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Surprises in Large Nc Thermodynamics

Thursday 6 February 2020 17:00 (30 minutes)

This talk takes a new look at the thermodynamics of QCD in the large Nc limit. In many contexts QCD in the large Nc limit gives a reasonable, if somewhat cartoonish, description of the theory at Nc=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 Nc limit is quite different from Nc=3. Instead of having a cross-over as in Nc=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 Nc 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 Nc 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 Walls gas. The talk will conclude with an attempt to draw lessons for QCD Nc=3.

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