Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Micorscopic theory of temperature-dependent magnetoelectric effect in Cr_2O_3 ANDREA SCARAMUCCI, MAXIM MOSTOVOY, Zernike Institute for Advanced Materials, University of Groningen, NICOLA A. SPALDIN, Materials Department, University of California Santa Barbara / Department of Materials, ETH Zurich, KRIS T. DELANEY, Materials Research Laboratory, University of California Santa Barbara — We study the temperature dependence of the magnetoelectric effect in Cr_2O_3 by considering the coupling between electric polarization and spins induced by Heisenberg exchange interactions. The form of the coupling is obtained by symmetry analysis and its strength is calculated by *ab initio* methods. Using Monte Carlo simulations, we evaluate the temperature dependence of the largest component of the magnetoelectric susceptibility. The quantitative agreement of our results with experimental measurements shows that the dominant contribution to the linear magnetoelectric effect originates from nonrelativistic exchange interactions and spin fluctuations. The approach used can be applied to study other magnetoelectrics with collinear spin ordering and opens a new route for the design of materials with large magnetoelectric effect at high temperatures.

Andrea Scaramucci
Zernike Institute for Advanced Materials, University of Groningen

Date submitted: 19 Nov 2010 Electronic form version 1.4