QCD as an SU(3) Gauge Theory

Pre-Lecture Reading/Post-Lecture Summary

Now that we have the basics of gauge theory under our belt having worked through the simplest case of electromagnetism as a theory of local U(1) invariance, it is time to turn to one of the more complicated cases. The strong interactions of quantum chromodynamics (QCD) is an interaction between quarks that is based on local SU(3) invariance. To understand what this even means, we will introduce the notion of "color" or "color charge" which comes in three varieties: red, green and blue. The SU(3) transformations will act on three component color vector states. We will have to dig back into some of our Lie algebra technology to understand how to properly handle this case since SU(3) (unlike U(1)) is a nonabelian group. This will make the strong interactions more complicated than E&M, but will also yield some very interesting effects like the interaction of gluons with each other. Then you will leave and be happy.