Condensation of bosonic pairs in quantum magnets

Frédéric Mila, Ecole Polytechnique Fédérale de Lausanne, Switzerland

Closing the gap with a magnetic field in gapped antiferromagnets can be interpreted as a Bose-Einstein condensation of triplets, and the resulting phase is gapless with low-lying triplet excitations that can be observed with inelastic neutron scattering. In this talk I will discuss an alternative scenario where the gap closing is due to the condensation of spin-2 bound states, a possibility put forward two decades ago in the context of the Shastry-Sutherland model and of its almost exact realization, the compound SrCu2(BO3)2. The resulting phase is a spin nematic phase which, in bosonic language, corresponds to a pair condensation without single particle condensation, and it has been shown to be stabilised in a field range above condensation in models with correlated hopping. The detection of such a phase is quite challenging however because standard spectroscopies do not couple to spin-2 excitations. Motivated by recent inelastic neutron scattering in SrCu2(BO3)2 up to 26 T, I will argue that very clear although indirect evidence can be detected as a characteristic kink in the lowest triplet branch at the magnetic field where the spin-2 bound state condenses, leading to the first experimental confirmation of the possibility to realize a spin nematics by applying a magnetic field to a gapped antiferromagnet.