Theory Colloquium

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"UV complete field theory in (2+1)D with symmetry breaking at all temperatures"

Abstract

It was recently conjectured that spontaneous symmetry breaking can persist at all temperatures in certain biconical vector models with coupled Ising and N-vector fields when the underlying field theories are ultraviolet complete, i.e., if they can be defined on all scales. So far, the existence of such models has only been explored in fractional dimensions for local but non-unitary models or in 2+1 dimensions but for non-local models. In my talk, I will discuss our study of local models at zero and finite temperature directly in 2+1 dimensions employing functional methods. At zero temperature, I show that our approach reproduces the critical behaviour with high accuracy for all N. I will then exhibit the mechanism of discrete inverted symmetry breaking for increasing temperature near the biconical critical point when N is finite but large. We calculated the corresponding finite-temperature phase diagram and further showed that the Mermin-Wagner-Hohenberg theorem is respected, i.e., symmetry breaking only occurs in the Ising sector. Finally, we also determined the critical value above which this phenomenon occurs to be N~15. I will also discuss possible extensions of the scenario to the case of the BKT transition and the inclusion of fermion degrees of freedom.

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SR 1 | ICT building