Title: Micromanaging and Accounting in de Sitter Holography

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Abstract: I will discuss recent work engineering "semi-holographic" constructions of de Sitter space in string theory, using elliptic fibrations and orientifolds to uplift known Freund-Rubin compactifications. The dual brane construction is compact and provides a microscopic realization of the dS/dS correspondence of Alishahiha et al., realizing de Sitter space in d dimensions as a warped compactification down to d-1 dimensional de Sitter space coupled to a pair of large N matter sectors. This provides a parametric microscopic accounting of the Gibbons-Hawking entropy. I will discuss an explicit example in three dimensions as well as ongoing work in four dimensions.

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Micro brane construction of dS/dS

- Field theory?
- micro origin of S_{GH}

gravity on dS_d ← 2 QFT on dS_{d-1},
cut off $\Lambda \sim 1/R_{dS}$
, coupled to gravity, + each other

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Micro: $dS_3 \times S^3/\mathbb{Z}_k \times T^4$

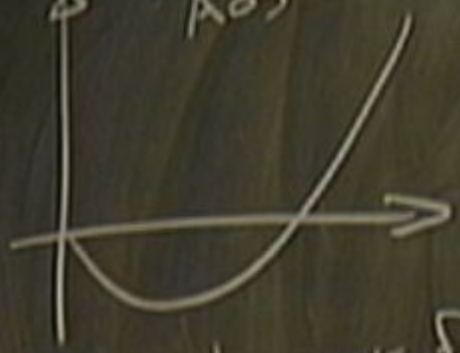
D1-D5 system → $AdS_3 \times S^3 \times T^4$

$$V = M_3^3 \left(\frac{g_5^2}{R^5 L^4}\right)^3 (R^3 L^4) \left\{ -\frac{1}{g_3^2 R^2} + \frac{N_5^2}{R^6} + \frac{N_1^2}{R^6 L^8} \right\}$$

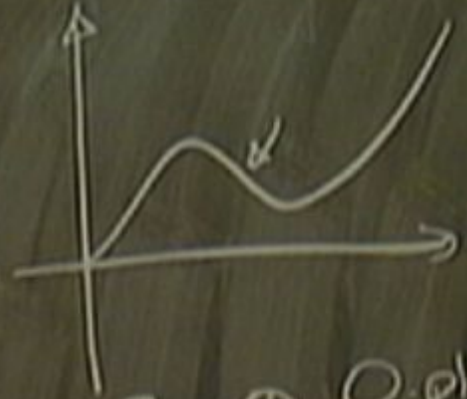
$$\eta = \frac{g_3}{R^2 L^2} \longrightarrow M_3^3 \left(-\eta^4 + \eta^6 \left(\frac{N_1^2}{L^4} + N_5^2 L^4\right)\right)$$

