

**NANO-SEMINÁŘ**  
**a seminář projektu NANOCENT**  
**čtvrtek, 23. 2. 2023, 14:00,**  
**posluchárna F2, MFF UK, Ke Karlovu 5**

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## **Study of novel magnetically ordered materials**

Magnetically ordered materials were so far categorized by the arrangement of their magnetic moments into two main groups: ferromagnets with magnetic moments aligned parallel and with a resulting net magnetization, and antiferromagnets with magnetic moments aligned antiparallel, fully compensating each other. While already Néel has noted that "Effects in antiferromagnets depending on the square of the spontaneous magnetisation should show the same variation as in ferromagnetic substances" [1], many other properties of systems with compensated moments remained more elusive.

Traditionally, spin splitting in the band structure and related effects were thought to be limited to ferromagnets only, and occasionally reported contradictory observations were considered anomalous exceptions. Recently, however, it was discovered that all these anomalies can be linked to a new class of materials in which the band degeneracy is cancelled by crystallographic symmetry in spite of the compensated magnetic order [2]. In the light of this discovery the categorization of magnetic materials needs revisiting and the term altermagnetism was coined [3].

In this talk, we will introduce the concept of altermagnetism, its origins, and material candidates as well as the experimental observations of altermagnetic behaviour. These range from the detection of the spontaneous anomalous Hall effect [4, 5] to the generation of the spin-polarized electrical currents [6] in compensated magnetic thin films. Eventually, we shall focus on specific altermagnetic materials and transport experiments we aim to perform.

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### References

- [1] Louis Néel, Nobel Lecture (1970) <https://www.nobelprize.org/uploads/2018/06/neel-lecture.pdf>
- [2] L. Šmejkal, R. González-Hernández, T. Jungwirth, and J. Sinova. Sci. Adv. 6, eaaz8809 (2020).
- [3] L. Šmejkal, J. Sinova, and T. Jungwirth. Phys. Rev. X 12, 031042 (2022).
- [4] H. Reichlova, D. Kriegner, et al., arXiv:2012.15651.
- [5] R. D. Gonzalez-Betancourt et al. Phys. Rev. Lett. 130.3, 036702 (2023).
- [6] A. Bose et al. Nat. Electron. 5, 267 (2022).