Electroweak symmetry breaking from layered QCD

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Outline

EWSB via proximity effect

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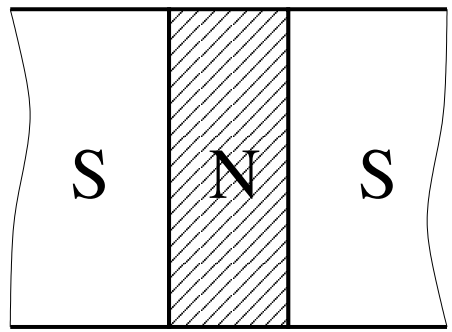

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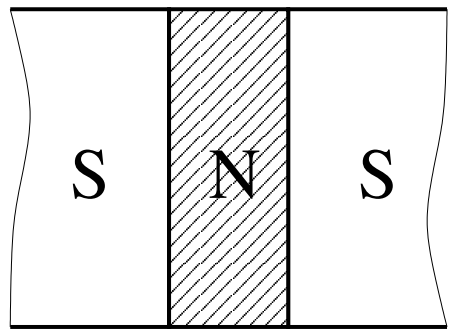

- Fermions get masses too! (By a mechanism similar to Andreev scattering.)

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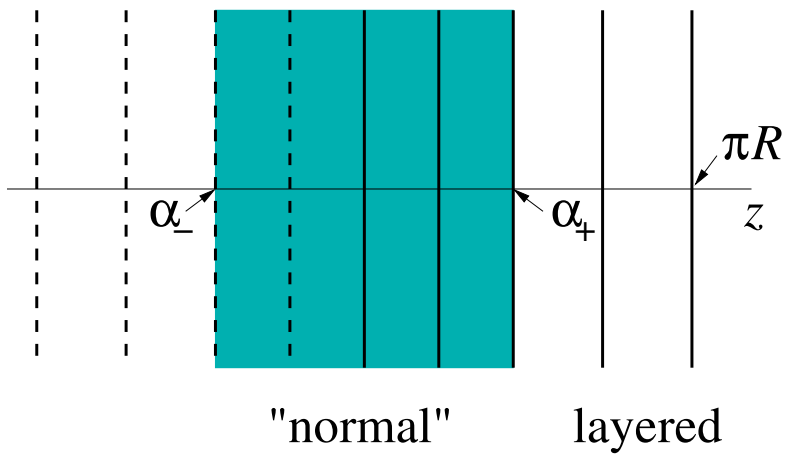
- Confinement-"deconfinement" boundary:



Masses of W and Z

- Ordinary QCD is localized in the "normal" region because of the difference in mass gaps. Indeed,

$$\frac{1}{g^2_{\rm QCD}} \approx \int_{\rm normal} \frac{dz}{g_5^2} = \frac{N_{\rm norm}\Delta z}{g_5^2}\,,$$

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$$m_W \sim m_Z \sim g_W F_{\pi,\mathrm{layer}} \sqrt{N_{\mathrm{layer}}} \,.$$

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  This is similar to technicolor (and distinct from Higgsless models), so the ρ parameter is protected.
- If $N_{\rm layer} \gg 1$, the scale of new physics ($4\pi F_{\pi,{\rm layer}}$) can be much smaller than 1 TeV.

Chiral fermions and flavor symmetries

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- If the barrier for quarks to go into the layered state was strictly infinite, the Hamiltonian

$$H \sim \sum_{\alpha=\alpha_-}^{\alpha_+-1} (i\bar{q}_\alpha \gamma^5 q_{\alpha+1} + \text{H.c.})$$

would have two strictly massless chiral modes (one R and one L, in the 4d sense), of the form

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- Orbifolding allows for a misalignment ("twist") between the quark condensates at $\alpha > \alpha_+$ and $\alpha < \alpha_-$. Such twists break flavor symmetries.

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- Open questions: lepton masses? neutrinos?