Contribution ID: **21** Type: **Poster**

# The Hidden Symmetries of Yang-Mills Theory in (3 + 1)-dimensions

This work explores novel hidden symmetries within (3+1)-dimensional Yang-Mills theories, uncovering structures that parallel the integrable systems typically seen in lower dimensions. By formulating the classical Yang-Mills equations as integral equations over generalized loop spaces, we reveal a flat connection and an infinite set of conserved, gauge-invariant charges. These charges, unlike energy and momentum, live in the space of non-abelian electric and magnetic charges and exhibit a fundamental Poisson bracket structure with an associated R-matrix. The theory exhibits a hidden, non-Lie infinite-dimensional symmetry group in loop spaces, hinting at a new framework for integrability in higher-dimensional field theories. Our results also consist in two classes of symmetries: one generated by conserved charges via Poisson brackets, and another as gauge-like transformations of the integral equations themselves. These findings suggest a profound hidden structure within Yang-Mills theories, possibly contributing to non-perturbative analysis in quantum chromodynamics and related models

**Authors:** MALAVAZZI, Henrique; Dr FERREIRA, Luiz Agostinho (University of Sao Paulo)

**Presenter:** MALAVAZZI, Henrique

**Session Classification:** Poster