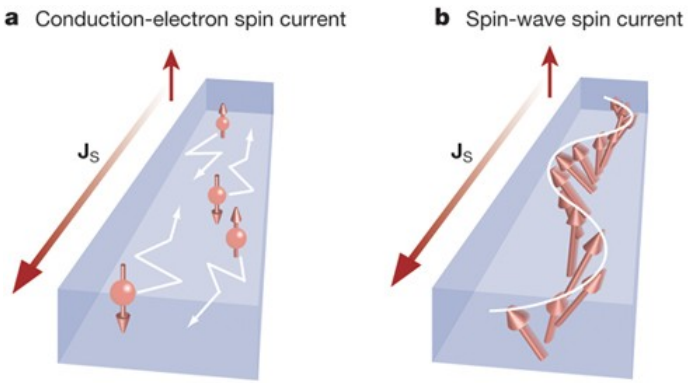
Magnonics as a promising concept for future computing?

Supervisor:	RNDr. Eva Schmoranzerová, Ph.D. (eva.schm@karlov.mff.cuni.cz)
	Department of chemical physics and optics, MFF UK
Advisor:	RNDr. Helena Reichlová, Ph.D. (reichlh@fzu.cz)
	Institute of Physics, CAS

The increasing energy demand of the information technologies is often listed between the major challenges for our society and various concepts of more sustainable electronics are very actively studied. Spintronics [1], for example, exploits also the quantum property of electron – its spins – to reduce energy costs and it already found its application in computer memories. In these spintronic memories, the moving electrons are carrying the spin (illustration on Fig. 1a). The motion of electrons is, however, also one of the major energy consuming processes. In the last decade an alternative concept is very actively discussed – it is based on transporting the spin momentum is transported in a form of a wave (illustration on Fig. 1b) and no moving electrons are required. Such a spin wave is called magnon and it gave the research directions its name – magnonics [2].

In the student project, we will develop a device design and measurement algorithm to generate and detect magnons by all electrical means [3]. We will test the design first on a well-known ferromagnetic material and if successful we can use the same design for the emerging class of materials with compensated magnetic moments. The student will work at the Institute of Physics of the Czech Academy of Sciences and he/she will have opportunity to consult the project with the leading experts in the field of magnonics within the international network of the supervisor and the advisor.



Obrázek 1: Schematic illustration of the conduction-electron spin current (a) and spin-wave spin current (b) [4].

Bibliography

[1] https://www.sciencecafe.cz/zaznamy/video/spintronika/

[2] Barman et al. *J. Phys.: Condens. Matter* 33 413001 (2021), doi.org/10.1088/1361-648X/abec1a

[3] Schlitz et al. *Phys. Rev. Lett.* 126, 257201 (2021), doi.org/10.1103/PhysRevLett.126.257201

[4] Kajiwara et al. *Nature* 464, 262–266 (2010), www.nature.com/articles/nature08876