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Magnetic Quivers, Higgs Branches, and 6d $N=(1,0)$ Theories

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The physics of M5 branes placed near an M9 plane on an A-type ALE singularity exhibits a variety of phenomena that introduce additional massless degrees of freedom. There are tensionless strings whenever two M5 branes coincide or whenever an M5 brane approaches the M9 plane. These systems do not admit a low-energy Lagrangian description so new techniques are desirable to shed light on the physics of these phenomena. The 6-dimensional $N=(1,0)$ world-volume theory on the M5 branes is composed of massless vector, tensor, and hyper multiplets, and has two branches of the vacuum moduli space where either the scalar fields in the tensor or hyper multiplets receive vacuum expectation values. Focusing on the Higgs branch of the low-energy theory, previous works suggest the conjecture that a new Higgs branch arises whenever a BPS-string becomes tensionless. Consequently, a single theory admits a multitude of Higgs branches depending on the types of tensionless strings in the spectrum. The two main phenomena discrete gauging and small E8 instanton transition can be treated in a concise and effective manner by means of Coulomb branches of 3-dimensional $N=4$ gauge theories.

After a brief reminder of the set-up, a formalism is introduced that allows to derive a novel object from a brane configuration, called the magnetic quiver. Focusing on the two main phenomena, I will demonstrate the derivation of the magnetic quiver for 6d $N=(1,0)$ theories from multiple M5 branes transverse to an A-type singularity. Thereafter, equipped with the necessary derivation rules, I will discuss magnetic quivers for M5 branes near an M9 plane.

The main features of this formalism are as follows: (i) the 3d Coulomb branch of the magnetic quiver yields the Higgs branch of the 6d system, (ii) all discrete gauging and E8 instanton transitions have an explicit brane realisation, and (iii) exceptional symmetries arise directly from brane configurations. The formalism facilitates the description of Higgs branches at finite and infinite gauge coupling as spaces of dressed monopole operators.

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