Summary: We propose a regularization of four-dimensional chiral gauge theories using six-dimensional Dirac fermions. In our formulation, we consider two different mass terms having domain-wall profiles in the fifth and the sixth directions, respectively. A Weyl fermion appears as a localized mode at the junction of two different domain walls. One domain wall naturally exhibits the Stora-Zumino chain of the anomaly descent equations, starting from the axial U(1) anomaly in six dimensions to the gauge anomaly in four dimensions. Another domain wall implies a similar inflow of the global anomalies. The anomaly-free condition is equivalent to requiring that the axial U(1) anomaly and the parity anomaly are canceled among the six-dimensional Dirac fermions. Since our formulation is based on a massive vector-like fermion determinant, a nonperturbative regularization will be possible on a lattice. Putting the gauge field at the four-dimensional junction and extending it to the bulk using the Yang-Mills gradient flow, as recently proposed by Grabowska and Kaplan, we define the four-dimensional path integral of the target chiral gauge theory.

MSC:
81T13 Yang-Mills and other gauge theories in quantum field theory

Full Text: DOI arXiv