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Exploring center symmetry with electrically charged quarks

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In pure SU(N) gauge theory, the deconfinement phase transition is tied to the spontaneous breaking of center symmetry. The expectation value of the Polyakov jumps from zero to a finite value at T_c, which coincides with the suppression of spacelike center vortices. Center symmetry is lost, however, with the introduction of dynamical quarks, and this picture evaporates with it. Still, since quarks carry fractional electric charge, a center transformation may be compensated by an appropriate U(1) phase. The true gauge group of the Standard Model is in fact SU(3)xSU(2)xU(1)/Z_6, with Z_6 representing this hidden global symmetry. As a first step towards studying the relevance of this symmetry and the corresponding vortices to confinement and the phase structure of the Standard Model, we consider SU(2)xU(1)/Z_2 with two flavors of dynamical Wilson fermions to model quarks in two-color QCD with electromagnetism.

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