

A novel class of quantum phase transitions: from bounded to extensive entanglement.

I will describe continuous families of frustration-free Hamiltonians with exactly solvable ground states. The ground state of the model is non-degenerate and exhibits a novel quantum phase transition from bounded entanglement entropy to a massively entangled state with volume entropy scaling. The ground state may be interpreted as a deformation away from the uniform superposition of colored Motzkin paths, showed by Movassagh and Shor to have a large (square-root) but sub-extensive scaling of entanglement into a state with an extensive entropy. This novel transition shows that entanglement in many body systems may be enhanced under special circumstances with a potential for generating “useful” entanglement for the purpose of quantum computing and that the full implications of locality and its restrictions on possible ground states may hold further surprises.

References:

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