

*"Giant magnetoelastic coupling and tricritical metamagnetism in Mn-based Pnma compounds"*

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Large magnetoelastic interactions are crucial to a range of new, technological materials in which multiple order parameters exist simultaneously and are coupled. These include ferromagnetic shape memory materials, multiferroics and magnetic refrigerant materials. Despite their relevance, atomically-resolved observations of large magneto-elastic coupling within a given crystal structure are very rare.

I will present our recent high-resolution neutron diffraction studies of CoMnSi, a metallic helical metamagnet in which the thermal evolution of the helimagnetic state is accompanied by a change in inter-atomic distances of up to 2%, the largest ever found in a metallic magnet [1]. Our observations lead us to a picture of competing exchange interactions at particular values of nearest-neighbour Mn-Mn separation. This subtle exchange balance is probably the key to metamagnetism in a wide range of Mn-based Pnma compounds and should enable the synthesis of new materials with tailored metamagnetic transitions [2].

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[1] A. Barcza et al., Phys. Rev. Lett., 104 247202 (2010).

[2] Z. Gercsi et al., Phys. Rev. B, 81 224426 (2010).