

## Magnetization textures and processes

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In this lecture I will introduce the various magnetic states of magnetic materials, and their magnetization processes. These generally occur at a length scale larger than lattice cells, making an atomic and quantum description not practical, and often useless. Magnetization textures is an important aspect of magnetism, as most functional effects of magnetic materials rely on them and their control under some stimuli.

### Lecture topics:

1. Magnetic length scales and magnetization states
  - a. Magnetic energies in competition
  - b. Domains, domain walls, vortices and other spin textures
2. Quasistatic magnetization reversal
  - a. Coherent rotation (Stoner-Wohlfarth)
  - b. Nucleation-propagation mechanisms
  - c. What do we learn from hysteresis loops?
3. Precessional magnetization dynamics
  - a. Landau Lifshitz Gilbert equation: precession and relaxation
  - b. Spin-torques and other stimuli
  - c. Precessional switching
  - d. Domain-wall motion
  - e. Vortex and skyrmion motion

### Recommended reading:

- [1] A. Hubert et R. Schäfer, *Magnetic Domains*, Springer, 1998.
- [2] R. Skomski, *Simple models of magnetism*, Oxford, (2008).
- [3] A. P. Guimarães, *Principles of Nanomagnetism*, Springer, (2009).