolution.

Biography: Jason Bartell is an applied physics Ph.D student working in the Fuchs group at Cornell University. He graduated with a B.S. in physics from Penn State in 2011.





Cornell University
School of Electrical and Computer Engineering

Date: March 23, 2018 (Friday)

Time:
Refreshment at 12:00pm
Talk begins at 12:15 pm

Place: Phillips 233

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