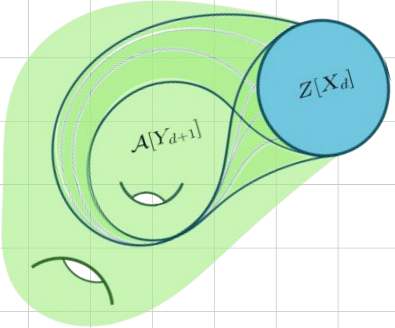
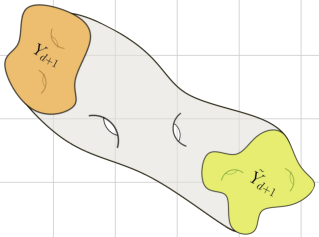


ANOMALIES & BORDISMS
OF NON-SUPERSYMMETRIC STRINGS

Matilda Delgado



Based on:
[2310.06895] I. Basile, A. Debray, M.D., M. Montero

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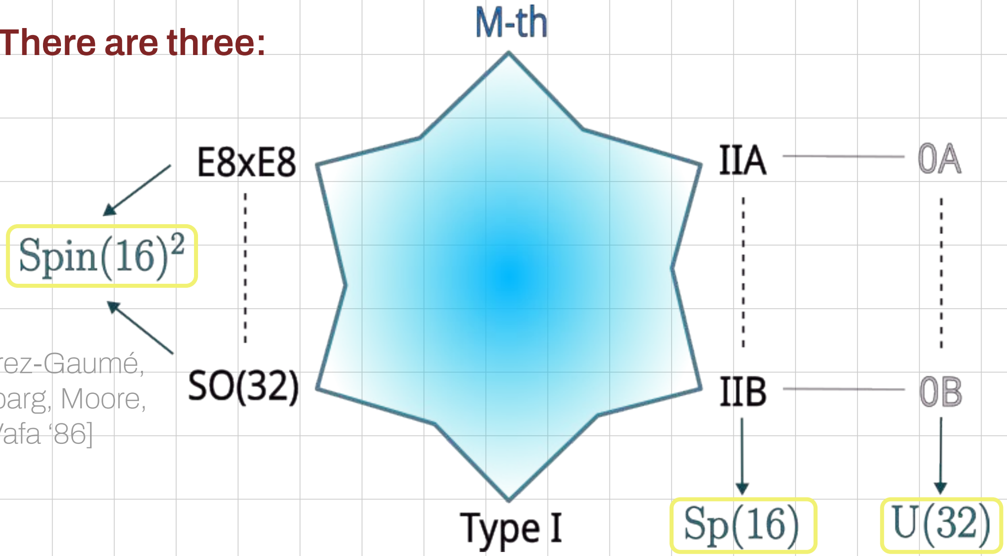
How?

10D NON-SUPERSYMMETRIC STRING THEORIES

There are three:



[Alvarez-Gaumé, Ginsparg, Moore, Vafa '86]

[Sugimoto '99] [Sagnotti '95]

Arguably the most natural way to study QG away from SUSY !!

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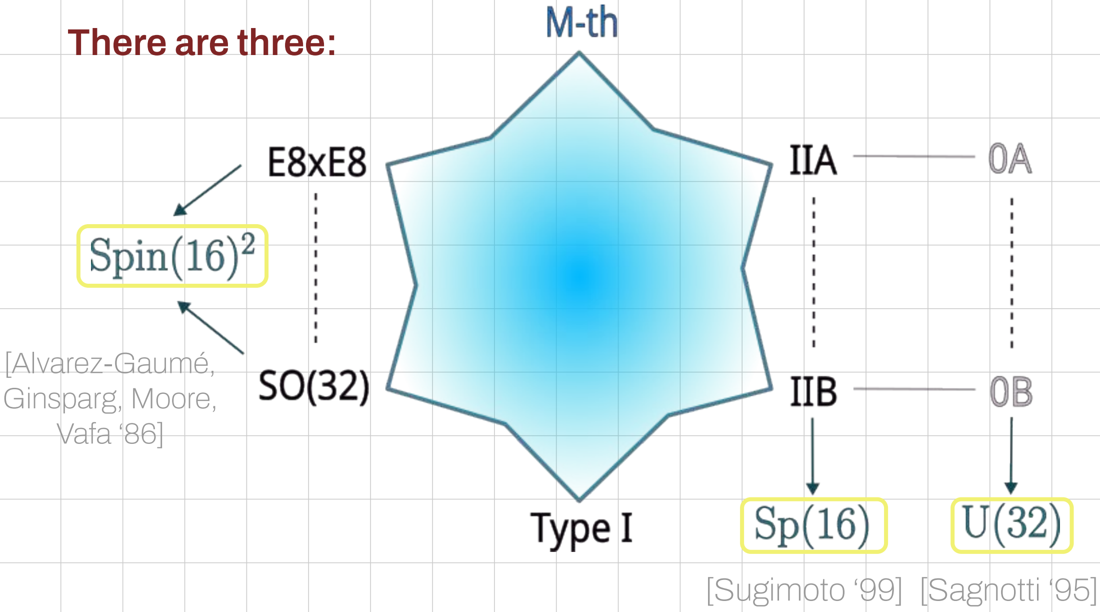

