Coincident M5-branes and dual singular geometries

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Based on 1803.06190 with Andreas Braun, Andre Lukas, and Fabian Ruehle

Context: My biases

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I work with compactifying on Calabi-Yau manifolds,
usually down to four dimensions.

(And practically I work with supergravity.)

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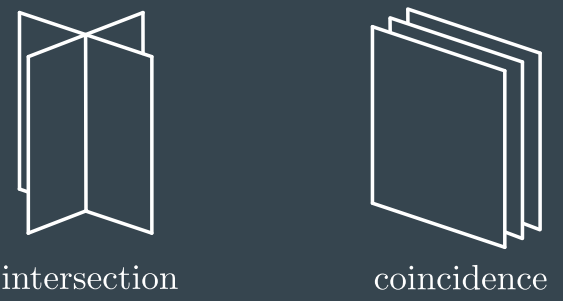
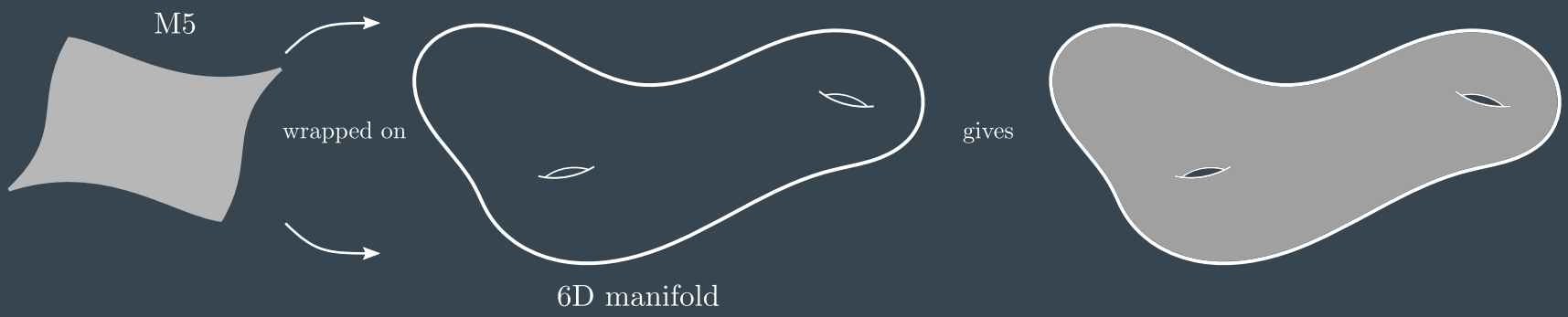


- Next talk will describe theory living on coincident M5-branes.
- I'll just say it's interesting and difficult to understand. This is the motivation for looking at coincident M5-branes.

Introduction: M5-branes (2)

- M5-branes can wrap subspaces.



