

Discussion February 3, 2010: Nuclear Lunch Seminar

Lattice Quantum Chromodynamics comes of Age

Questions about QCD

1. What is meant by color neutral? What made scientists believe that the hadrons come in color neutral combinations? How was this idea of color neutrality developed or discovered? How are colors assigned to the quarks and gluons? (3 Q)
(Harsha)
2. Can you give a brief explanation of what it means for a theory to be gauge invariant?
(Shloka)

Questions about the path integral

1. What is the action, S ? Why does it appear in the path integral? How does the path integral “work”?
(Anthony)
2. Why does one use imaginary time for the path integral in the formulation we are discussing here? What does it physically mean that we have imaginary quantities like time in our calculation? (3 Q)
(Dilu)

Questions about Lattice methods and Monte Carlo sampling

1. Why were discrete lattice points in space-time introduced, and how is this really done? (2 Q)
(Paul)
2. Why Monte Carlo integration and not any other method? Is it possible to do the relevant integrals by some other method?
(Youngshin)
3. What is importance sampling? Why is it so important?! How are the numbers that are employed when doing it generated?
(Daniel)

Questions about lattice QCD

1. What is a quark-loop effect?
(Anton)

2. How are the values of parameters (e.g. quark masses) determined in lattice simulations if they do not refer to physical values?

(Bing)

3. Why is it necessary to extrapolate the lattice spacing a to zero? Do you have to prove that?

(Jerry)

Questions about what lattice QCD can do

1. How does a lattice QCD calculation show that the quark-quark potential is proportional to the distance between the two quarks?

(Ken)

2. If the proton is 100 times heavier than the sum of its 3 quarks: what contributes to the heavy mass of the proton? (the proton is made of 3 quarks, right?)

(Cody)

3. Can the half-life for the neutron be determined from LQCD?

(Chen)

4. Where did the CKM matrix come from and what is its use?

(Nowo)

5. What is the quark-gluon plasma? What role does it play in QCD?

(Open to everyone)