On the decay of correlations under quenched disorder

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Abstract:
In sufficiently low dimensions, the addition of quenched disorder to a translation invariant Hamiltonian of a system with a first order phase transition results in the elimination of the related discontinuity. This Imry-Ma phenomenon is exemplified by the random field Ising model for which the rounding occurs in two dimensions. For continuous symmetry breaking, as in the O(N) models, the rounding effect persists up to and including four dimensions. The talk will focus on the question of a possible existence at the critical dimensions of another transition, reached by varying the disorder's strength. Its manifestation would be in the decay rate of the correlation between quenched expectations, which could conceivably transition from exponential decay at high disorder to a power law at low disorder. (Talk based on a joint work with R. Peled).