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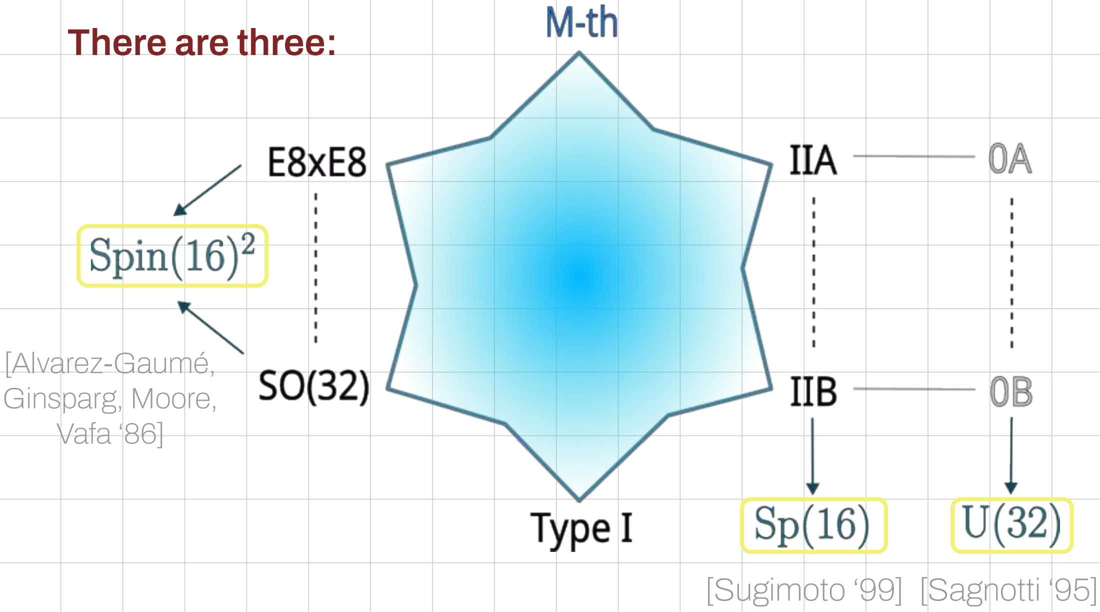

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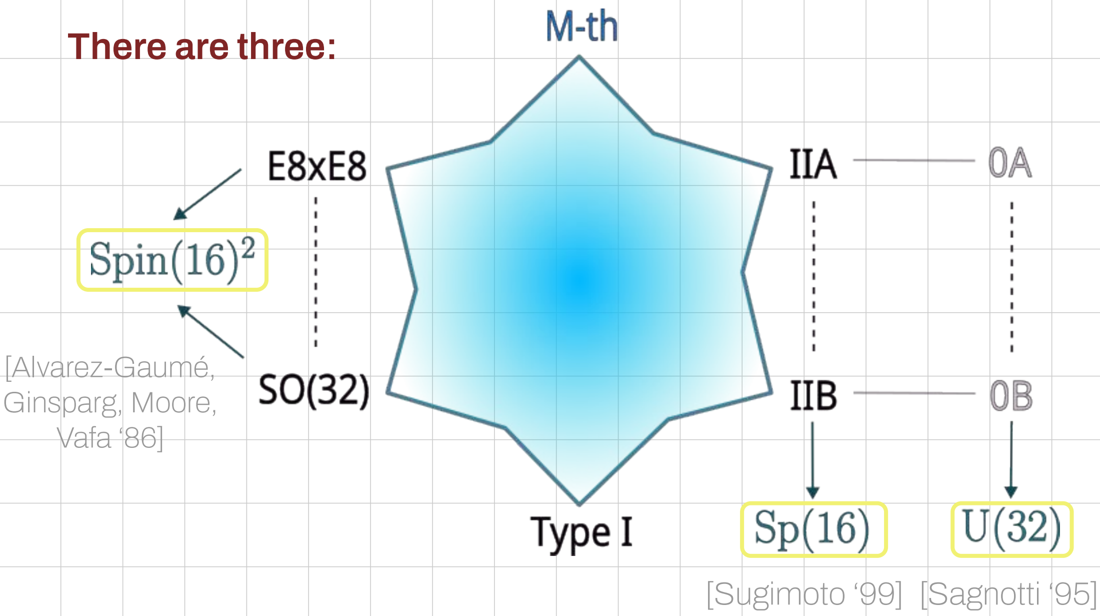

