Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Magnetic Correlations in $YBaCo_4O_7$: A Frustrated Magnet with Novel Trigonal Bipyramidal Chains JOHN MITCHELL, Argonne National Laboratory, PASCAL MANUEL, LAURENT CHAPON, ISIS Facility, PAOLO RADAELLI, Dept. of Physics, University of Oxford, HONG ZHENG, Argonne National Laboratory — Novel structural motifs generate opportunities to explore unique geometrically frustrated groundstates and their properties. One such new material,$YBaCo_4O_7$ (Y114), is closely related to the pyrochlore lattice, differing only in the stacking sequence of triangular layers. This alternative stacking sequence leads to chains of corner sharing trigonal bipyramids with magnetic ion vertices, a novel motif among geometrically frustrated lattices. We have studied Y114 using single crystal neutron diffraction above its ordering temperature. Strong magnetic diffuse scattering can be understood using Monte-Carlo simulations, and a simple nearest-neighbor model explains the magnetic structure. Along the c-axis, long-range correlations arising from the corner-sharing bipyramids create a quasi one-dimensional order at finite temperature. In contrast, the spin-spin correlation function decays rapidly in the ab-plane, following a unique short-range configuration that enforces an$L$=0 for the bipyramid. Approaches to suppressing long-range order in the system will be discussed.

John Mitchell
Argonne National Laboratory

Date submitted: 21 Nov 2008 Electronic form version 1.4