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Title: Anomaly preserving compactifications and semi-classical description of confinement via center-vortices

Abstract: I describe anomaly-preserving compactifications of four dimensional gauge theories, including Yang-Mills theory, its super symmetric version, and QCD, down to 2d by turning on t Hooft flux through a 2-torus. This provides a new framework to analytically calculate nonperturbative properties such as confinement, chiral symmetry breaking, and multi-branch structure of vacua. I give the semi classical description of these phenomena based on the center vortices and show that it enjoys the same anomaly matching condition with the original 4d gauge theory. For YM, the long-distance theory maps to topological gauge theory (TQFT) deformed by local topological operators. In QCD, our work provides an analytic derivation of chiral Lagrangian with  $U(1)_b$  background on small  $T^2 \times R^2$  by using non abelian bosonization. We conjecture that the weak-coupling vacuum structure on small  $T^2 \times R^2$  is adiabatically connected to the strong coupling regime in infinite volume.