String sketches of Dynamical supersymmetry breaking

M. Bianchi, F.Fucito, J.F.M , hep-th/0904.2156

F. Fucito, A. Lionetto, J.F.M, R. Richter , work in progress

Motivations

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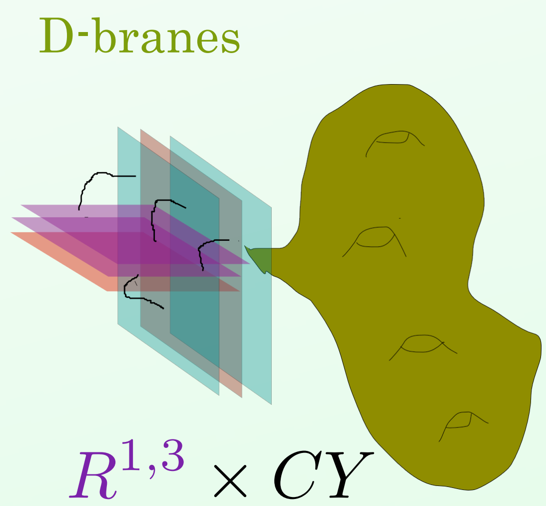
(orbifolds, intersecting or magnetized branes)



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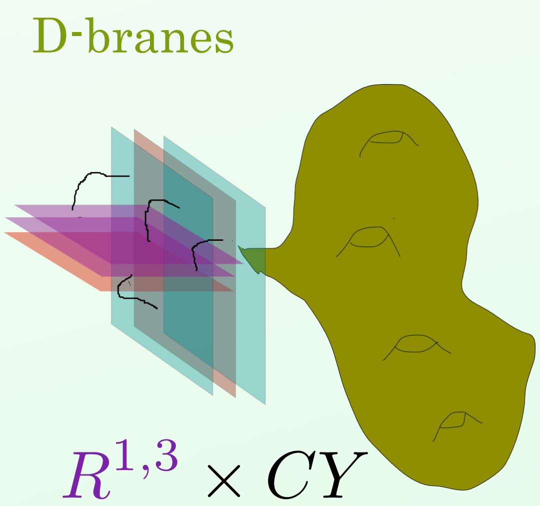

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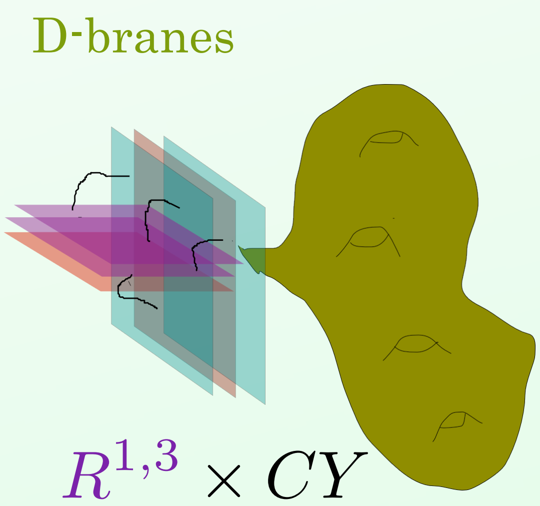

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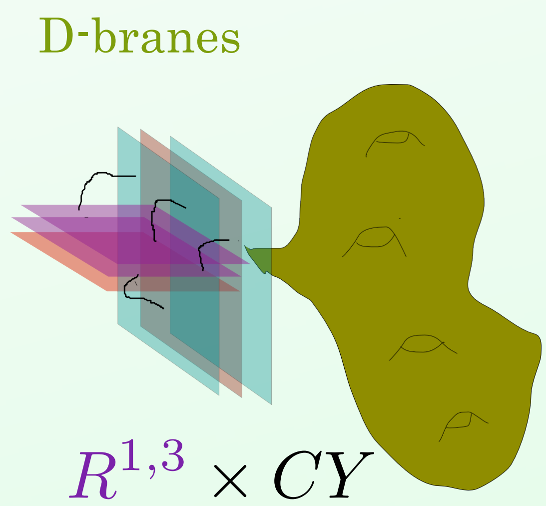

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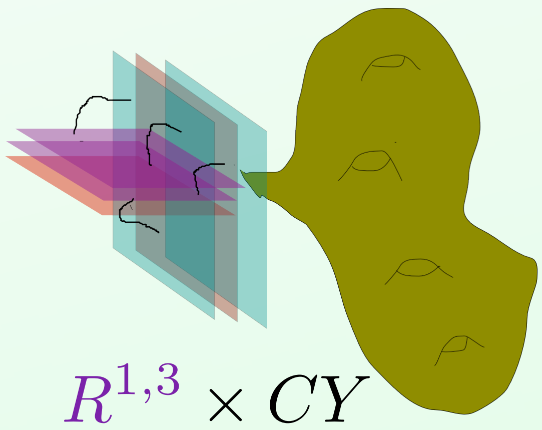

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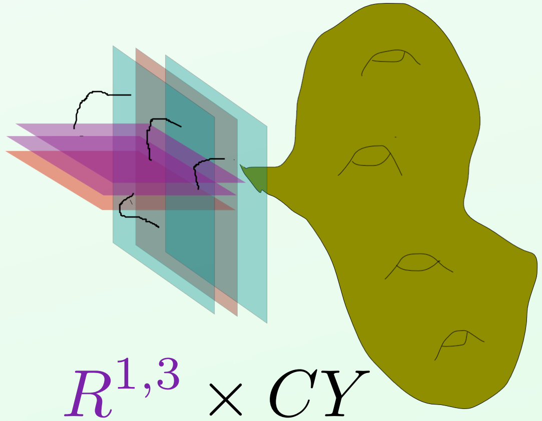

