Unconventional ferromagnetic quantum criticality in a chiral spin chain

Leon BALENTS

Kavli Institute of Theoretical Physics, University of California, Santa Barbara

Email: balents@spinsandelectrons.com

Chirality is an important ingredient in many exotic states of matter. In this talk, I will discuss a quantum phase transition induced by chirality in a minimal one dimensional model: the Heisenberg chain supplemented by a 3-spin interaction term. We develop a theory of an unusual chiral z=3 quantum critical point in this system in which SU(2) spin rotation symmetry is spontaneously broken in the form of weak ferromagnetism. The critical point is related to a strongly interacting integrable non-conformal field theory with no free particle description, yet for which many results can be obtained. The ferromagnetic phase itself is unusual in that it supports both a quadratically dispersing magnon and linearly dispersing bosonic collective modes, necessitating an augmented bosonization description. The results are validated with numerical studies.