Contribution ID: **24** Type: **not specified**

A gauge-invariant measure for gauge fields on CP^2

Thursday 29 August 2024 11:45 (45 minutes)

I discuss four-dimensional non-Abelian gauge theory parametrized on a complex pro- jective space CP2 as a way of gaining insights into (3+1)-dimensional QCD. The low- energy scale of non-Abelian gauge theories remains an elusive area of research even af- ter decades of work. Working on CP2 facilitates a manifestly gauge-invariant parametriza- tion of the gauge fields and a possibly non-perturbative way of analyzing the low-energy dynamics of QCD. In particular, we use this parametrization to find the gauge-invariant measure for the gauge orbit space, which is the space of all gauge potentials modulo the set of all gauge transformations. The terms appearing in the measure that are of particular interest are a four-dimensional Wess-Zumino-Witten (WZW) action for the longitudinal modes of the gauge potentials, and a mass-like term for the transverse components. I argue that the appearance of a WZW action indicates the existence of a kinematic regime where the Yang-Mills theory can be approximated by a 4d-WZW theory. This result can be used to draw similarities between the mechanism of confinement in four dimensions and two dimensions. On the other hand, the appearance of a mass term in the measure can provide dimensional transmutation in QCD through an explicit gauge-invariant mass term for the gauge fields. Finally, I briefly outline a trajectory for moving beyond CP2 and recovering 4d Euclidean geometry, thus, bringing this framework closer to QCD.

Author: Dr MAJ, Antonina (The Graduate Center, CUNY)

Presenter: Dr MAJ, Antonina (The Graduate Center, CUNY)