$R^{1,3} \times CY$

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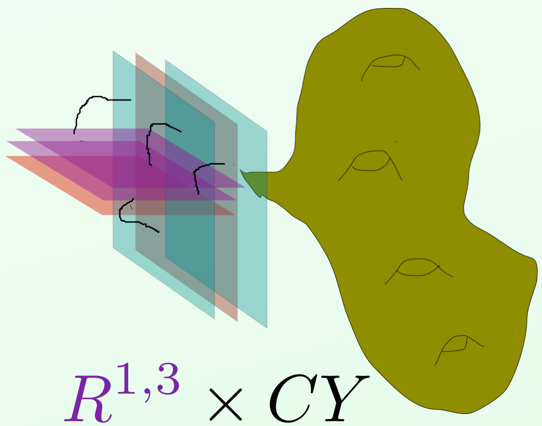

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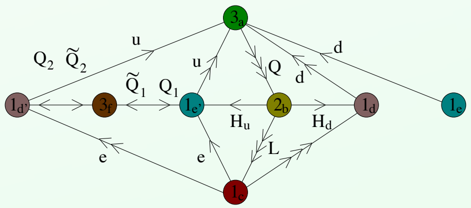

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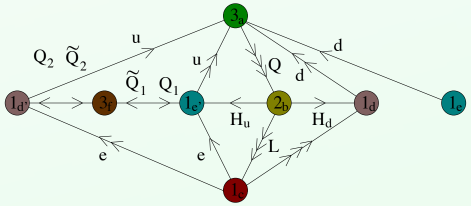

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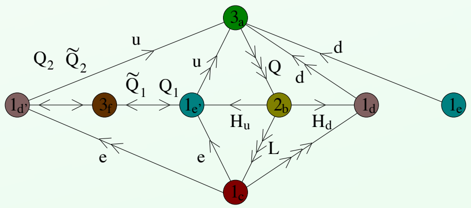

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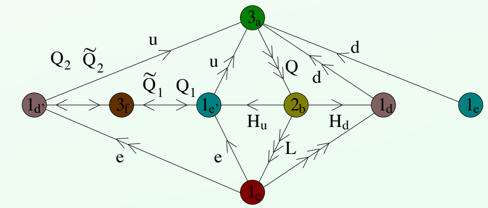

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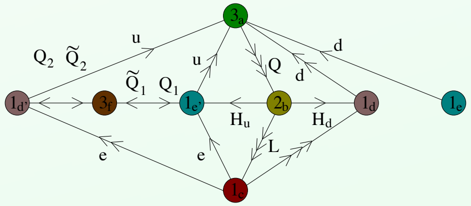

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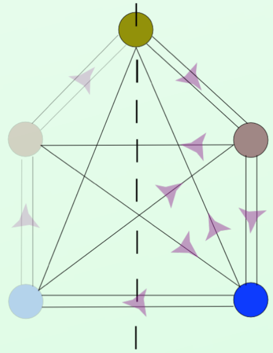

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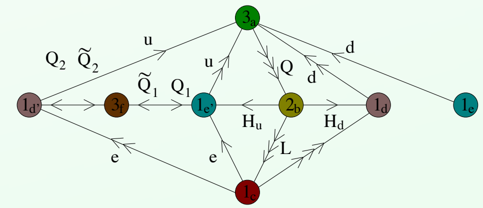

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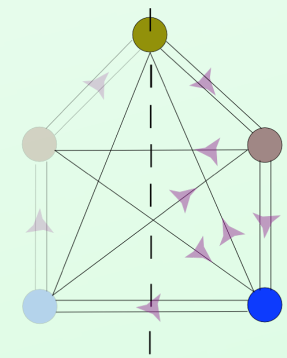

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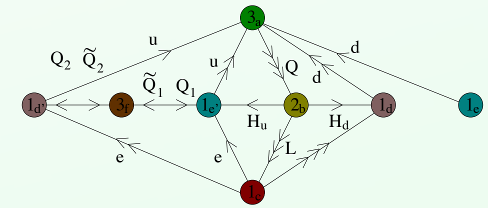

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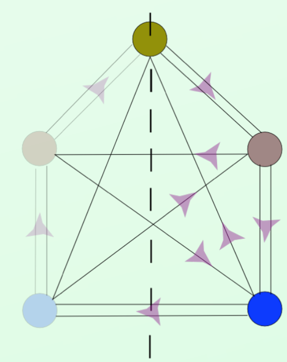

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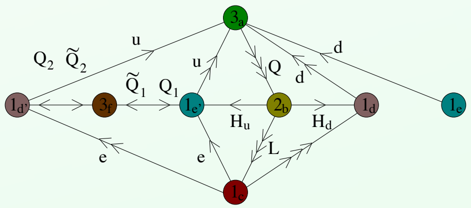

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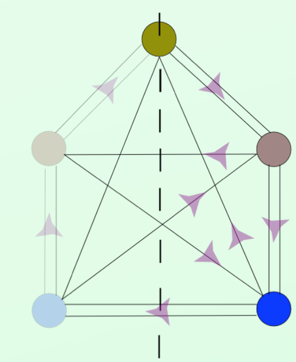

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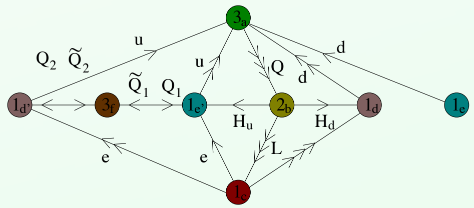

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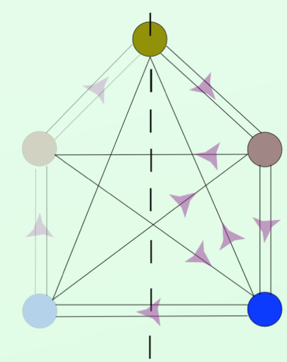

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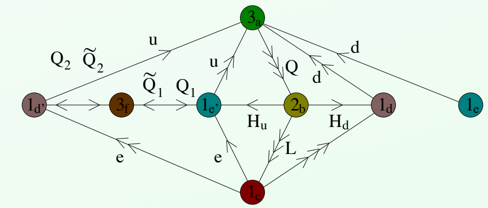

