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Speaker: Andreas Athenodorou (University of Pisa)

Title: "The Spectrum of the SU(N) confining string"

Abstract:

I will present our recent results on the spectrum of a confining flux tube that is closed around a spatial torus as a function of its length. The extraction of the spectrum has been realized using lattice techniques. I will briefly demonstrate the spectrum in 2+1 and then I will focus on the case of 3+1 dimensional SU(N) gauge theories. For $D=3+1$ we have performed a calculation for $N=3,5,6$ and for various values of spin, parity and longitudinal momentum. A new extended basis of operators enables us to extract the first few excitation states for each different combination of spin and parity.

Long flux-tubes can be thought of as infinitesimally thin strings; hence their spectrum is expected to be described by an effective string theory. Furthermore, the flux-tube's internal structure makes possible the existence of massive states in addition to string modes. Recent theoretical advances which made use of our old and less accurate results on $D=3+1$ provided evidence for the existence of a massive particle with particular (axionic) quantum numbers on the world-sheet of the QCD flux-tube.

Our calculations on the spectrum of the flux tube in $D=2+1$ have shown that this is very well described by the Nambu-Goto bosonic string up to small deviations. However, our results in $D=3+1$ demonstrate that albeit most states exhibit spectrum which can be approximated adequately by Nambu-Goto there is now an even stronger evidence for the existence of a massive axion on the world-sheet of the QCD flux-tube as well as a bound state of two such axions twice as massive. Hence, a complete picture of the low-lying spectrum of the confining flux-tube will be provided.