

Surprises in Large N_c Thermodynamics

Thursday 6 February 2020 17:00 (30 minutes)

This talk takes a new look at the thermodynamics of QCD in the large N_c limit. In many contexts QCD in the large N_c limit gives a reasonable, if somewhat cartoonish, description of the theory at $N_c=3$. It is well-known, however, that the description of QCD near its cross-over from a hadronic regime to QGP is a place where the large N_c limit is quite different from $N_c=3$. Instead of having a cross-over as in $N_c=3$, it is generally believed that there is a first-order phase transition. A first order transition implies the possibility for the QGP phase to supercool and the hadronic phase to superheat. What is not generally appreciated is that at large N_c such a supercooled QGP phase has a remarkable property: it has negative absolute pressure; that is its pressure is lower than that of the true vacuum at $T=0$. The superheated hadronic phase at large N_c also reveals some interesting and surprising behavior. If the endpoint of the hadronic metastable phase as occurring at the Hagedorn temperature, then the analytic behavior of the entropy density as a function of the energy density is qualitatively quite different than one would have for a simple equation of state for a first order transition such as one would have in a van der Waals gas. The talk will conclude with an attempt to draw lessons for QCD $N_c=3$.

Primary author: Prof. COHEN, Thomas (University of Maryland)

Presenter: Prof. COHEN, Thomas (University of Maryland)