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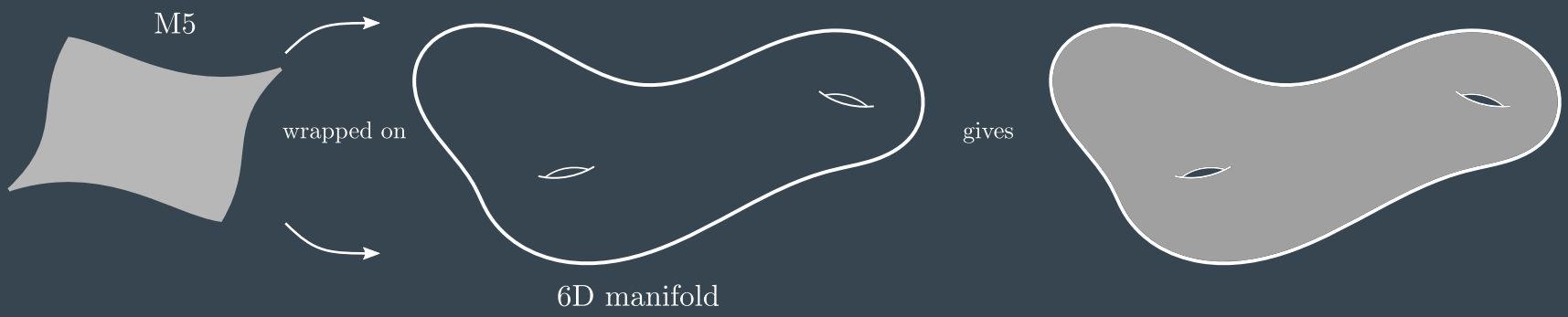
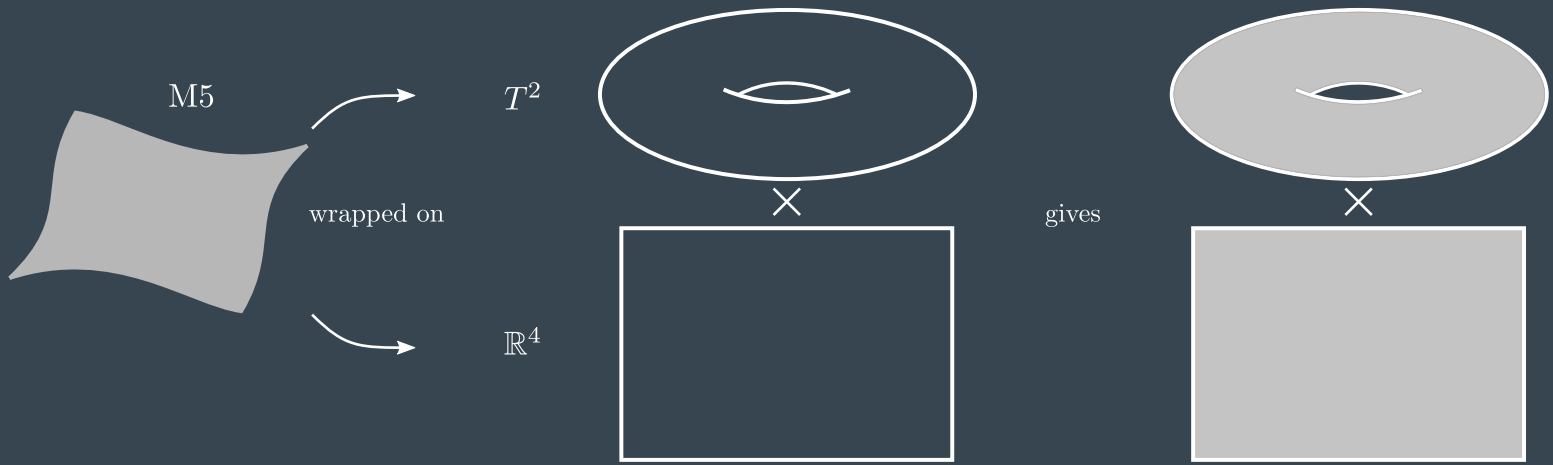


- I'll talk about spacetime-filling M5-branes.



Part 1:

What approach will we take?

Mapping to another problem

- How are we going to attack this problem?

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- In particular we'll use heterotic $\mathrm{E}_8 \times \mathrm{E}_8$/F-theory duality.
- We'll see that this will map the M5-branes to geometry.

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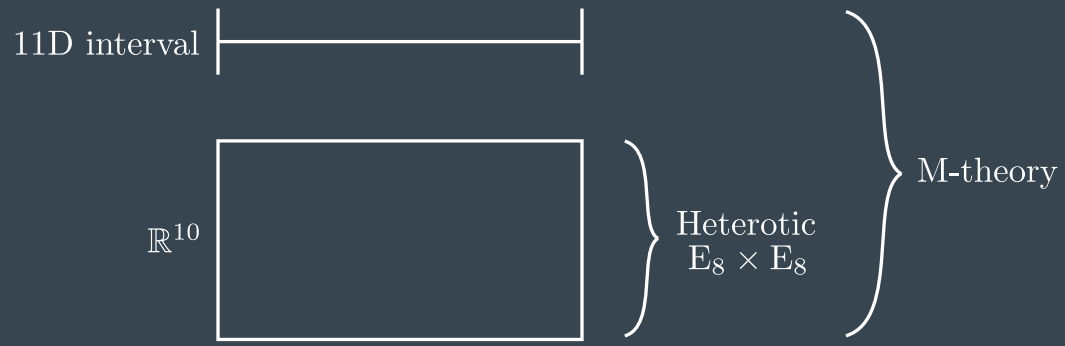

