SUSY Gauge Singlets and Dualities

Moriond EW09

Steve Abel and **James Barnard**

Durham University
IPPP, Department of Mathematics

March 11th 2009

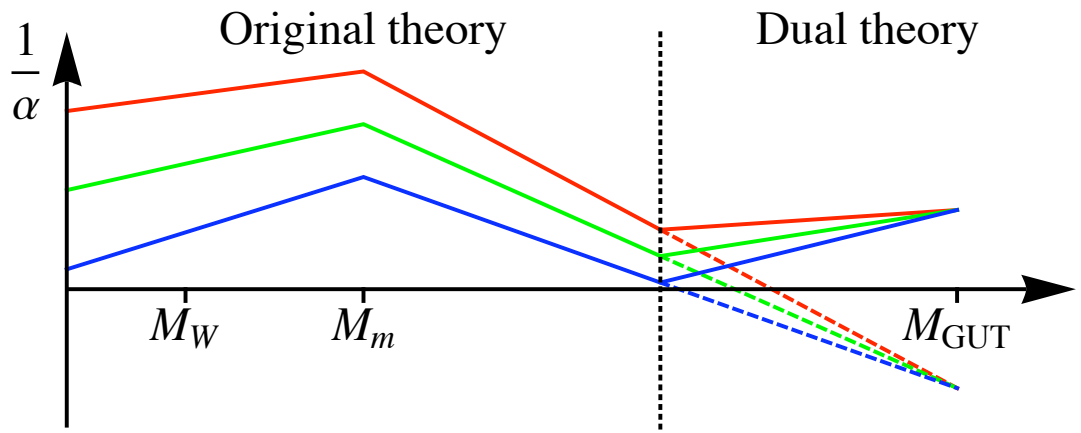
Why bother?

- *Seiberg duality* gives us a different way of looking at supersymmetric gauge theories.[1]
- We believe it will help in understanding many aspects of BSM physics such as gauge unification, proton decay and dynamical SUSY breaking.
- Problem: currently, dualities only exist for theories with highly constrained matter content and unrealistic superpotentials.
- Our goal is to find a dual theory to a more realistic GUT, like the supersymmetric $\mathrm{SU}(5)$ Georgi-Glashow model.

[1] N. Seiberg - arXiv:hep-th/9411149

Example: "Dualification"

- In models of SUSY breaking with *direct mediation*, the messengers deflect the gauge coupling unification.
- Extrapolating to higher scales it may appear as though unification occurs at a negative, unphysical value of the coupling constant $\frac{1}{\alpha}$.
- In the dual theory the unification is much more natural.[2]



[2] S. Abel, V.V. Khoze - arXiv:809.5262v1[hep-ph]

Our contribution

- By adding gauge singlets to certain theories we have been able to alleviate some of the constraints on the superpotential required for duality.[3]
- Our approach retains access to the powerful, quantum mechanical tests of Seiberg duality.
- The theories we have considered contain several of the standard ingredients of GUTs (e.g. multiple generations of adjoints/antisymmetrics).

[3] S. Abel, J. Barnard - arXiv:0903.1313v1 [hep-th]