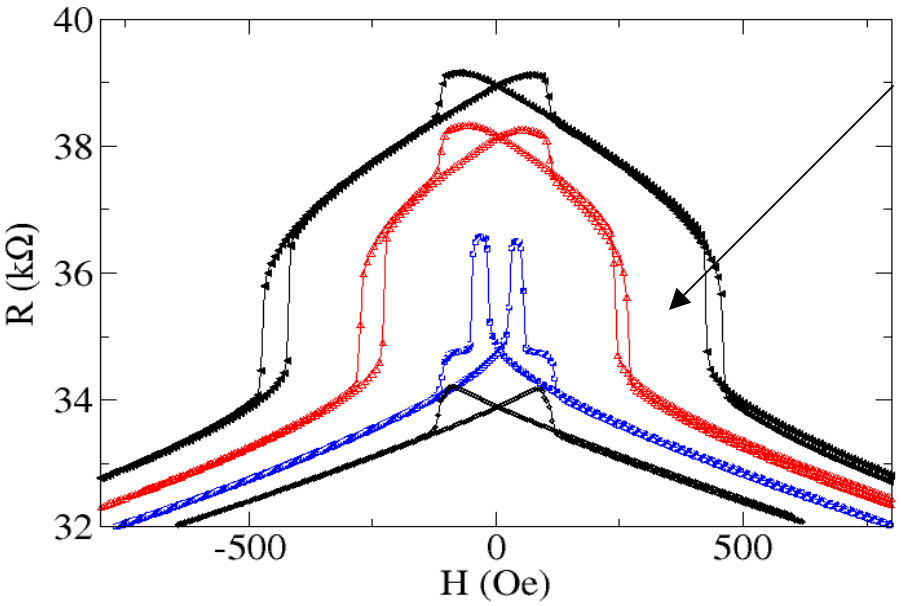
Current-tunable Magnetoresistive Hysteresis
M. B. Weissman, U. of Illinois at Urbana-Champaign,
NSF DMR 0240644

The development of devices to sense magnetic field changes has driven interest in a variety of materials whose electrical resistance changes dramatically as a function of magnetic field. One class, Colossal Magnetoresistive (CMR) materials shows particularly large sensitivity, but presents difficulty in controlling the hysteresis, or memory of past field changes. We have found that non-linear effects can allow us to controllably turn hysteresis on or off via changing electrical current, with very convenient low values of hysteretic fields.



Resistance vs. field hysteresis loops at (from bottom) current I= 700, 735, 775, and 800 μA and T= 260.69 K. The arrow marks a current-induced hysteretic jump of about 5% and a field width of about 20 Oe

Noise Studies of Disordered Condensed Matter

M. B. Weissman, UIUC, DMR-0240644

Education:

This grant supports work by three graduate students (Andrea Mills, Lambert Chao, and Aki Palanisami) as well as a Visiting Research Professor (Eugene Colla) and, recently, an undergraduate (Shahzeen Attari). Recent graduates from this group have gone on to work for several hard-drive developers, as well as for other hardware developers, national labs, and universities.

The work described in this nugget was done in collaboration with a group from Cambridge University.

Outreach:

The PI has prepared and edited many dozens of answers for a question-and-answer Web site run by the Physics Department http://van.hep.uiuc.edu/van/qa/qaform.htm

This site draws questions on all sorts of science topics from students of all ages from around the world. Here's the PI's favorite: http://van.hep.uiuc.edu/van/qa/section/stuff_about_space/the_earth_and_the_moon/20020821210810.htm.

Here's another, with more serious substance: http://van.hep.uiuc.edu/van/qa/section/states_of_matter_and_energy/boiling_evaporating_and_condensing/20030626151340.htm.