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1. SO(10) FLAVOR SYMMETRY

In an SO(10) GUT, all the fermions of one generation belong to a single spinorial representation of SO(10), the 16. The minimal SO(10) yukawa interactions are given by:

$$\mathcal{L}_{\text{Yukawa}} = Y_{10}^{ij} 16_i H_{10} 16_j + Y_{10}^{ij} 16_i H_{1\bar{2}6} 16_j + Y_{10}^{ij} 16_i H_{120} 16_j \tag{1}$$

Here we have suppressed SO(10) indices, Y_{10} and $Y_{1\bar{2}6}$ are symmetric matrices and Y_{120} is antisymmetric. This is the minimal content necessary to accommodate realistic fermion masses and mixing as well as SO(10) breaking. In the absence of yukawa interactions, there is an SU(3) flavor symmetry which mixes the three generations of fermions, with the 16 transforming as a triplet. The yukawas break this symmetry explicitly, but it can be restored promoting the yukawas to spurions which appropriately transform under SU(3) as to restore the symmetry.

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