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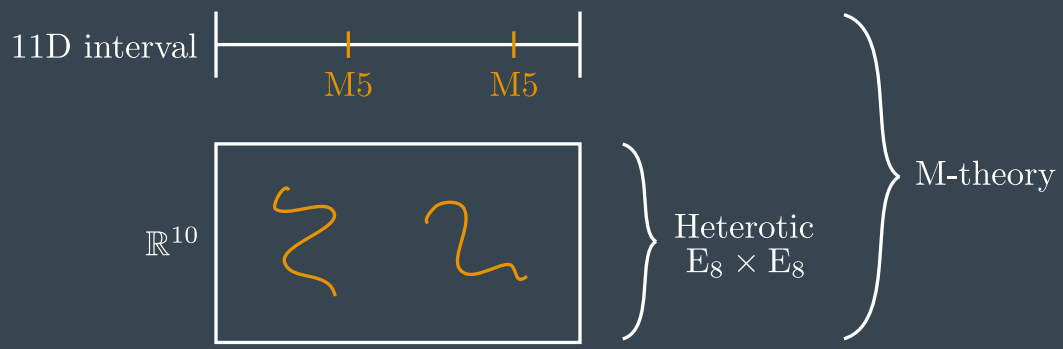

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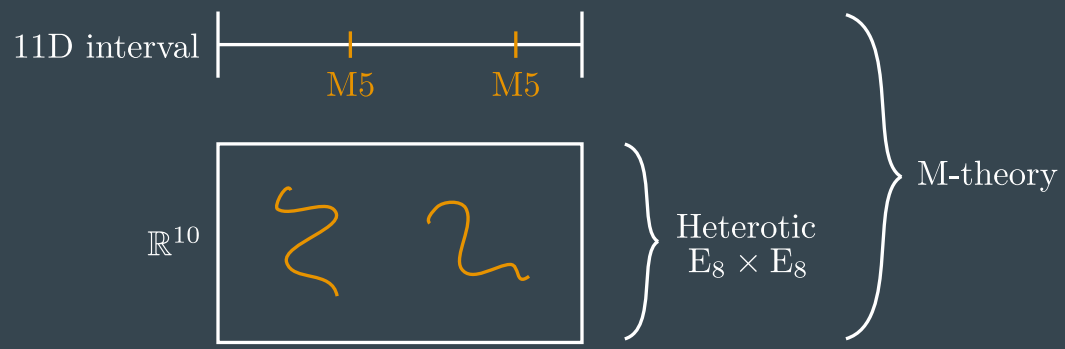

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- This is how M5-branes will appear in our use of heterotic/F-theory duality.

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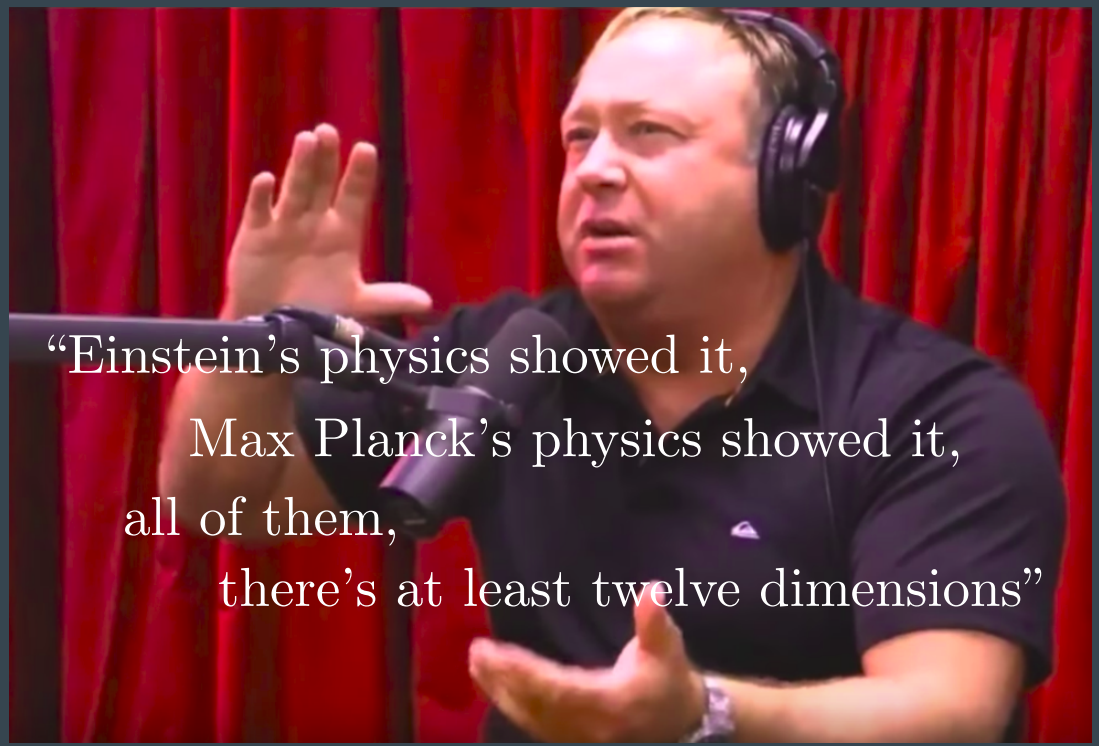

