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Oliver E. Buckley Condensed Matter Prize: Quantum-topological phases of matter¹

XIAO-GANG WEN, Massachusetts Institute of Technology

For a long time, we thought that symmetry breaking patterns describe all phases and phase transitions. The featureless disordered liquids correspond to trivial phase. But in fact disordered liquids have very rich features, with amazing emergent phenomena, such as fractional quantum numbers, fractional and non-abelian statistics, perfect conducting boundary even in presence of magnetic impurities, etc. All those are due to many-body entanglement. In this talk, I will first discuss topological phases that have topological order (ie with long range entanglement). Then I will cover topological phases that have no topological order (ie with only short-range entanglement). I will stress on how to understand and describe many-body entanglement, which is a very new phenomenon.

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