THEORETICAL PHYSICS SEMINAR

Title: Fun with Phases

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Date/Time/Venue: 27th October (Tuesday)/2:30 PM/ Room No. 469

ABSTRACT

We discuss some interesting classical and quantum phase transitions.
The classical 2d spin 1 Blume-Capel model is a non-integrable model,
but it exhibits a tricritical point described by a CFT which can be
located only numerically. We show how we can determine this point using
the concepts of Entanglement entropy, employing classical Monte Carlo
simulations coupled with the knowledge that the critical theory is a
minimal model with c=0.7. In the next part, we discuss topological
phases. Certain real parameters of a Hamiltonian, when continued to
complex values, can give rise to singular points called exceptional
points (EP's), where two or more eigenvalues coincide and the
complexified Hamiltonian becomes non-diagonalizable. We show that for a
topological superconductor with a chiral symmetry, one can find EP's
associated with the chiral zero energy Majorana fermions bound to a
topological defect/edge. Exploiting the chiral symmetry, we propose a
formula for counting the number (n) of such chiral zero modes. We also
establish the connection of these solutions to the Majorana fermion
wavefunctions in the position space. Finally, we conclude that EP's
cannot be associated with the Majorana fermion wavefunctions for
systems with no chiral symmetry, though one can use our formula for
counting n, using complex k solutions where the determinant of the
corresponding BdG Hamiltonian vanishes.

All are welcome to attend