

# 5d Higgs Branches in the Tropical Rain Forest

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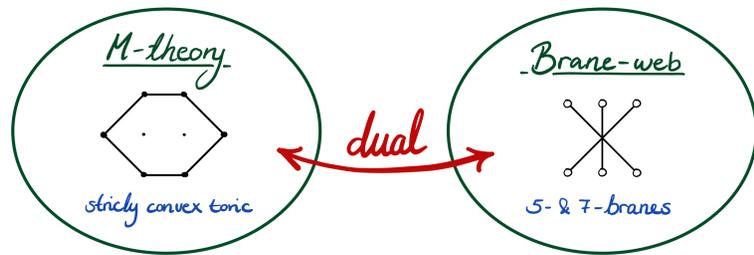


## 5d SCFTs

- Higher dimensional field theories
- Intrinsically strongly coupled
- UV dualities
- Rich moduli space
  - Higgs branch (hyper)
  - Coulomb branch (vector)

## String Theory Constructions

- \* M-theory on  $\mathbb{R}^{1,4} \times \text{CY}_3$  singularity (subclass: toric)
- \* 5-brane-web in type IIB

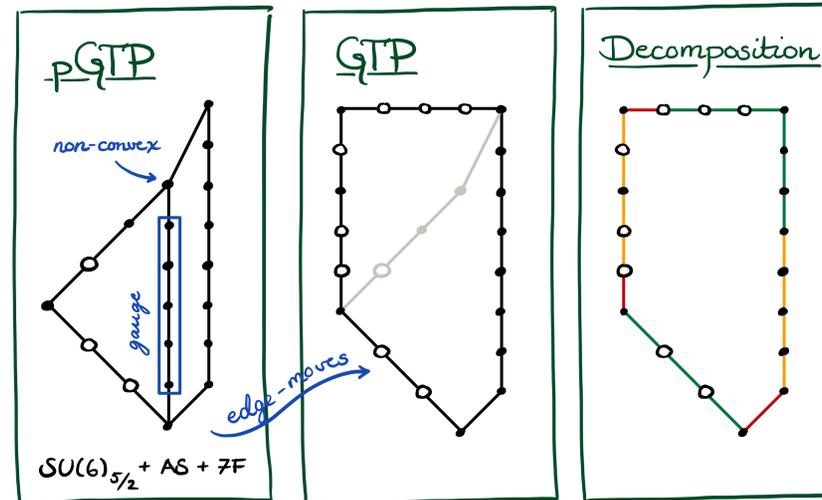


## Generalized Toric Polygon (GTP)

Generic brane-web dual to *Generalized Toric Polygon*: can have empty vertices (white dots).

Non-convexity signals that we are not at origin of Coulomb branch  $\rightarrow$  *edge-moves* (dual to Hanany-Witten brane creation).

Higgs branch accessed by *refined Minkowski sum* decomposition of GTP: generalizes decomposition of deformation theory of strictly convex toric polygons, dual to tropical curves in brane-web.



## 5d Higgs Branch

Recent progress characterising Higgs branch by:

*Magnetic quiver (MQ)*: Effective theory from reduction to 3d and 3d  $\mathcal{N} = 4$  mirror symmetry. 3d Coulomb branch of MQ identified with 5d Higgs branch:

$$C^{3d} \left( \begin{array}{c} 1 \quad 3 \\ \circ \quad \circ \\ | \quad | \\ 2 \quad 4 \\ \circ \quad \circ \\ | \quad | \\ 6 \quad 5 \quad 4 \quad 3 \quad 2 \quad 1 \\ \circ \quad \circ \quad \circ \quad \circ \quad \circ \quad \circ \end{array} \right) = \mathcal{H}(\text{SCFT}_{5d})$$

*Magnetic quiver*

Better control, monopole formula.

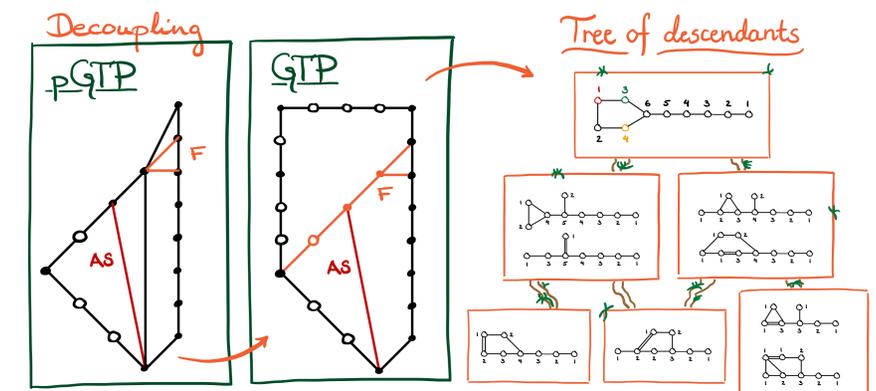
*Hasse diagram*: Foliation of Higgs branch in terms of symplectic singularities.

Full foliation structure obtained by partial resolutions of GTP, i.e. we can subtract symplectic singularities by introducing internal lines in GTP.

## Descendant Trees

Successive decoupling of hypermultiplets and RG-flow generates tree of descendant SCFTs.

Decoupling in GTP straightforwardly generalizes standard flop transitions of curves in toric polygons.



We apply this to a large class of 5d KK-theories:

- Single gauge node theories with anti-symmetric (AS) & fundamental (F) matter
- $SU(2)$  quiver gauge theories
- All rank 2 5d SCFTs

We determine the MQ and flavor symmetry for entire descendant trees.

## Outlook

- Relate generic GTP to a CY singularity
- Decouple directly in GTP (at SCFT point)
- Use GTP  $\rightarrow$  MQ map to decouple directly in MQ; relate HB of descendant to HB of parent (*in progress*)
- Flavor symmetry directly from GTP