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- Or as M-theory on full space, with a direction decompactified.

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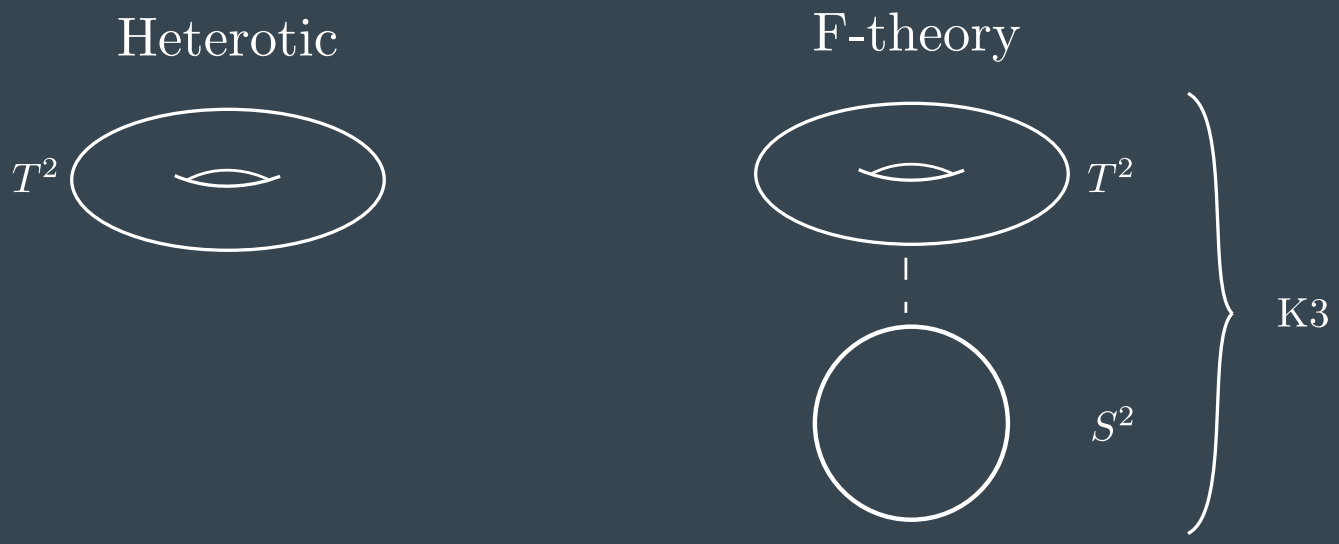
- Basic duality is: heterotic on T^2 and F-theory on K3 (to 8D).