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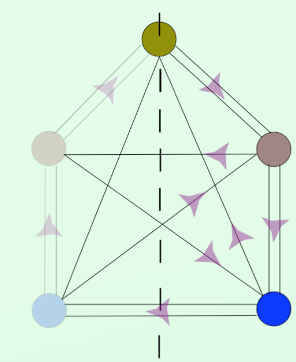

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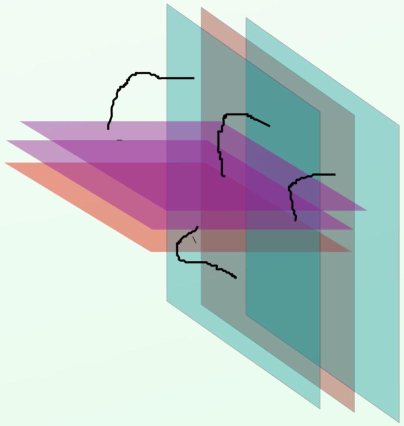

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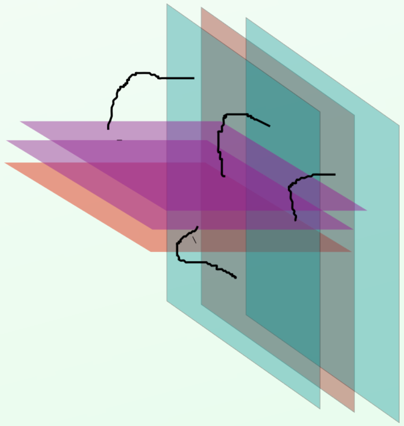

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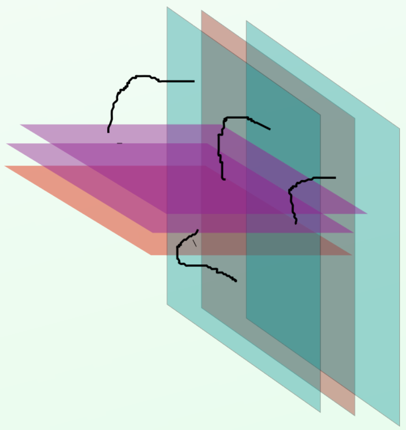

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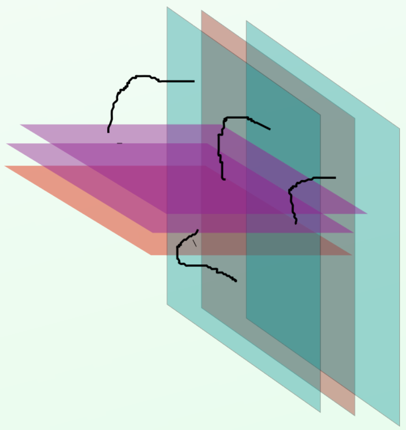

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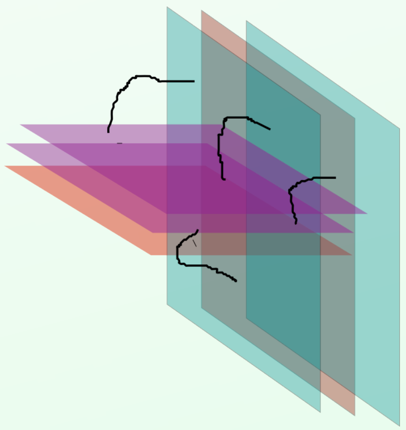

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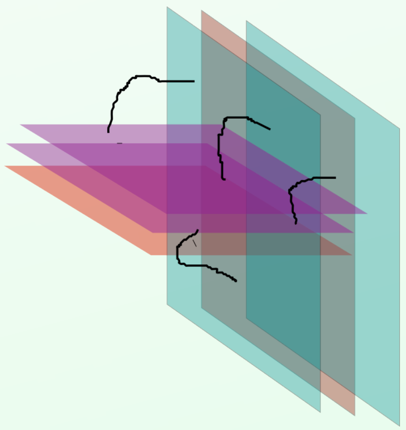

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$\Rightarrow$ $$\Delta n(\square_a) + (N_a + 4)\Delta n(\square\square_a) + (N_a - 4)\Delta n(\begin{smallmatrix}\square\\\square\end{smallmatrix}_a) = 0$$ Anomaly cancelation + ...

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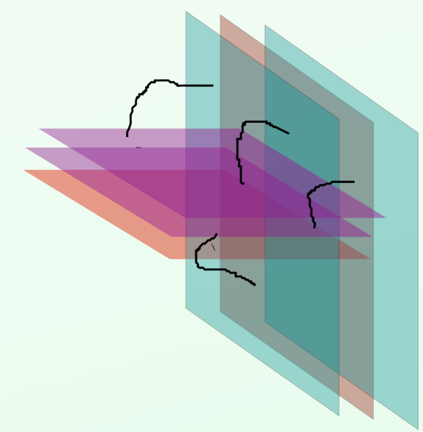

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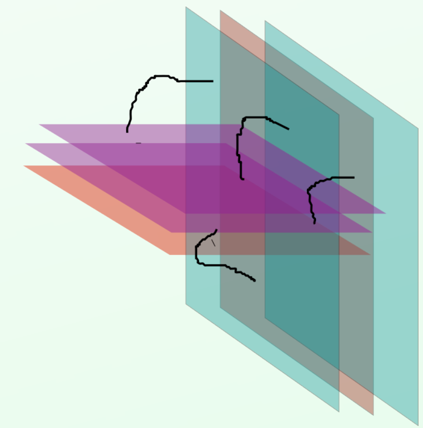

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$$\Rightarrow \quad q_a\, N_a\left(\Delta n(\square\!\square_a) + \Delta n(\begin{smallmatrix}\square\\\square\end{smallmatrix}_a)\right) + \sum_{x\neq a} q_x\, N_x\, \Delta n(\square_a, \square_x) = 0$$

Field theory Models

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- Gauge group: $G = \underbrace{U(3)_a \times SU(2)_b \times U(1)_c \times U(1)_d \times U(1)_e}_{\text{MSSM+extra U(1)'s}} \times U(3)_f$

