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Triality in Little String Theories

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I discuss a class of little string theories (LSTs) with eight supercharges on the world-volume of N M5-branes probing a transverse Z_M orbifold. These M-brane configurations compactified on a circle are dual to M D5-branes intersecting N NS5-branes on T^2 x $R^{\{7,1\}}$ as well as to F-theory compactified on a toric Calabi-Yau threefold $X\_{\{N,M\}}$. I argue that the Kähler cone of $X\_{\{N,M\}}$ admits three regions associated with weakly coupled quiver gauge theories of gauge groups $[U(N)]^M$, $[U(M)]^N$ and $[U(NM/k)]^k$ where $k=\gcd(N,M)$. These provide low-energy descriptions of different LSTs. The duality between the first two gauge theories is well known and is a consequence of the S-duality between D5- and NS5-branes or the T-duality of the LSTs. The triality involving the third gauge theory is new and I demonstrate it using several examples. Finally, I argue that triality implies a dihedral symmetry for the theories with M=1, which acts intrinsically non-perturbative from a gauge theory perspective.

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