Baryon spectrum in the large N_c limit

Cintia T. Willemyns

Abstract

The asymptotic freedom in QCD allows for accurate calculations at high energy using perturbation theory. At low energies, typical of hadronic systems, a perturbative approach using the coupling constant as the expansion parameter is not appropriate. Baryon spectroscopy has been essential for our understanding of QCD in the low-energy, strong-coupling regime. In this context, the Quark Model which is based on the spin-flavor group O(3) $\times$ SU($2N_f$) has since a long time been a useful tool to analyze the spectrum and properties of excited baryons. This symmetry is not something that follows from the fundamental QCD theory.

An analytic scheme to study the phenomenology of baryons and their excited states, whose connection with QCD is clearly stated, can be obtained by generalizing QCD from three colors and an SU(3) gauge group to N_c colors and an SU(N_c) gauge group. Because a contracted SU($2N_f$)$_c$ symmetry arises from QCD in the large N_c limit, the $1/N_c$ expansion is especially interesting to help us understand the success of the Quark Model.

In this talk, I will present some consequences of the large N_c contracted symmetry for the first excited states of baryons and their relation with the Quark Model spin-flavor symmetry.