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Equilibration and coarsening in the quantum O(N) model at infinite N

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The quantum O(N) model in the infinite-N limit is a paradigm for symmetry breaking. In this talk, I will investigate the physics of this model out of equilibrium, specifically its response to global quenches starting in the disordered phase. In the infinite-N limit, I will show that not only does the model not lead to equilibration on account of an infinite number of conserved quantities, it also does not relax to a generalized Gibbs ensemble (GGE) consistent with these conserved quantities. Instead, an infinite number of new conservation laws emerge at late times and the system relaxes to an emergent GGE consistent with these. Nevertheless, the late-time states following quenches bear strong signatures of the equilibrium phase diagram. Notably, we find that the model exhibits coarsening to a nonequilibrium critical state only in dimensions d $>$ 2, that is, if the equilibrium phase diagram contains an ordered phase at nonzero temperatures.