

IEEE Magnetics Society Distinguished Lecturer

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4:00 PM – CMRR Auditorium

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University of Minnesota

**An Investigation of Magnetic Reversal
at Almost the Nanoscale**

One of the current frontiers in magnetism is to understand the domain structure and the magnetization reversal in nanometer-sized particles. Explorations at these length scales have been aided by the development of new magnetic imaging techniques [1], one of which is the magnetic force microscope (MFM), a variant of the atomic force microscope. We have utilized the high resolution MFM (30 nm) we developed [2] to increase our fundamental understanding of magnetism on this length scale. I will discuss the field-induced magnetic reversal in particles on the order of hundreds of nanometers in width and about twice that in length. In general, for the small aspect (length to width) ratio, the magnetization reverses by the formation of a single vortex and its propagation down the length of a particle (when the fields are applied perpendicular to the long axis). There are some surprises when the aspect ratio of the particles increases.



[1] E. Dan Dahlberg and Jian-Gian Zhu, *Physics Today*, vol. 48, pp. 34-40, April 1995.

[2] George D. Skidmore, Sheryl Foss, and E. Dan Dahlberg, *Appl. Phys. Lett.*, vol. 71, pp. 3293-3295, December 1997.

E. Dan Dahlberg received the B.S. and M.S. in physics from the University of Texas at Arlington in 1970 and 1972, respectively, and the Ph.D. from University of California, Los Angeles, in 1978. He joined the faculty at the University of Minnesota in 1980 and is currently a professor of physics and an Institute of Technology Distinguished Professor. He is the director and principal investigator of the Magnetic Microscopy Center (MMC) at the university. His recent research is on exchange bias, the physics of magnetic tunnel junctions, and noise in magnetic devices. Some of his previous research includes magnetotransport and other magnetic properties of thin films and multilayers, the dynamics of spin glasses, nonequilibrium superconductivity, the thermodynamics of magnetic superconductors, and the quantum Hall effect.

Prof. Dahlberg is a member of Sigma Pi Sigma (1971) and a Fellow of the American Association for the Advancement of Science (1995) and the American Physical Society (1996). He was an Alfred P. Sloan Foundation Research Fellow (1981-1985). He served as general chair of the 2001 Joint Magnetism and Magnetic Materials (MMM)-Intermag Conference and as an editor of several MMM and MMM-Intermag conferences. He was divisional councilor to the Division of Condensed Matter Physics of the American Physical Society (1999-2002), a member of the Executive Board of American Physical Society (2001-2002), and Vice President of the International Union of Pure and Applied Physics (IUPAP) (2006-2009).

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