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Lattice chiral gauge theory, $U(1)$ symmetries, and absence of a strong CP problem

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It has recently been argued that a proposal to nonperturbatively regulate chiral gauge theories on the boundary of a five-dimensional Euclidian lattice will fail due to the existence of exact $U(1)$ symmetries not present in the target theories. A related observation is that in the presence of gauge fields with nontrivial topology, fermion zero modes will appear embedded in the extra dimension. We show that for a boundary theory that contains QCD, the exact $U(1)$ symmetry in conjunction with fermion zero modes in the 5d bulk gives rise to a 4d world with neither a strong CP problem nor a light η' meson. This solution to the strong CP problem results because the fermion zero modes in the bulk which quench contributions to the partition function from nontrivial gauge field topology much in the way a massless up quark would, but without altering the hadron spectrum. The consequence is a certain level of nonlocality in the interactions of the η' meson.

Parallel Session (for talks only)

Theoretical developments and applications beyond Standard Model

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Session Classification: Theoretical developments and applications beyond Standard Model