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Femtosecond opto-magnetism:  
A key to novel mechanisms of spin reorientation

The demand for the ever-increasing speed of information storage and manipulation has triggered an intense search for ways to control the magnetization of a medium by means other than magnetic fields. The control of magnetism by light is one of the promising approaches to this problem, because such methods may access timescales of a picosecond or less [1]. Can light directly and nonthermally magnetize a medium? In my lecture I will demonstrate that the effect of an ultrashort circularly polarized optical pulse on a magnetic system is equivalent to the effect of an equally short magnetic field pulse with strengths up to few Tesla [2-5]. Using such short pulses of effective magnetic field we were able to discover novel mechanisms of spin-reorientation [6,7]. Finally, I will demonstrate that using two single subpicosecond laser pulses it is possible to do both all-optical recording and reading on an ultrashort time scale. The magnetic information was recorded by a subpicosecond laser pulse and read-out by a similarly short pulse after 30 ps, which is the fastest "write-read" event demonstrated for magnetic recording medium so far. [6].


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