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Yukawa int for Higgs and Mesons

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❖ At the vacuum: $\left\{ \begin{array}{l} \vec{x} \\ \vec{F}_x \end{array} \right.$ masses of quark and leptons: Soft susy breaking terms:

Susy breaking vacua

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❖ Gauge unbroken solution:

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$$V = 0.25$$

$$V = \frac{g_d^2 g_e^2 (\xi_d + \xi_e)^2}{2(g_d^2 + g_e^2)}$$

❖ Gauge broken solution:

$$g_b = g_d = g_e = \Lambda = 0.5 \qquad m = \mu = \xi_e = \xi_d = 1$$
$$h_u = 0.01 \qquad h_d = 0.5 \qquad x_1 = 0.37 \qquad x_2 = 0.46$$
$$V = 0.23$$

String realizations

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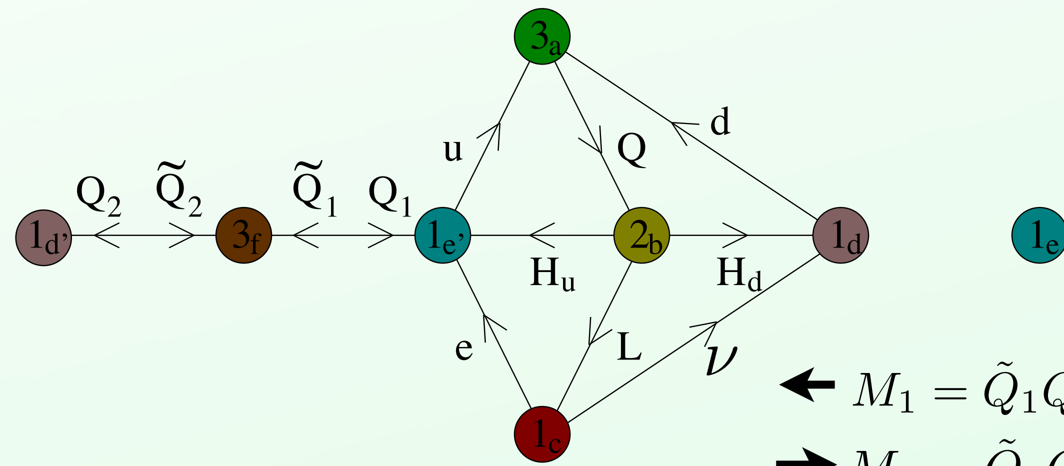
- One generation model:



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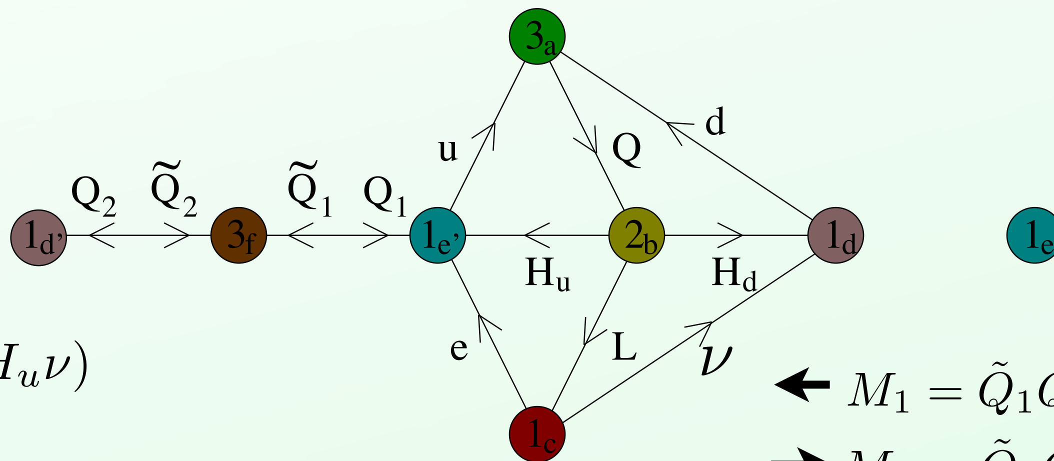

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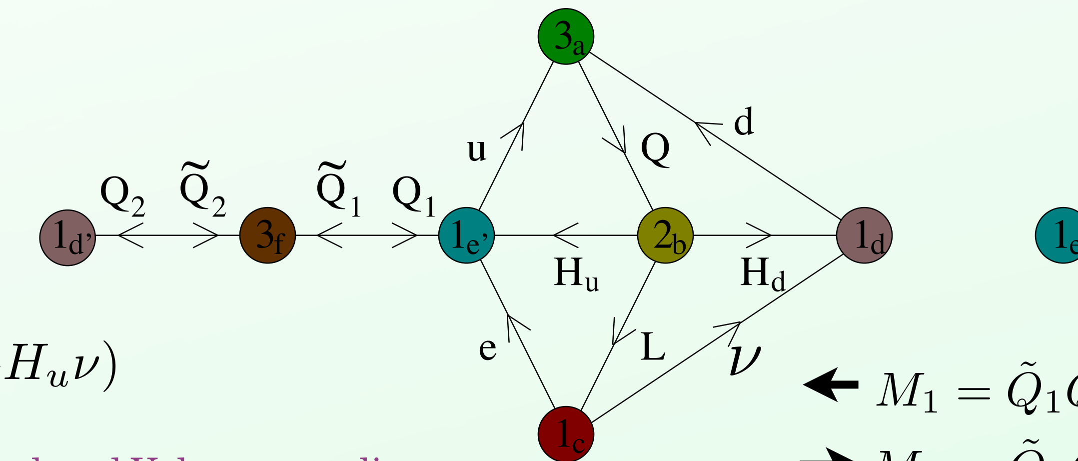

