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Emergent critical phase in a 2D frustrated Heisenberg model PETER P. ORTH, Karlsruhe Institute of Technology (KIT), PREMALA CHANDRA, PIERS COLEMAN, Rutgers University, JOERG SCHMALIAN, Karlsruhe Institute of Technology (KIT) — It is well-known that a discrete Ising (Z_2) order parameter emerges in the frustrated square lattice J_1-J_2-Heisenberg model, which may be broken at finite temperature. We ask whether a different discrete symmetry Z_q with $q > 2$ may be found in other frustrated Heisenberg models, giving rise to a different finite temperature phase transition. Indeed, we identify an emergent Z_6 symmetry at low temperatures in a frustrated Heisenberg model on a 2D lattice that contains both the sites of the triangular and its dual honeycomb lattice. Our analysis combines a spin-wave expansion, susceptible to short-distance physics, with renormalization group arguments of the corresponding long-wavelength non-linear sigma model. Our results are even more appealing since the Z_6 clock model has a rich finite temperature phase diagram with two distinct Berezinskii-Kosterlitz-Thouless (BKT) phase transitions separated by a massless critical phase. We also discuss possible realizations of this phenomenon using cold-atoms in optical lattices.

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