Phase diagram evolution by finite coupling effect in color SU(3) SC-LQCD at finite T and density

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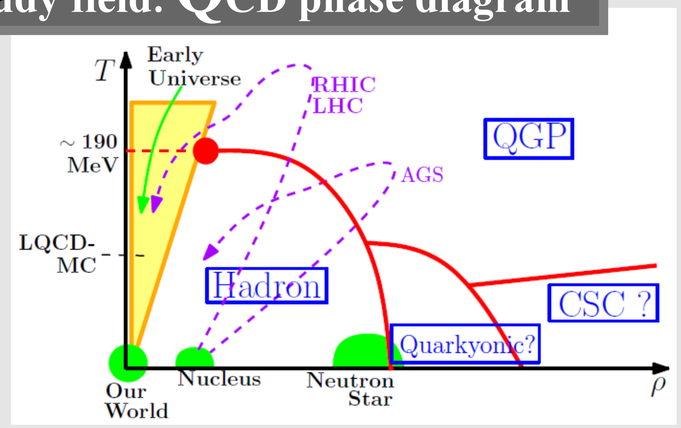
Introduction

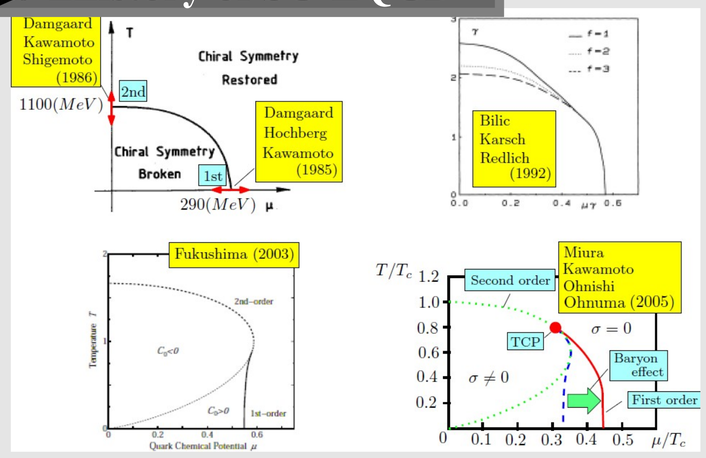
1. Study field: QCD phase diagram



2: Strong coupling lattice QCD

1. SC-LQCD is an “Analytic” LQCD with strong coupling expansion.
2. No sign problem.
3. Should be consistent with Monte-Carlo in strong coupling region.
4. Long history in the study of chiral phase transitions.

3. History of SC-LQCD



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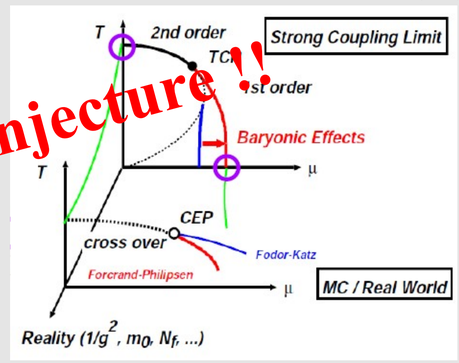
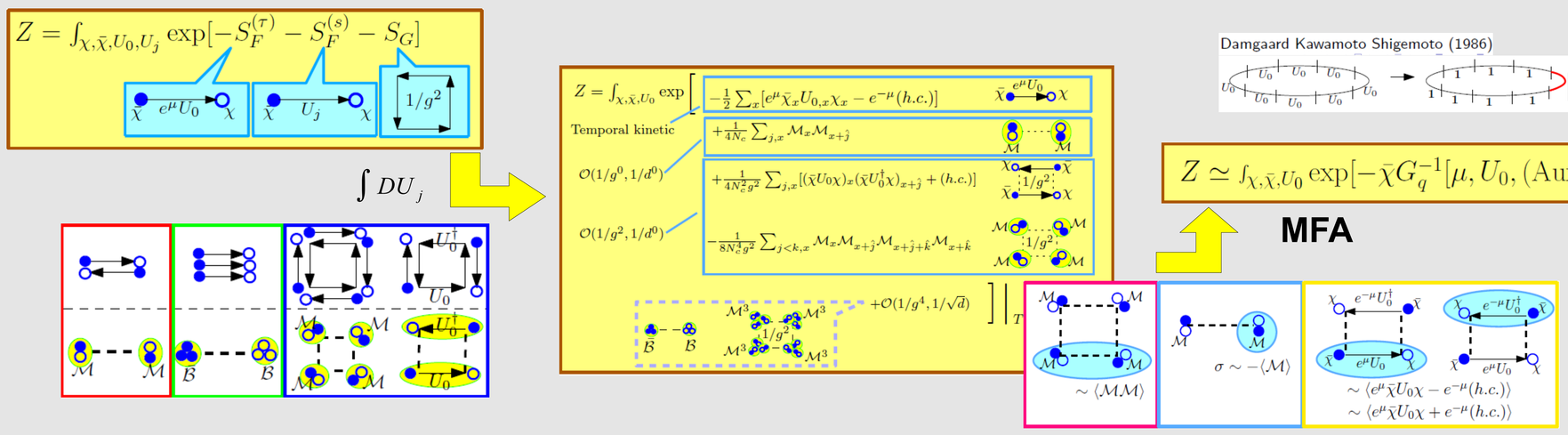


