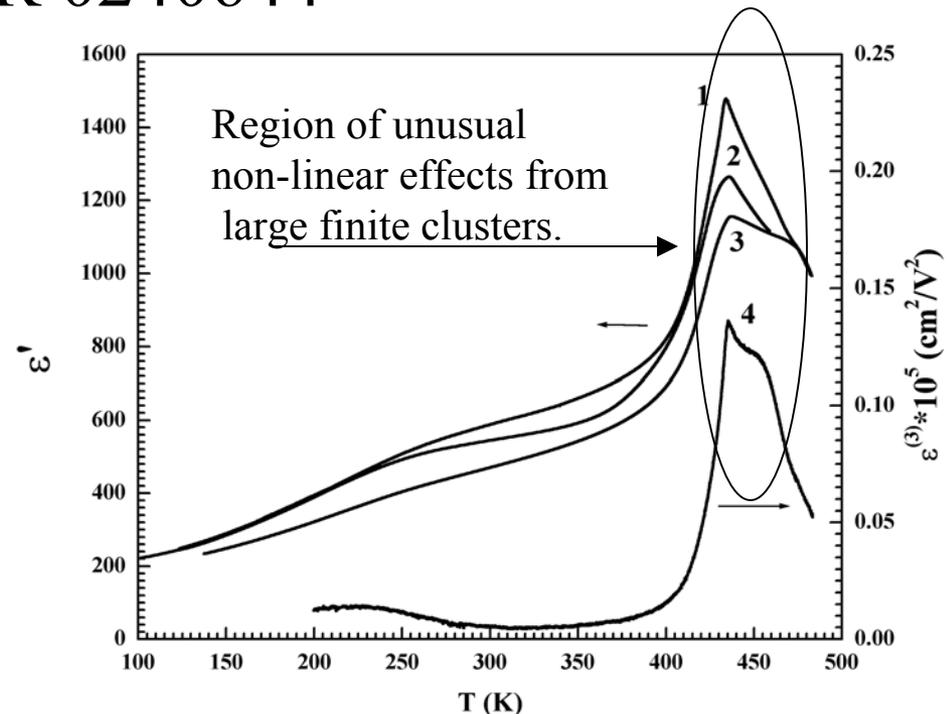


Griffiths behavior in a disordered antiferroelectric

M. B. Weissman, U. of Illinois at Urbana-Champaign,
NSF DMR 0240644

A long-standing theory due to Griffiths and McCoy implies that in materials with a little built-in disorder, a special regime with very large clusters should be found just above the temperature at which conventional long range order (e.g. like the order of an ordinary magnet) develops. This cluster regime should show very large non-linear sensitivity to external fields. We found rather dramatic evidence of this sort of predicted behavior in a disordered antiferroelectric material, $\text{Pb}_{0.97}\text{La}_{0.02}(\text{Zr}_{0.60}\text{Sn}_{0.30}\text{Ti}_{0.10})\text{O}_3$.



Curve 3 shows the linear susceptibility on Cooling in zero dc field, with a peculiar plateau. Curve 1 shows the strong nonlinear enhancement in the plateau on cooling in a dc field of 9kV/cm, and memory effects (curve 2). Curve 4 shows an ac non-linear susceptibility measurement, with large values in the plateau.

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 the City University of Hong Kong.

Outreach:

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

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.