UNIVERSITY OF MIAMI
COLLEGE of
ARTS & SCIENCES

Miami Physics Conference 2026

Date: Dec 10-16, 2026

Location: Lago Mar Resort

Affiliation: Tokyo University of Science

Shintaro Yamamoto, Student

Topology and Fermion Number in Chiral Soliton Backgrounds: The Role of Coupling Schemes

Abstract

When topological solitons are coupled to fermions, they often induce a nontrivial fermion number. In the chiral quark soliton model (CQSM), this phenomenon underlies the identification of soliton topology with baryon number. However, whether this topology--fermion-number correspondence is determined solely by soliton topology or also depends on the fermion--soliton coupling scheme remains unclear.

In this talk, we investigate this question by comparing several coupling schemes to the same SU(N) chiral soliton background. We evaluate the variation of the regularized fermion number along a path in model-parameter space and show that the standard chiral Yukawa coupling and an axial-vector coupling yield the topological charge associated with the soliton. In contrast, the variation vanishes for a vector coupling, even in the presence of nontrivial soliton topology.

These results demonstrate that the fermionic response is sensitive not only to the topology of the background field but also to the structure of its coupling to fermions.

This talk is mainly based on our recent work, arXiv:2610.29632.