$$\Sigma_0 = \begin{pmatrix} & & I_2 \\ & 1 & \\ I_2 & & \end{pmatrix}$$ breaks $SU(5) \to SO(5)$.
(ex)

\# Goldstones: $\dim SU(5) = n^2 - 1 = 24$
$\dim SO(5) = \frac{n(n-1)}{2} = 10$

$\overline{\quad 14 \quad}$

$$\Sigma(x) = e^{2i\Pi/f}\Sigma_0$$

$\Pi^a X^a \quad a = 1, \cdots, 14$

Now, gauge $[SU(2) \times U(1)]^2 < SU(5)$

$$T_1^a = \begin{pmatrix} \sigma^a/2 & \\ & \end{pmatrix} \qquad Y = \mathrm{diag}(-3,-3,2,2,2) \qquad g_{1(1)} \; g_{2(1)}$$

$$T_2^a = \begin{pmatrix} & \\ & -\sigma^{a*}/2 \end{pmatrix} \qquad Y = \mathrm{diag}(-2,-2,-2,3,3) \qquad g_{1(2)} \; g_{2(2)}$$

Σ_0 breaks this $\to SU(2) \times U(1)$ (ex.)

indeed, $$\Pi = \begin{pmatrix} & \phi/\sqrt{2} & \tau^+ \\ \phi^\dagger/\sqrt{2} & & \phi^T/\sqrt{2} \\ \tau & \phi^*/\sqrt{2} & \end{pmatrix} + \text{eaten}$$

triplet of $SU(2)$.

Now: $g_{i(1)} = 0 \Rightarrow SU(3)_1$ global sym $\begin{pmatrix} 3\times 3 & \\ & \end{pmatrix}$

$g_{i(2)} = 0 \Rightarrow SU(3)_2$ global sym. $\begin{pmatrix} & \\ & 3\times 3 \end{pmatrix}$

<u>Either</u> prevents m_h ; acts as $\phi_i \to \phi_i + \varepsilon_{i(1,2)}$ (ex)

$\therefore$ if $g_{(1)}$ or $g_{(2)} = 0$, $m_h = 0$.

$\therefore$ $\delta m_h^2 \propto g_{(1)} g_{(2)} \Lambda^2$

$\uparrow$ two loop!

designer fine tuning ...

Such models can permit $\Lambda \sim 10\,\text{TeV}$,

avoiding little hierarchy problem

(more fundamentally, need $\sim$ ETC, etc.)