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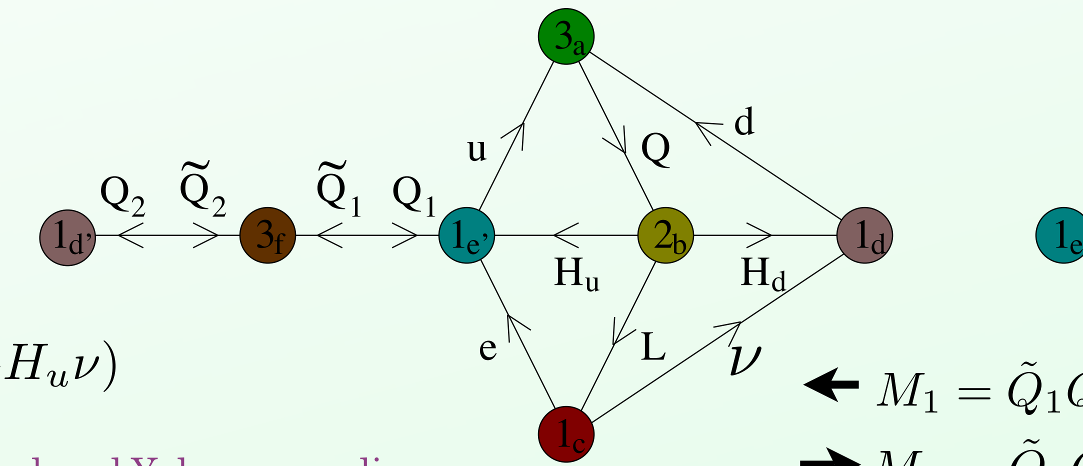

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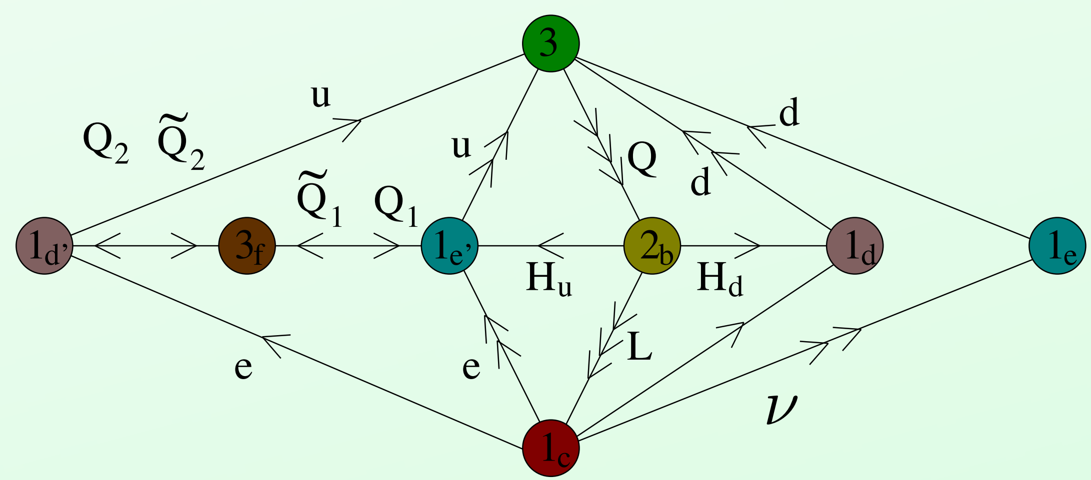

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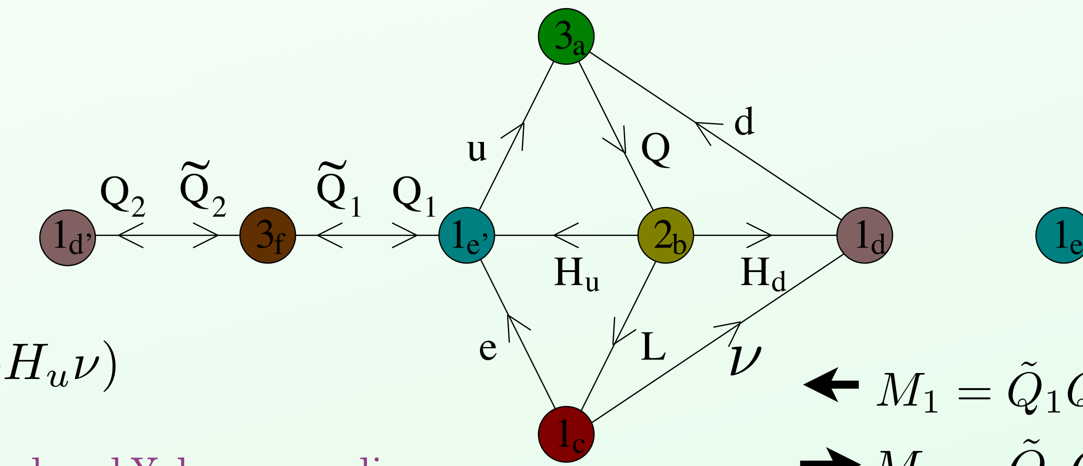

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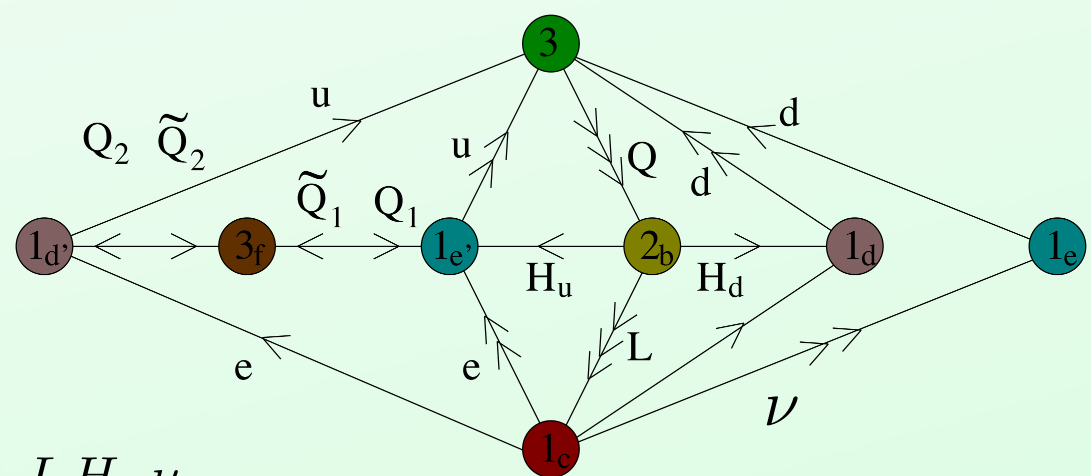