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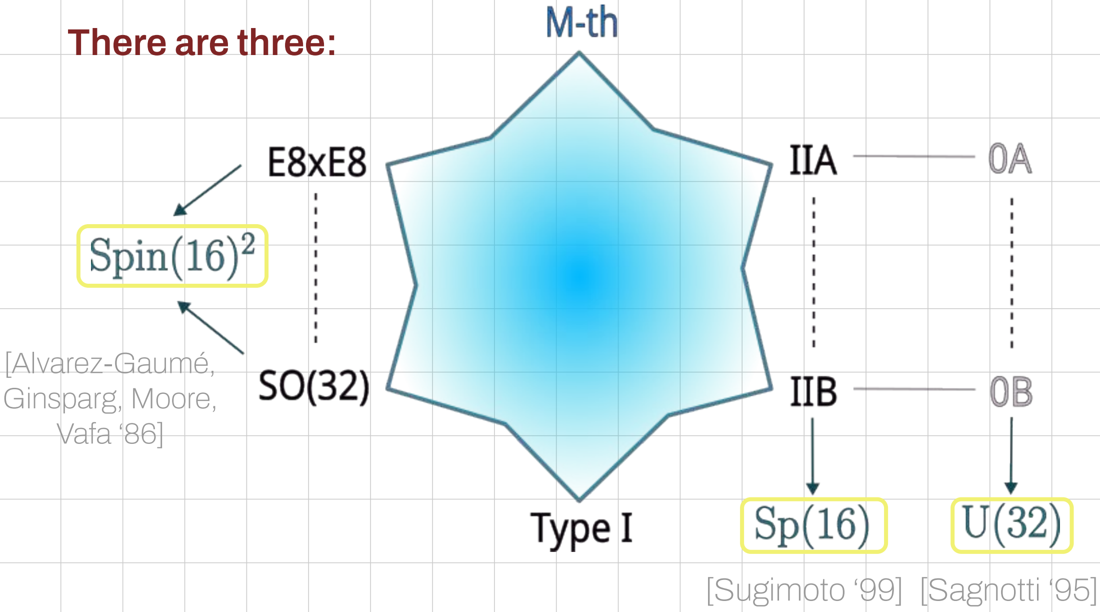

