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The thermodynamics of large-N QCD and the nature of metastable phases[1] YUKARI YAMAUCHI, THOMAS COHEN, SCOTT LAWRENCE, University of Maryland, College Park — In the limit of a large number of colors (N), both Yang-Mills and quantum chromodynamics are expected to have a first-order phase transition separating a confined hadronic phase and a deconfined plasma phase. The existence of a first-order transition suggests that the hadronic phase can be superheated and the plasma phase supercooled. The talk will focus on the thermodynamic nature of such metastable phases and beyond their endpoints. The supercooled deconfined plasma at large N, if it exists, has negative absolute pressure – a pressure below that of the vacuum. For energy densities beyond the endpoint of the hadronic superheated phase, a description of homogeneous matter composed of ordinary hadrons with masses of order unity in a $1/N$ expansion can exist, and acts as though it has the constant Hagedorn temperature in the $N \to \infty$ limit. In this regime, the connection between the canonical and microcanonical descriptions breaks down and the system cannot fully equilibrate as $N \to \infty$. Rather, in a hadronic description, energy is pushed to hadrons with arbitrarily large masses.

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