# Spin Waves, Magnons and Improbable Adventures in Wave Dynamics

**Alexy Karenowska**

Electronic spin waves are microwave-frequency magnetic excitations which propagate in magnetically ordered materials, their quanta are known as magnons. The emerging field of magnonics —the study of spin waves in magnetic thin films and nanostructures— provides a valuable window into the underlying mechanisms of static and dynamic magnetism and is increasingly widely recognised as an area of science with much to contribute to the technological aspirations of spintronics [1].

In this talk I hope to bring into focus the value of spin-wave systems both as adventure playgrounds for the spin-physicist, and as unique theatres for the exploration of general wave and quasi-particle dynamics. I shall begin with a general introduction to spin waves and magnonics, move on to explore some recent experimental results in the area of magnonic crystals (spin-wave artificial crystals [2, 3]), and finish by discussing future directions in fundamental and applied spin-wave science.

[1] A. A. Serga, A. V. Chumak and B. Hillebrands, YIG magnonics, J. Phys. D: Appl. Phys., 43 264002, (2010).

[2] A. D. Karenowska, V. S. Tiberkevich, A. V. Chumak, A. A. Serga, J. F. Gregg, A. N. Slavin and B. Hillebrands, Oscillatory energy exchange between wave modes coupled by a dynamic artificial crystal, Phys. Rev. Lett., forthcoming, (2011).

[3] A. V. Chumak, V. S. Tiberkevich, A. D. Karenowska, A. A. Serga, J. F. Gregg, A. N. Slavin and B. Hillebrands, All-linear time reversal by a dynamic magnonic crystal, Nature Commun., 1 141, (2010).

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