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Some recent numerical results concerning phase transitions in spin glasses

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I will describe results of some recent, large-scale, numerical simulations concerning phase transitions in spin glasses in three dimensions. I will focus on two important questions which have been extensively debated in the spin glass community for many years :

The first is whether there is a finite temperature spin glass transition in the Heisenberg spin glass, and, related to that, whether "spin-chirality" decoupling occurs. Chirality is a measure of the handedness of the spin configuration around a point. Kawamura had proposed that the spin glass transition temperature, T_{SG}, is zero, while the chiral transition temperature T_{CG} is non-zero, which implies a decoupling of spin and chiral degrees of freedom. Subsequently Kawamura has argued that T_{SG} is non-zero but somewhat less than T_{CG}. Our results on very large sizes, $N = L^3$ where $L <= 48$, are compatible with a single transition temperature, though numerics can, of course, never rule out a small difference.

The second question is whether there is a line of transitions (AT line) in a magnetic field for an Ising spin glass. By simulating both directly in three dimensions, and a related model in one-dimension with long-range power-law interactions, I will argue that there is not, though there is some evidence for an AT line in high-dimensions (perhaps d greater than 6).