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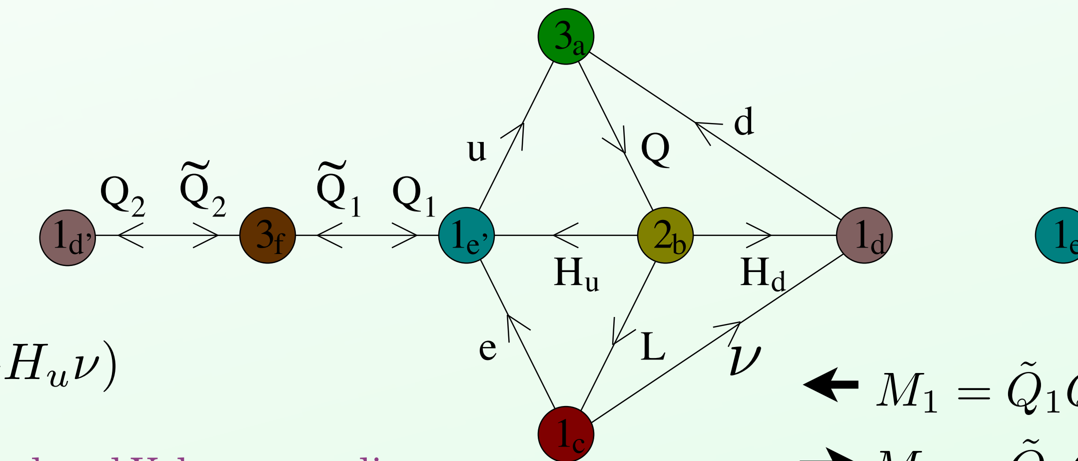

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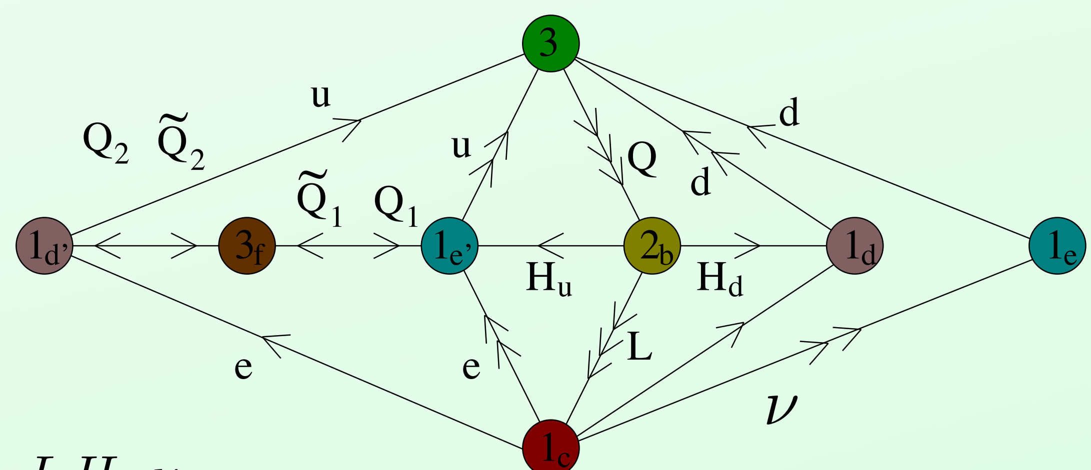

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Induced Yukawa couplings for the third generation

Z_5- quiver

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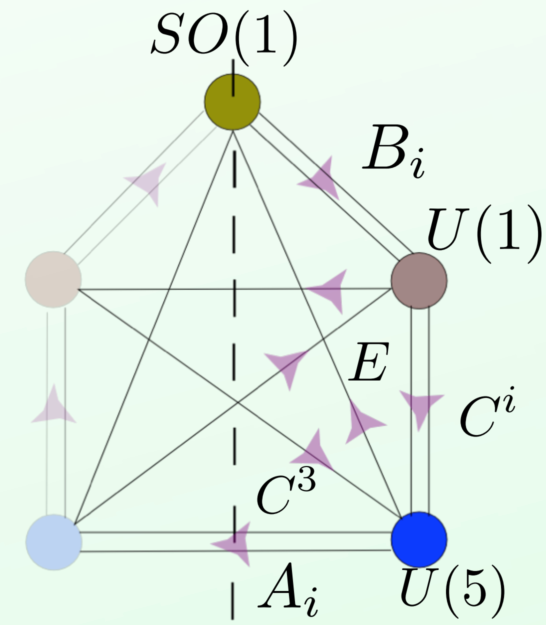
- N=1 Field Content: Type IIB with D3, O3 planes



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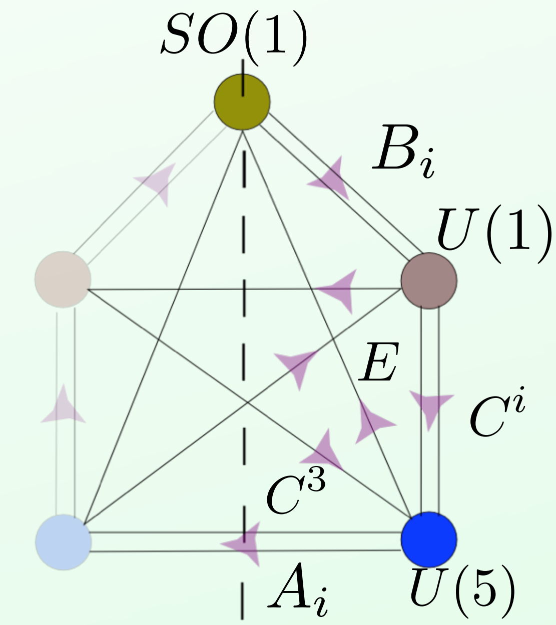

