

geom sing = light solitons

$$\text{IIA/B on K3 ADE=light} \begin{cases} \text{particles} & \text{massless} \\ \text{strings} & \text{tensionless} \end{cases}$$

IIA/B on Y3 conifold = massless hyps

HSO = massless instantons

$$\text{F singular/H gauge enhanced duality} \begin{cases} D6 \\ N1 \end{cases} \Rightarrow \text{IIA hyps/H instanton duality} \begin{cases} D4 \\ N2 \end{cases} \text{ hyper singularities}$$

$$M \boxplus 1_{\mathbb{R}}^0 2_{\mathbb{R}}^0 = \text{IIA} \boxplus 2_{\mathbb{R}}^0$$

$$1_{\mathbb{R}}^{R(z)}: z \in 2_{\mathbb{R}}^0$$

$R(z) \gg 1$  perturb weak IIA coupling

$$F \boxplus 1_{\mathbb{C}}^0 \times B_{\mathbb{C}} = \text{IIB} \boxplus B_{\mathbb{C}}$$

$$1_{\mathbb{C}}^{C(z)}: z \in B_{\mathbb{C}}$$

$$y^2 = x^3 + f(z)x + g(z)$$

Im  $C(z) \gg 1$  perturb weak IIB coupling

$$\Delta(z) = 4f(z)^2 + 27g(z)$$

$$1_{\mathbb{C}} = \frac{z \in B_{\mathbb{C}}}{\Delta(z) = 0}$$

$$b = 1: 1_{\mathbb{C}}^1 = \mathbb{P} \text{ rational}$$

$$2_{\mathbb{C}}^0 = 1_{\mathbb{C}}^0 \times 1_{\mathbb{C}}^1$$

$$H \boxplus \mathbb{T}^2 \asymp F \boxplus 2_{\mathbb{C}}^0 = F \boxplus 1_{\mathbb{C}}^0 \times 1_{\mathbb{C}}^1 = \text{IIB} \boxplus 1_{\mathbb{C}}^1 \begin{cases} D8 \\ N \end{cases}$$

$n$  parallel 7branes

$$b = 2: 1_{\mathbb{C}}^1 \times_n 1_{\mathbb{C}}^1 \text{ rational ruled surface}$$

$$\text{HE8}_{12 \pm n}^{\text{inst}} \boxplus 1_{\mathbb{C}}^0 \times 1_{\mathbb{C}}^1 \asymp F \boxplus 1_{\mathbb{C}}^0 \times 1_{\mathbb{C}}^1 \times_n 1_{\mathbb{C}}^1 = \text{IIB} \boxplus 1_{\mathbb{C}}^1 \times_n 1_{\mathbb{C}}^1$$

$$0_{\mathbb{C}}^1 = 0:\infty$$

$$1_{\mathbb{C}}^0 \times \begin{cases} 1_{\mathbb{C}}^1 \\ 0_{\mathbb{C}} \end{cases} \text{ ADE sing}$$

$$1_{\mathbb{C}}^0 \times \begin{cases} 1_{\mathbb{C}}^1 \\ 0_{\mathbb{C}} \end{cases} \times_n 1_{\mathbb{C}}^1 \text{ ADE sing fibration}$$

$$\text{matter curve } \begin{cases} \\ 0_{\mathbb{C}} \end{cases} \times_n 1_{\mathbb{C}}^1$$