Abstract:

It is well-established that the Standard Model (SM) of particle physics is based on su(3)Xsu(2)Xu(1) Lie-algebra. However, what is less appreciated is that SM accommodates a Z_6 1-form global symmetry. Gauging this symmetry, or a subgroup of it, changes the global structure of the SM gauge group and amounts to summing over sectors of instantons with fractional topological charges. After a brief review of the concept of higher-form symmetries, I will explain the origin of the Z_6 1-form symmetry and construct the explicit fractional-instanton solutions on compact manifolds. The new instantons mediate baryon-number and lepton-number violating processes, which can win over the weak BPST-instanton processes, provided that SM accommodates extra hyper-charged particles above the TeV scale. I will also comment on the cosmological aspects of the new solutions and speculate on the decompactification limit.