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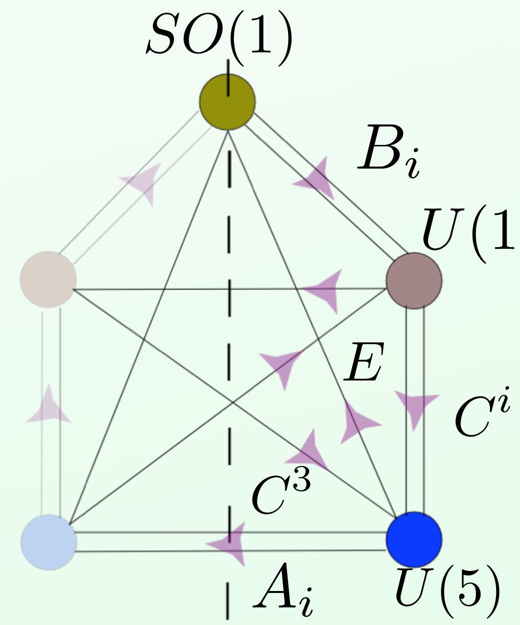

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$$X^I = C^{Iu} E_u \qquad Y^i_I = \tfrac{1}{2}\epsilon_{IJK} A^i_{u_1 u_2} C^{Ju_1} C^{Ku_2}$$

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Z_5- quiver

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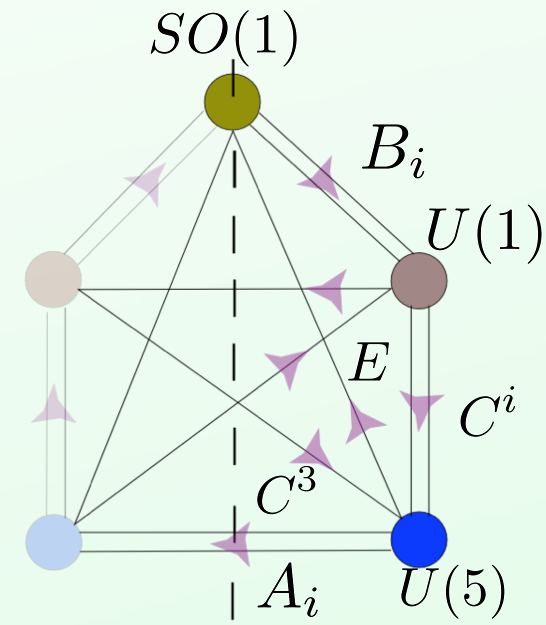

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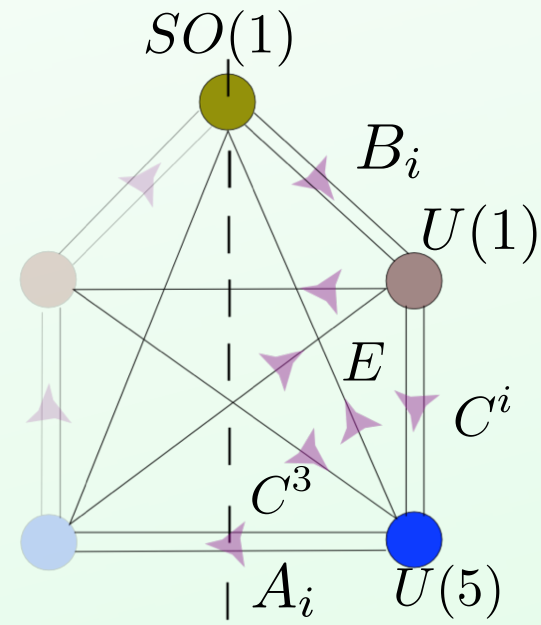

Z_5- quiver

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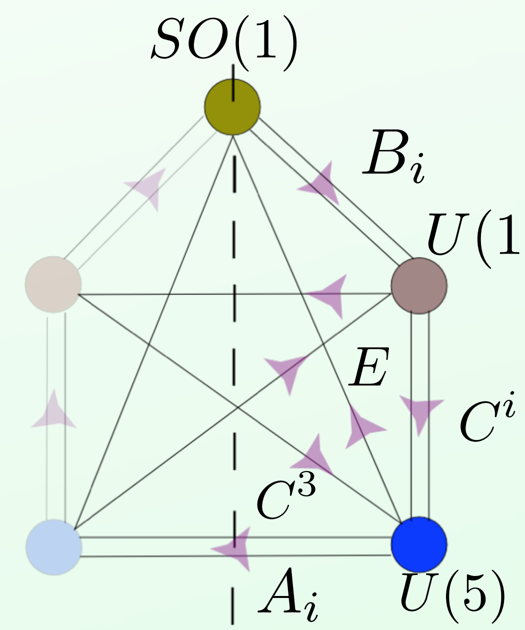

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❖ Susy breaking: $\xi_{U(1)} = m^2 \neq 0$

Z_5- quiver

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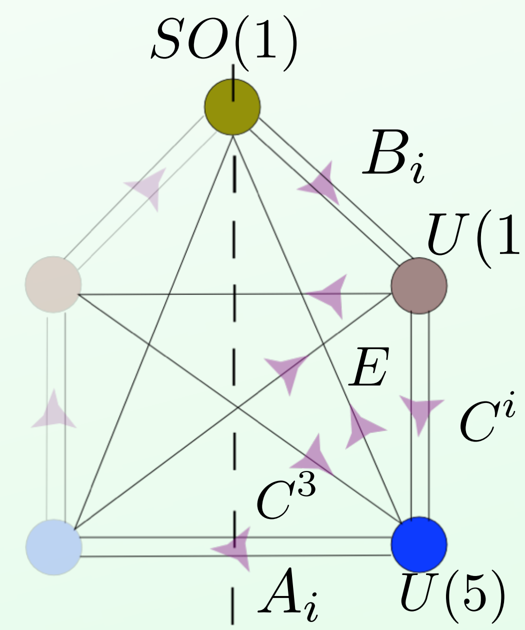

