

5d SCFTs, Brane Webs, Geometric Engineering and the Tangram

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Supersymmetric QFTs in 5 dimensions are a surprising result coming from string theory. In this talk, we will present two powerful methods from which they are constructed: one using geometries called Calabi-Yau (CY) 3-folds in M-theory, and another involving networks of 5-dimensional branes that form intricate structures called brane webs. A singular CY engineers a superconformal theory. The ways how such singularities can be removed (resolutions/deformations) encode information about the vacua of the 5d QFT (extended Coulomb/Higgs branch). If the CY is toric, then the deformations can be mapped in a straightforward way to the brane web via toric diagrams. One can go beyond the toric case by introducing 7-branes and making several external 5-branes end on them, these are Generalized Toric Polygons (GTPs). The fundamental junction of these GTPs are called T-cones, corresponding to a certain type of smoothable singularity. T-cones can be combined to tessellate the toric diagrams in the so-called 5d Tangram. We also clarify how certain transformations in the brane setups, known as Hanany-Witten transitions, map onto smooth changes in the CY geometry.

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