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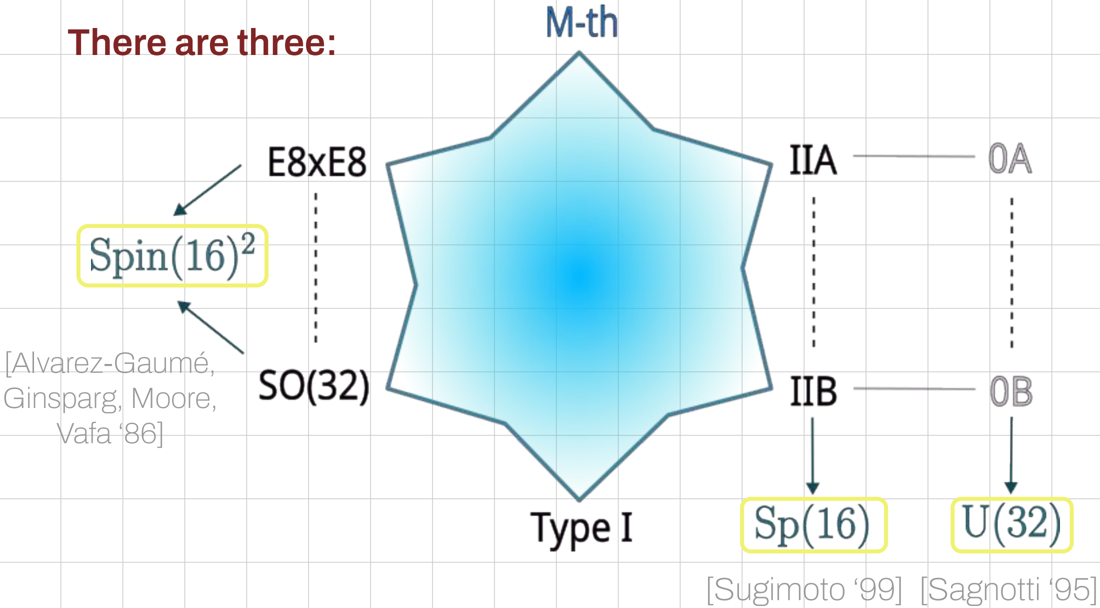

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e.g. do gauge/gravitational anomalies cancel?

- local anomaly cancellation ✅
- **global anomaly cancellation ❓**

Our work answers this question

HOW?

by computing the relevant bordism groups for these theories

[e.g. Álvarez-Gaumé, Vázquez-Mozo ‘22]

A CRASH COURSE ON GLOBAL ANOMALIES

An anomaly in a **gauge** transformation or diffeomorphism is:

$$Z[X_d] \Longrightarrow \tilde{Z}[X_d] \neq Z[X_d]$$

Global anomalies = associated to a transformation that cannot be *deformed to the identity*

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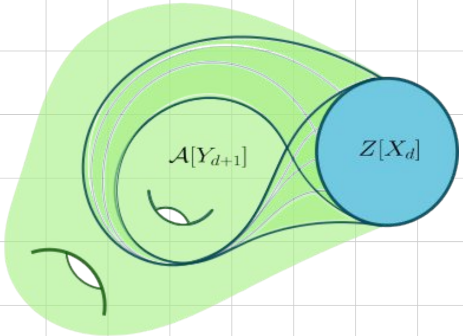

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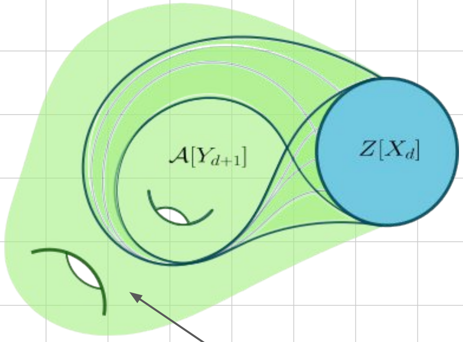

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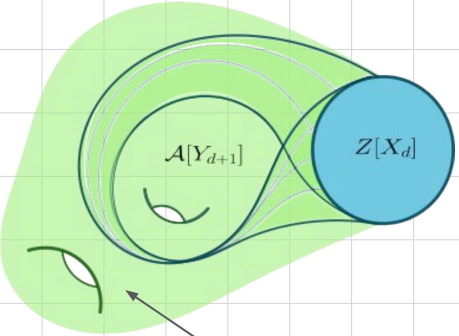

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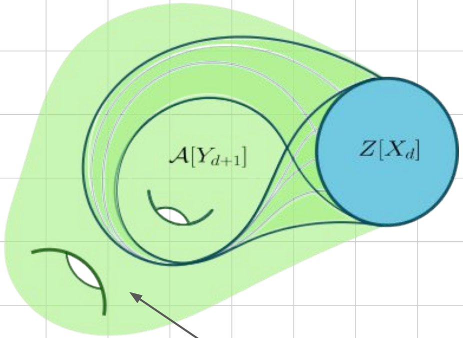

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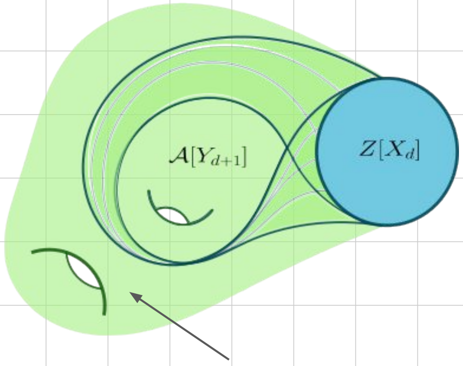