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Z_5- quiver

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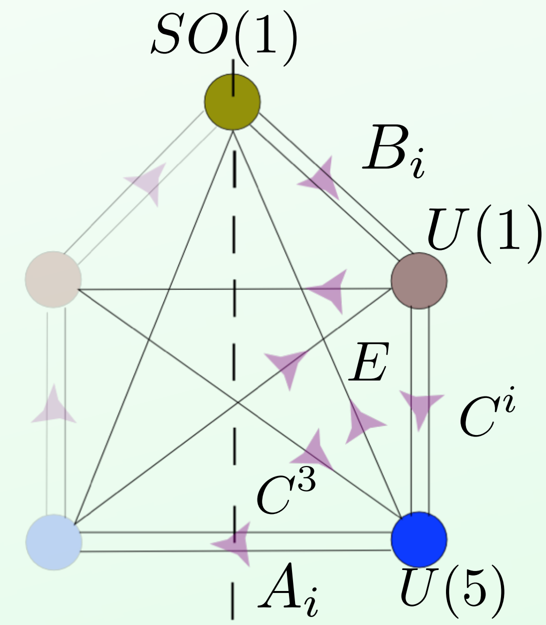

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$$X^I = C^{Iu} E_u \qquad Y_I^i = \frac{1}{2} \epsilon_{IJK} A^i_{u_1 u_2} C^{J u_1} C^{K u_2}$$

$$\tilde{Y}^{ij} = \frac{1}{4} \epsilon^{u_1 \ldots u_5} A^i_{u_1 u_2} A^j_{u_3 u_4} E_{u_5}$$

$$Z^{iI} = \frac{1}{12} \epsilon^{u_1 \ldots u_5} A^i_{u_1 u_2} A^j_{u_3 u_4} A_{u_5 v, j} C^{Iv}$$

❖ Quantum deformed constraints:

$$Y_I^i Z_i^I = 0$$

$$\epsilon_{IJK} X^I Z_i^J Z^{iK} + Y_{iI} \tilde{Y}^{ij} Z_j^I = \Lambda^{10}$$

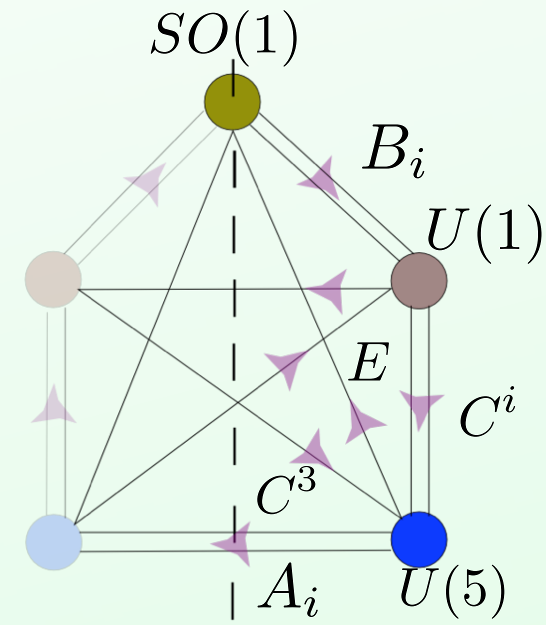
❖ The prepotential: $W_{\text{pert}} = B_i X^i + \delta_i^I Y_I^i$

❖ Susy breaking: $\xi_{U(1)} = m^2 \neq 0 \Rightarrow \langle B_i \rangle = (m, 0)$

$$\Rightarrow \quad W_{\text{eff}} = A^1_{uv} C^{2u} C^{3v} + \frac{m \Lambda^{10}}{Z^{i\alpha} Z_{i\alpha}}$$

Z_5- quiver

- N=1 Field Content: Type IIB with D3, O3 planes



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Conclusions

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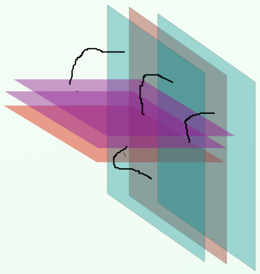

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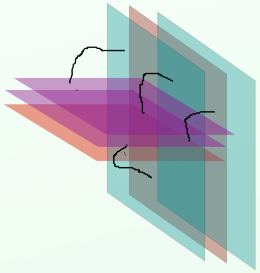
❖ Brane intersections, orbifold singularities: F-, D- type interactions+instantons

Conclusions



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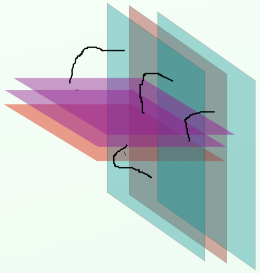

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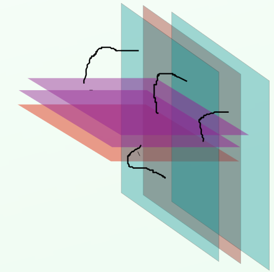

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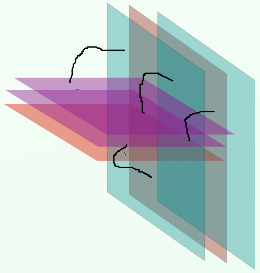

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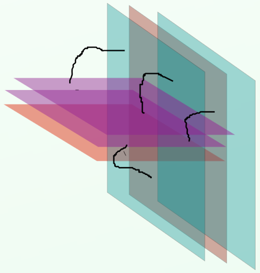

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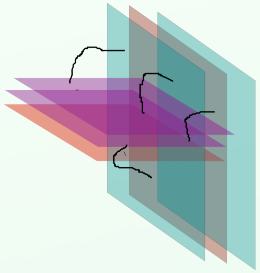

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❖ Metastability: Runaway vacua