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Deconfinement transition as a black hole formation by the condensation of QCD string

Monday, 23 June 2014 16:30 (20 minutes)

In the gauge/gravity duality, the deconfinement transition in the gauge theory is identified with a formation of black hole in the dual gravity theory. In this talk, firstly we give quantitative evidence for this identification from the thermodynamic study of the supersymmetric theory. Then we consider generic gauge theories, including QCD, and show that the deconfinement transition is the condensation of very long and self-intersecting QCD strings, which is analogous to the formation of a black hole in string theory. We provide a concrete picture by using lattice gauge theory and matrix models in the Hamiltonian formulation, and give numerical evidence supporting this interpretation. As a by-product we derive an analytic formula for the deconfinement temperature of the lattice gauge theory in the strong coupling limit.
We also argue how the fast thermalization of the QGP can be understood from this viewpoint.

This talk is based on the following work:

Hanada, Hyakutake, Ishiki and Nishimura, Science (2014)[arxiv:1311.5607].
Hanada, Maltz and Susskind, arxiv:1405.****[hep-th], to appear.
Berkowitz, Hanada, Hayden and Susskind, in progress.

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