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Order From disorder in Frustrated Spin Systems[1]

PIERS COLEMAN, Rutgers Univ

This talk will review the phemomenon of "Order from disorder": the mechanism by which fluctuations remove a degeneracy within a frustrated spin system. An important consequence of order-from-disorder, is the ability of frustrated Heisenberg spin systems to overcome the Mermin-Wagner theorem, developing new forms of discrete order, even when the spins themselves remain disordered with a finite correlation length. The most well-known example, is the two-dimensional frustrated $J_1 - J_2$ Heisenberg model, which undergoes a finite temperature Ising phase transition into a stripy or "nematic" state, even though the spins do not order until absolute zero[1,2]. Nematic ordering of this kind is believed to occur in the iron-based superconductors, such as $BaFe_2As_2$. More recently, it has been possible to theoretically study the triangular-honeycomb versions of the $J_1 - J_2$ model, called a windmill model[3-4], in which order-from disorder drives the development of six-state clock order. Remarkably, in this case, order-from-disorder leads to an intermediate power-law spin phase, despite the underlying Heisenerg spins.

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