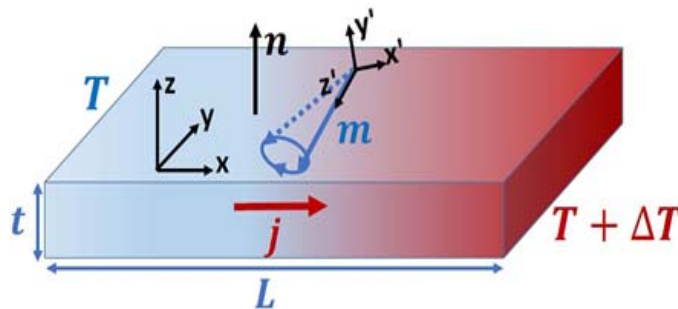


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*Magnetization Switching and Energy Manipulation in
 Dzyaloshinskii-Moriya Magnets*



Single domain magnetization dynamics induced by microwave field pumps magnon current by virtue of Dzyaloshinskii-Moriya interactions.

Pure spin currents in the form of magnon flow have attracted considerable attention recently because they can transfer signals [1] and even realize magnonic logic circuits with low dissipation and without generation of Oersted fields [2]. On the other hand, magnons can exhibit similar phenomena as those exhibited by electrons (e.g., spin-transfer torque on magnetic textures in ferromagnets and antiferromagnets, such as domain walls [3,4] and skyrmions [5], such as domain walls [3,4] and skyrmions [5], Hall effect, and even topologically protected edge states). Dzyaloshinskii-Moriya interactions are associated with spin-orbit interactions in systems with broken inversion symmetry and magnons can be influenced by Dzyaloshinskii-Moriya interactions in a way similar to how electrons are influenced by spin-orbit interactions (see Figure). Thus, Dzyaloshinskii-Moriya interactions should result in a single-domain magnetization switching by a temperature gradient and magnonic spin-current pumping – effects which are analogs of spin orbit torques and charge pumping by the inverse spin Hall effect. Studies of such effects will pave the way for the creation of novel devices capable of switching magnetization by magnonic currents, and devices in which magnon/energy currents can be controlled by magnetization dynamics.

- 1) Y. Kajiwara, K. Harii, S. Takahashi, J. Ohe, K. Uchida, M. Mizuguchi, H. Umezawa, H. Kawai, K. Ando, K. Takanashi, et al., *Nature* **464**, 262 (2010).
- 2) Khitun and K. L. Wang, *J. Appl. Phys.* **110**, 034306 (2011).
- 3) E. G. Tveten, A. Qaiumzadeh, and A. Brataas, *Phys. Rev. Lett.* **112**, 147204 (2014).
- 4) A. Kovalev and Y. Tserkovnyak, *EPL (Europhysics Letters)* **97**, 67002 (2012).
- 5) A. Kovalev, *Phys. Rev. B* **89**, 241101 (2014).

Wednesday, September 24, 4:00 pm
Room 136 Jorgensen Hall

3:45 pm—Refreshments served in Jorgensen Atrium area

Host:
Prof. David Sellmyer
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Physics & Astronomy

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