QFT

- $\mathcal{L} = \bar{\psi} i \not{D} \psi$
- good to look at $Z(A) = \int \underbrace{D\psi D\bar{\psi}}_{\text{not chirally inv.}} e^{i\int d^4x\, \bar{\psi} i \not{D} \psi + \dots}$

't Hooft anomaly matching condition.

- suppose you are given a strongly coupled theory w/ global symmetries G & gauge group G_c and G is not spont. broken $\Rightarrow D^{\alpha\beta\gamma} \neq 0$
  - $\rightarrow$ weakly gauge G + add "spectator" fermions, trivial under G_c, s.t. $D^{(\text{gauge})}_{\alpha\beta\gamma} = 0$.
  - $\rightarrow$ in the IR still $D^{(\text{gauge})}_{\alpha\beta\gamma} = 0$, but $D^{(\text{spectators})}_{\alpha\beta\gamma} \neq 0$!
    $\Rightarrow \exists$ massless spin 1/2 bound states $\ni D_{\alpha\beta\gamma} = 0$.

- nice for e.g. susy, but not for SM.

$\rightarrow G_c = SO(3)_c$, $G = SO(3)_V \times SU(3)_A \times U(1)_V \times U(1)_A$

- but $U_{em}(1)_V \in SU(3)_V$ gauged