

Title: Fermion masses without spontaneous symmetry breaking

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Abstract: When an interacting fermionic lattice field theory contains symmetries that forbid fermion bilinear mass terms, one expects the presence of a massless fermion phase at weak interactions in three or more space-time dimensions. It is usually believed that at large couplings, one or more of the symmetries that protect the mass terms must break spontaneously before fermions can become massive. Using large scale Monte Carlo calculations in a simple lattice field theory model in three and four space-time dimensions, we argue that this folk lore is untrue. In three space-time dimensions we find evidence for a direct second order transition between the massless phase and the massive phase. No fermion bilinear order parameter distinguishes the two phases.