

On-line SPICE-SPIN+X Seminars



Wednesday, 31st March 2021, 15:00 (German Time)

The seminar will be via Zoom ([Meeting ID: 896 8121 3370](#)) and live streamed in the SPICE YouTube Channel.

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Dynamic generation of scalar chirality and topological Hall effect in spiral magnets



The concept of scalar chirality (SS) was introduced in the 1990s by Kubo and others, as a measure of noncoplanarity of a spin texture. In a triangle, it is defined simply as the triple product of the three spins.

In a continuous medium, it can be generalized as a triple product of the magnetization and its two spatial derivatives. It has generated considerable interest in the last few years, after it was shown that SS generates a nontrivial contribution to the Hall effect, dubbed Topological Hall Effect (THE). Intriguingly, a THE was discovered in a few materials where the known crystal and magnetic structure could not afford SS. Hidden phases of unknown nature, not detected by usual means, were hypothesized to explain these observations.

In this talk, I will present a theory that explains how SS can emerge in an external field in a particular class of non-chiral textures, in a manner similar to emergence of nematic order without underlying Magnetic order in Fe-based superconductors. The essence of the theory is extremely basic: we show that while single-spiral states do not support SS, in some cases a single magnon can generate SS, which then couples with the external magnetic field. While both positive and negative SS are generated, thermodynamically one sign is preferred. The resulting THE amplitude has a simple temperature and magnetic field dependence, confirmed by the experiment. I will discuss three examples, of which two are predicted to have such fluctuation-driven THE (and they do), and the third is not (and it doesn't).