4. Motivations

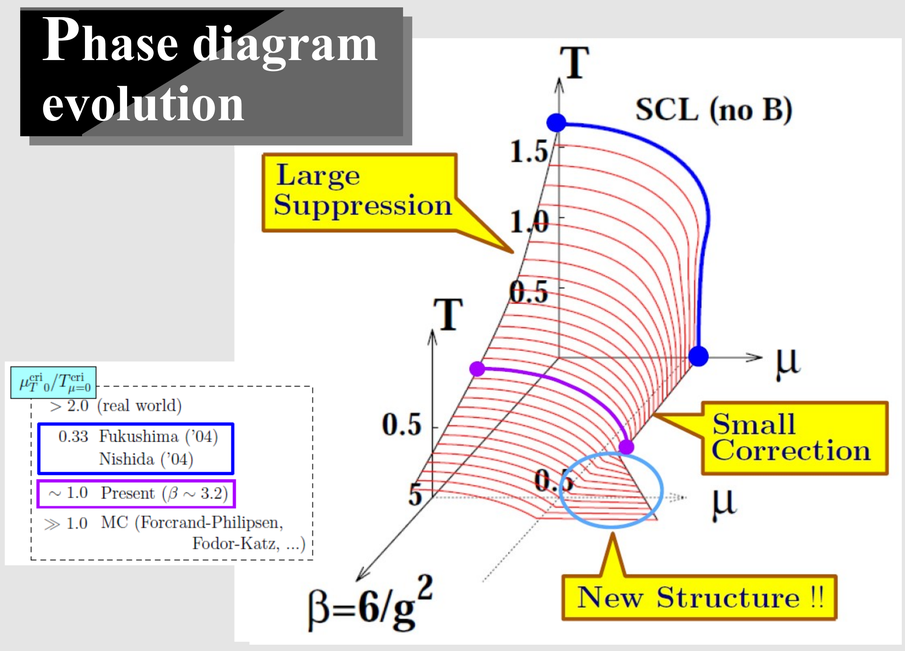
1. How can SCLim QCD and the real world be connected?
2. How is the ratio mu_c/T_c modified by the finite coupling?

Formulations



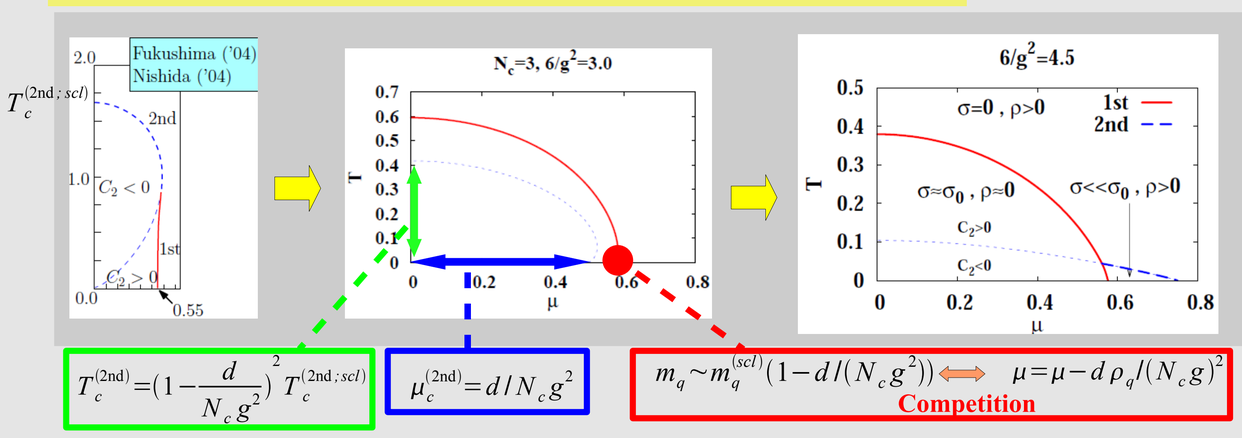
Results & Discussions

Phase diagram evolution

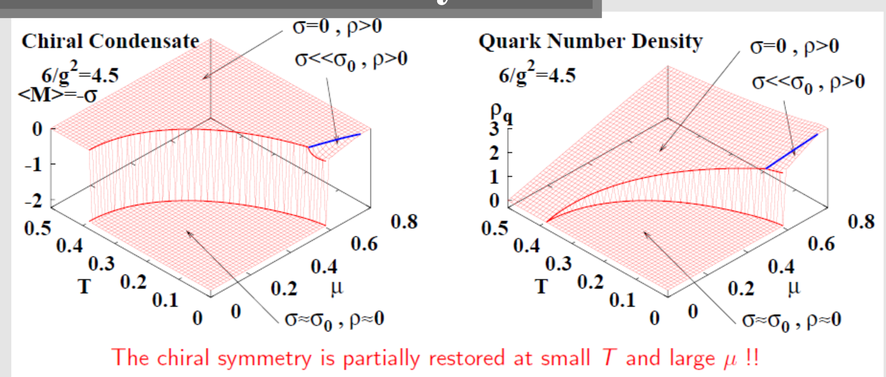


$$F_{eff}(\sigma) = \frac{C_2(T,\mu,g)}{2}\sigma^2 + \frac{C_4(T,\mu,g)}{4}\sigma^4 + \ldots$$

$C_2 = 0$ — 2nd order phase transition line at given g
$C_2 = C_4 = 0$ — Tri-critical point at given g



Chiral cond. & Density



The chiral symmetry is partially restored at small T and large μ !!

Summary

1. We investigated the phase diagram evlution by 1/g^2 in the strong coupling lattice QCD with one species of staggered fermion.
2. The ratio (μ_c/T_c) became closer to the expected real world value by 1/g2 effects. (SCLim: 0.3, Expected: 2.0, Current: 1.0 at 1/g^2=0.5).
3. The order of phase transition on the T axis changed to 1st from 2nd by 1/g2 effects, and this may reflect on the feature of the four tastes system.
4. In the low temperature region, we found the new kind of phase structure, where the chiral symmetry was found to be partially restored.