Abstract for an Invited Paper
for the MAR10 Meeting of
The American Physical Society

LeRoy Apker Award Talk: Small-Model Approximations to Ising Models of Two-Dimensional Geometrically Frustrated Systems[1]

BILIN ZHUANG, Wellesley College / Data Storage Institute

In geometrically frustrated spin systems, it is impossible for all local spin-spin interactions to be at their respective ground states simultaneously. These systems have many interesting properties. Most notably, they have many energy ground states and their entropy does not vanish at zero Kelvin, violating the third law of thermodynamics. Currently, there are two primary methods for studying the thermodynamic properties of frustrated systems: the exact analytical method and the Monte Carlo simulation. However, the exact analytical method is difficult and not always possible, while the Monte Carlo simulation can often be very time-consuming. In view of this, we have investigated small systems with less than 30 spins to approximate the energy and the specific heat of three extended 2D lattices, including the triangular lattice, the Kagome lattice and the triangular Kagome lattice, and found that the small systems can be good approximations to the extended lattices if they satisfy a set of criteria. This method of using small systems as approximations may provide us an efficient way to do a first approximation of the properties of frustrated systems.

[1]Supported by Jerome A. Schiff Fellowship