severe. Furthermore, zero coupling,for such theories, is an ultra-violet stable fixed point and therefore infrared unstable. This means that (neglecting masses) as the momenta decrease the effective coupling constant increases. Perturbation theory is therefore totally unreliable insofar as the small momenta behavior of an asymptotically free theory is concerned. The same renormalization group techniques allow one[44] to discuss the small or large classical field behavior of the "potential". The infrared instability of the origin indicates the unreliability of the classical (free) approximation to this potential. Thus whether or not the theory exhibits symmetry breaking is a difficult dynamical question, requiring non-perturbative calculations.

If the gauge symmetry is broken by a dynamically induced Higgs mechanism then the vector mesons will acquire masses (say 1-3 BeV) and the color degeneracy will be split. In that case one would still be faced with the fact that there is no experimental evidence for the existence of such neutral vector mesons, colored hadrons and especially quarks. The proponents of "red, white and blue" quarks[42] as a mathematical abstraction argue that the color SU(3) group should be exact, and that all non-color singlets suppressed completely. One clearly requires a dynamical explanation of such a miracle. It might very well be the violent infrared singularities of an asymptotically free gauge theory provide the requisite dynamical mechanism.

To illustrate some of the strange things that could occur in the region of small momenta consider a pure Yang-Mills theory