

## WEEKLY CALENDAR

30 January 2006



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### Materials Science & Engineering Seminar / General Seminar

3:40PM / Thursday, 2 February 2006 / Room 109 Nicholson

Host: Dr. Ilya Vekhter

[Refreshments served at 3:15PM in Room 229 Nicholson]

## Why are there so few Magnetic Ferroelectrics?

Nicola Spaldin, PhD

Materials Department  
University of California - Santa Barbara

Multiferroic magnetoelectrics are materials that are both ferromagnetic and ferroelectric in the same phase. As a result they have a spontaneous magnetization which can be switched by an applied magnetic field, a spontaneous polarization which can be switched by an applied electric field, and often some coupling between the two. Very few exist in nature, or have been synthesized in the laboratory, but there is some incentive to produce new multiferroics for technological applications. In this talk we use the study of multiferroics to illustrate the utility of theoretical and computational methods in the design of new multifunctional materials. First we determine the fundamental physics behind the scarcity of ferromagnetic ferroelectric coexistence, and show that in general transition metal d electrons, which are essential for magnetism, reduce the tendency for off-center ferroelectric distortion. Then we identify the chemistry behind the additional electronic or structural driving forces that must be present for ferromagnetism and ferroelectricity to occur simultaneously. Finally we describe the successful prediction and subsequent synthesis of new multiferroic materials.

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#### Publications:

P. Kok, W.J. Munro, K. Nemoto, T.C. Ralph, J.P. Dowling and G.J. Milburn. "Linear optical quantum computing." *arXiv:quant-ph/0512071*, v. 1 (Dec. 2005).

W.H. Wang, J.D. McGlothlin, D.J. Smith and K.L. Matthews. "Evaluation of a radiation survey training video developed from a real-time video radiation detection system." *Health Physics*, 90 (Supplement 1), pp. 33-39 (2006).

S. Habib, K. Jacobs, and K. Shizume. "Emergence of chaos in quantum systems far from the classical limit." *Physical Review Letters* 96, 010403 (2006).

J. Combes and K. Jacobs. "Rapid state reduction of quantum systems using feedback control." *Physical Review Letters* 96, 010504 (2006).

G.W. Ford and R.F. O'Connell, "Is there Unruh radiation?" *Physics Letters A* 350, pp. 17-26 (2006).

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#### Welcome to:

Dr. Marie Varnes, an Instructor with the Medical Physics Program. Dr. Varnes is located in Room 459A Nicholson; her telephone extension is 8-4289.

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#### Reminder:

The Steering Committee will meet on Tuesday, January 31st, at 3:40pm in Room 201 Nicholson.