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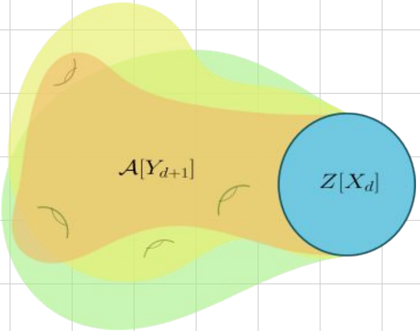
The anomaly itself is a bordism invariant of these (d+1)-manifolds
→ we "just" have to compute 11D bordism groups for our three 10D theories

WHAT ARE THE BORDISM GROUPS?

What are the relevant bordism groups for these theories?
The background must satisfy:

$$dH \sim \mathrm{tr}F^2 - \mathrm{tr}R^2 = 0$$



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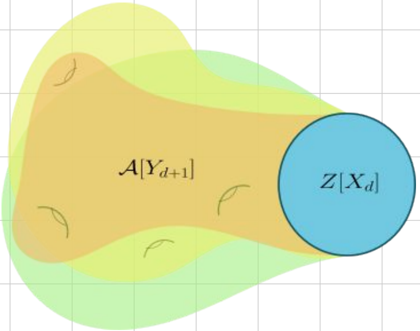

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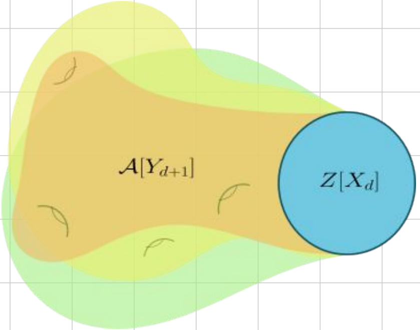

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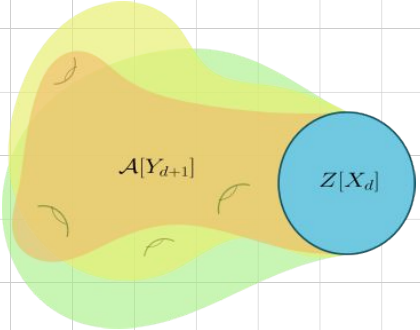

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(up to a technical subtlety for the Sagnotti string)

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CONCLUSIONS

We showed there are no global anomalies for the three 10D non-supersymmetric string theories

Huge consistency check!

But that's not all...

➥ We used **anomaly inflow** to shed light on the chiral content of worldvolumes of branes in these theories

➥ We also computed **lower-dimensional cobordism** groups for these theories:

$\Omega_0^{\text{String-}Sp(16)} \simeq \mathbb{Z}$	$\Omega_6^{\text{String-}Sp(16)} \simeq \mathbb{Z}_2$
$\Omega_1^{\text{String-}Sp(16)} \simeq \mathbb{Z}_2$	$\Omega_7^{\text{String-}Sp(16)} \simeq \mathbb{Z}_4$
$\Omega_2^{\text{String-}Sp(16)} \simeq \mathbb{Z}_2$	$\Omega_8^{\text{String-}Sp(16)} \simeq \mathbb{Z}^{\oplus 3} \oplus \mathbb{Z}_2$
$\Omega_3^{\text{String-}Sp(16)} \simeq 0$	$\Omega_9^{\text{String-}Sp(16)} \simeq (\mathbb{Z}_2)^{\oplus 3}$
$\Omega_4^{\text{String-}Sp(16)} \simeq \mathbb{Z}$	$\Omega_{10}^{\text{String-}Sp(16)} \simeq (\mathbb{Z}_2)^{\oplus 3}$
$\Omega_5^{\text{String-}Sp(16)} \simeq \mathbb{Z}_2$	$\Omega_{11}^{\text{String-}Sp(16)} \simeq 0.$

Example: Sugimoto

No Global Symmetries in QG implies that all of these bordism classes have to **trivialize in QG**.
[Cobordism Conjecture by McNamara, Vafa '19]

We can predict the existence of **new extended objects** that trivialize these classes!

... more info on arXiv:2310.06895

THANKS!