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**Thermoinduced Magnetization in Antiferromagnetic Heisenberg Chains** GREGORY BROWN, MARKUS EISENBACH, G. MALCOLM STOCKS, Oak Ridge National Lab — The magnetic properties of linear chains of classical three-dimensional Heisenberg spins, with antiferromagnetic nearest-neighbor exchange and uniaxial single-site anisotropy, are determined analytically and numerically to investigate the phenomenon of thermoinduced magnetization (TiM). TiM is the ferromagnetic response observed in nanoparticles of antiferromagnetic materials at low temperatures, with the ferromagnetic response increasing as temperature increases. In the strong-anisotropy limit, TiM is shown analytically to result from the relaxation of individual spins away from the anisotropy axis. In the weak-anisotropy limit, it is shown numerically that TiM occurs only at temperatures low enough for long-range ordering of the entire finite chain. In the absence of anisotropy, long-range order does not occur and TiM is not observed. Both of these results present serious challenges to current theories, which describe TiM only in terms collective motions at q=0 and in the limit of vanishing anisotropy. This work was sponsored by the Laboratory Directed Research and Development Program of ORNL (GB, ME, GMS), and by the DOE-OS through the Offices of BasicSciences, Division of Materials Sciences and Engineering (GMS).

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