Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Thermal-Cycle Memory Functions and Ising Dynamics BRAD JOHNSON, DAVID PATRICK, Advanced Materials Science and Engineering Center, Western Washington University — The Ising model provides a rich system for the study of a variety of correlated systems. In this talk, we present the results of numerical studies of 2- and 3-dimensional Ising spin systems subjected to thermal cycling from an ordered state to states with a fixed order parameter (<1), but with differing overall morphologies, and back to a quenched state. We find that for systems with initial states generated by thermal disordering above T_c, the initial state of a given order parameter has larger 'islands' of like-spin (than the case for random disorder with the same overall order parameter) and consequent quenches of the state to $T<T_c$ result in a strong correlation to a particular final average order parameter. The function we find is given by $\langle S\rangle \approx \tanh(B \cdot S_{init})$, where S_{init} is the order parameter of the initial state, <S> is the average quenched order parameter, and B is a constant that depends upon the morphology of the initial state. The reason for the strong correlation stems from the energies associated with spins at the borders of large clusters. This 'memory effect' does not occur in 3D (due to the larger number of near-neighbors). Finally, we discuss the 'memory function' in the context of interfacial states of liquid crystals.

Brad Johnson
Advanced Materials Science and Engineering Center,
Western Washington University

Date submitted: 22 Nov 2007 Electronic form version 1.4