Press Release

Cambridge scientists have shown that is possible to control the effective magnetization, as well as its direction, in a ferromagnet

The study by Professor Mark Blamire of the University of Cambridge and colleagues from Imperial College London and the University of Leeds, published this week in Physical Review Letters, shows for the that first time that so-called giant magnetoresistance (GMR) can be made to vary depending on the amount of current passed through a device.

GMR, which was discovered in the 1980s, is the very large change in resistance in materials made up of very thin alternating layers of various metallic elements. Professors Peter Grünberg and Albert Fert were awarded the Nobel Prize in Physics in 2007 for the discovery of GMR, in part because the discovery of GMR opened up a new field of spin electronics (spintronics), which physicists believe could revolutionise computers in coming decades.

In the Cambridge experiment, thin films containing three magnetic layers were patterned into nanometre scale devices so that large current densities could be passed through the device. The relative magnetic direction of the magnetic layers could be controlled by changing the magnetic field and so it was possible to observe the GMR effect. The new science which emerged from the experiment is that the difference in resistance between the various magnetic states is dependent on the size and direction of the applied current which implies that the effective magnetization of one of the magnetic layers is controlled by the current.

According to Professor Blamire: "We are reaching the limits of how small we can make semiconductors, so we need new technologies to allow computers/electronic devices to become smaller, faster and cheaper. Spintronics could be one of these technologies, so our finding helps open up this avenue by enabling spin amplification."

- Ends –

Contact details.

A. Aziz, O. P. Wessely, M. Ali, D. M. Edwards, C. H. Marrows, B. J. Hickey, and M. G. Blamire, 'Nonlinear Giant Magnetoresistance in Dual Spin Valves' is published online in Physical Letters Review on XXXX.

Spintronics, or spin electronics, refers to the use of the spin of the electron in addition to its charge in storing and processing data in electronic circuits. Spintronics potentially offers greater speed, lower power consumption and higher storage density than semiconductor equivalents.

The work was funded by the UK Engineering and Physical Sciences Research Council.