$\Rightarrow R^2 \sim g_s N_5, \; L^4 \sim N/N_5$

AdS

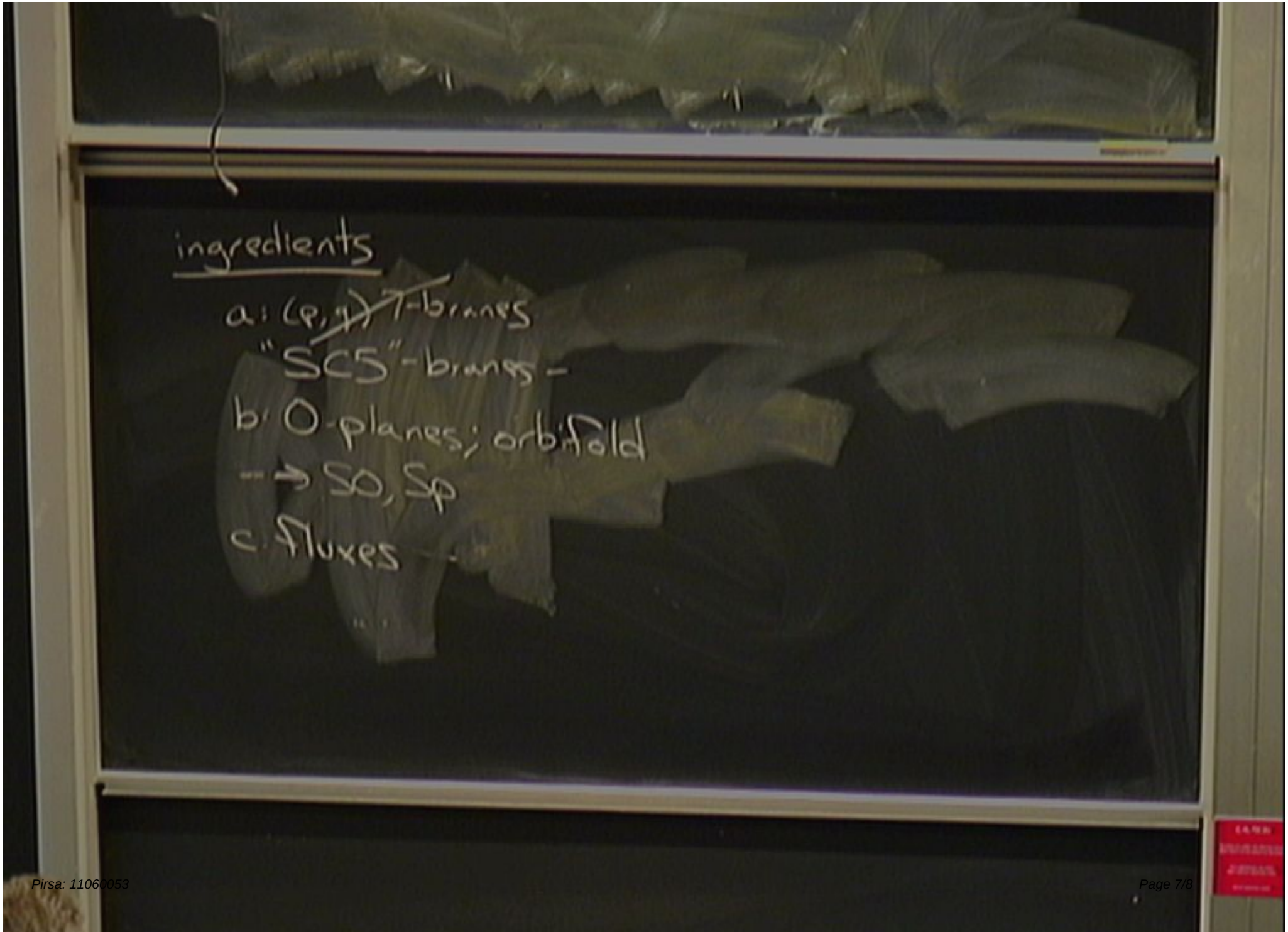


curvature vs flux



$R < 0$, O-planes,

flux


ingredients
a: (p,q) 7-branes
"SC5"-branes -
b: O-planes; orbifold
--> SO, Sp
c. fluxes

$$\frac{V}{M_3^3} \approx (R + SC5 + NS5)\eta^4 - (O5 + D7, \overline{D7})\eta^5$$
$$+ (F_3 + F_7)\eta^6$$

$$\Rightarrow R^2 \sim L^2 \sim k \sim \sqrt{\frac{N_1}{N_5}} \; ; \; R_A \sim \frac{R}{k}$$

$$g_s \sim \frac{1}{N_5^2}, \quad R_{dS}^2 \sim \frac{R^2}{\varepsilon} \Rightarrow \varepsilon \sim \frac{1}{N_5^2}$$

$$\Rightarrow \boxed{S_{GH} \sim M_3 R_{dS} \sim \frac{1}{\varepsilon^{3/2} k N_1 N_5}}$$

4d quiver gauge theory