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WEEKLY CALENDAR

November 13, 2006

General Seminar

"Ferroelectricity in Frustrated Magnets"

3:40PM / Thursday, 16 November 2006 / Room 109

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

Host: Dr. John DiTusa

Collin Broholm, Ph.D.

Physics and Astronomy, John Hopkins University

While electrostatics and magnetostatics are disparate phenomena in a vacuum, no symmetry forbids materials from responding magnetically to an electric field or vice versa. Materials with a strong magneto-electric response are of interest for applications and challenge our understanding of magnetic dielectrics. I discuss specific examples of magneto-electricity in metal oxides with triangular or kagomé lattices of spins where antiferromagnetic interactions compete [1-3]. It is shown that inversion symmetry breaking magnetic order can act as a pseudo electric field through magneto-elastic distortions that relieve frustration. The results presented in this talk are based on magnetic neutron scattering experiments.

[1] M. Kenzelmann, A. B. Harris, S. Jonas, C. Broholm, J. Schefer, S. B. Kim, C. L. Zhang, S.-W. Cheong, O. P. Vajk, and J. W. Lynn, Phys. Rev. Lett. **95**, 087206 (2005).

[2] G. Lawes, A. B. Harris, T. Kimura, N. Rogado, R. J. Cava, A. Aharony, O. Entin-Wohlman, T. Yildirim, M. Kenzelmann, C. Broholm, and A. P. Ramirez, Phys. Rev. Lett. **95**, 087205 (2005).

[3] M. Kenzelmann, G. Lawes, A.B. Harris, G. Gasparovic, C. Broholm, A.P. Ramirez, G.A. Jorge, M. Jaime, S. Park, Q. Huang, A.Ya. Shapiro, and L.A. Demianets, Submitted to Nature (2006).

General Seminar

"High Gauge Theory"

3:40PM / Friday, 17 November 2006 / Room 109

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

Host: Dr. Jorge Pullin

John Baez, Ph.D.

University of California-Riverside

Gauge theory describes the parallel transport of point particles using the formalism of connections on bundles. In both string theory and loop quantum gravity, point particles are replaced by 1-dimensional extended objects: paths or loops in space. This suggests that we seek some sort of "higher gauge theory" that describes parallel transport as we move a path through space, tracing out a surface. To find the right mathematical language for this, we must "categorify" concepts from topology and geometry, replacing smooth manifolds by smooth categories, Lie groups by Lie 2-groups, bundles by 2-bundles, and so on. Some interesting examples of these concepts show up in the mathematics of topological quantum field theory, string theory and 11-dimensional supergravity.