ABSTRACT

TITLE:	A Comparison of a Mean Field Theoretical Approach to Ferromagnetism with Experimental Results
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ABSTRACT: Often, trying to describe how atomic interactions in a structure come to manifest themselves macroscopically is tedious if not impossible when large numbers of molecules or atoms are being considered. One way to more easily approximate the expected behavior of a large system is to consider how the "mean field" affects a single particle and observing its behavior. In magnetic systems, there is an electromagnetic exchange between individual dipoles that extends only negligibly beyond the other dipoles immediately adjacent to them. By "tagging" an individual dipole in a tetragonal crystal lattice of ferromagnetic dipoles and then "freezing" the dipoles immediately near it, the mean field produced by the frozen dipoles can be calculated, and the net effect of the mean field on the tagged dipole can be seen. In the case of ferromagnetism (and all magnetic systems), the agnetization and orientations of dipoles are dependent on temperature. To see this, several magnets were cooled with liquid nitrogen and allowed to warm back up to room temperature while the strength of their magnetic fields were measured at a constant distance. The observed field strengths are then compared with theoretical results produced from the mean field approximation.