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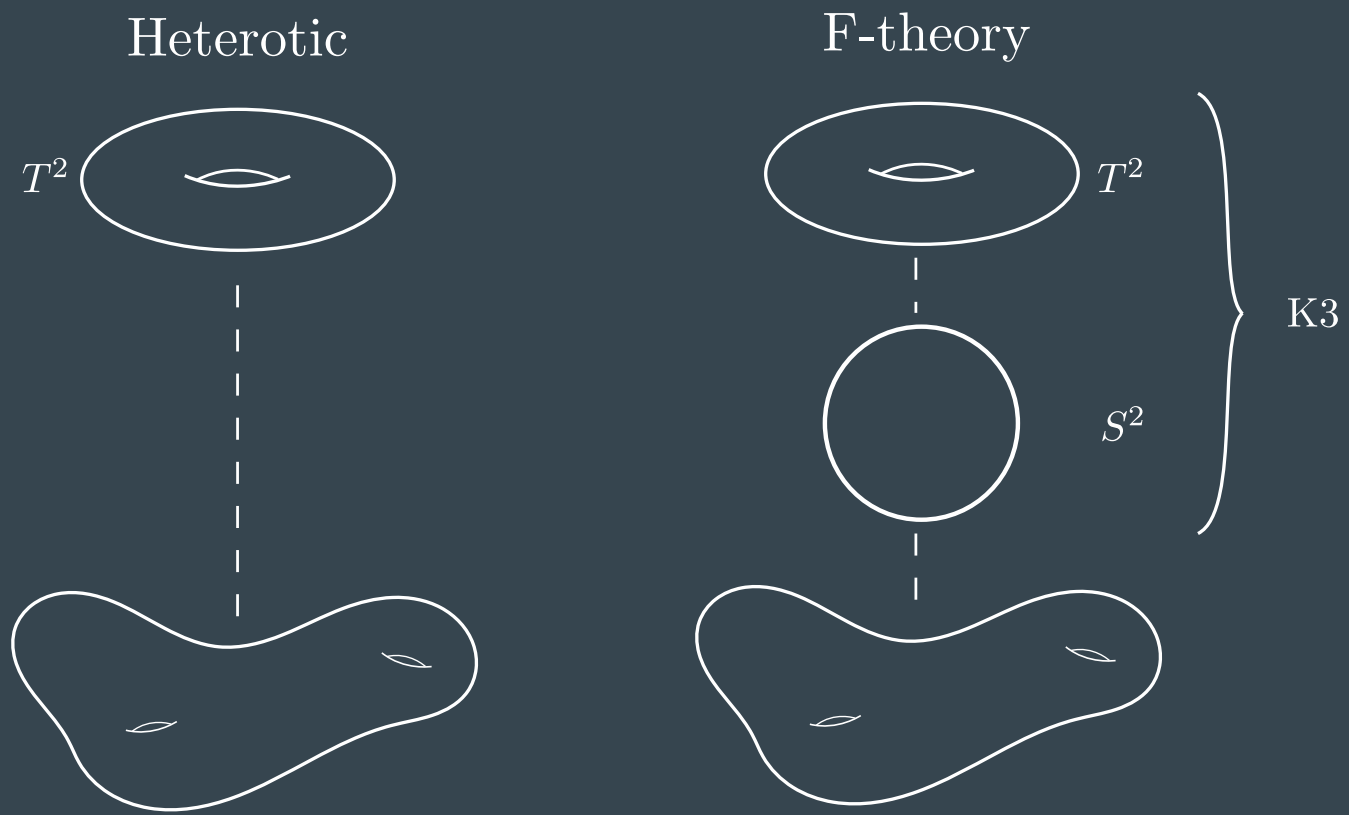

- Can fibre the T^2 and K3 over a common base (we go to 4D).

Part 2:

How we map M5-branes

M5-brane wrapped on heterotic torus

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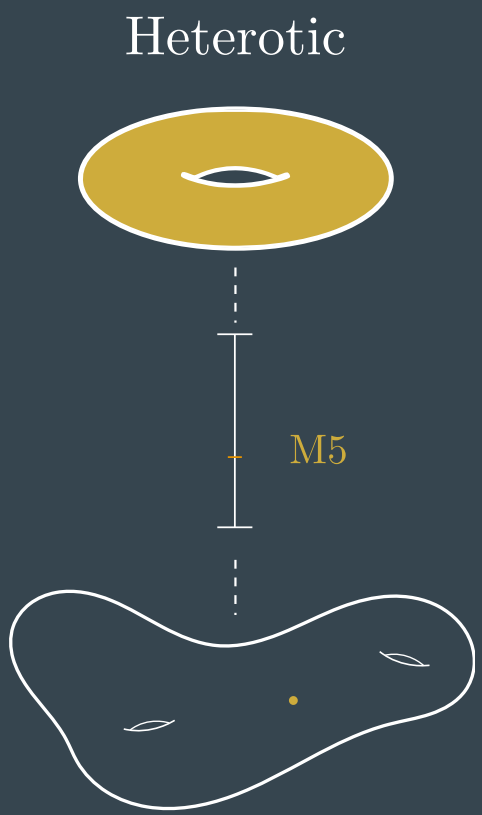

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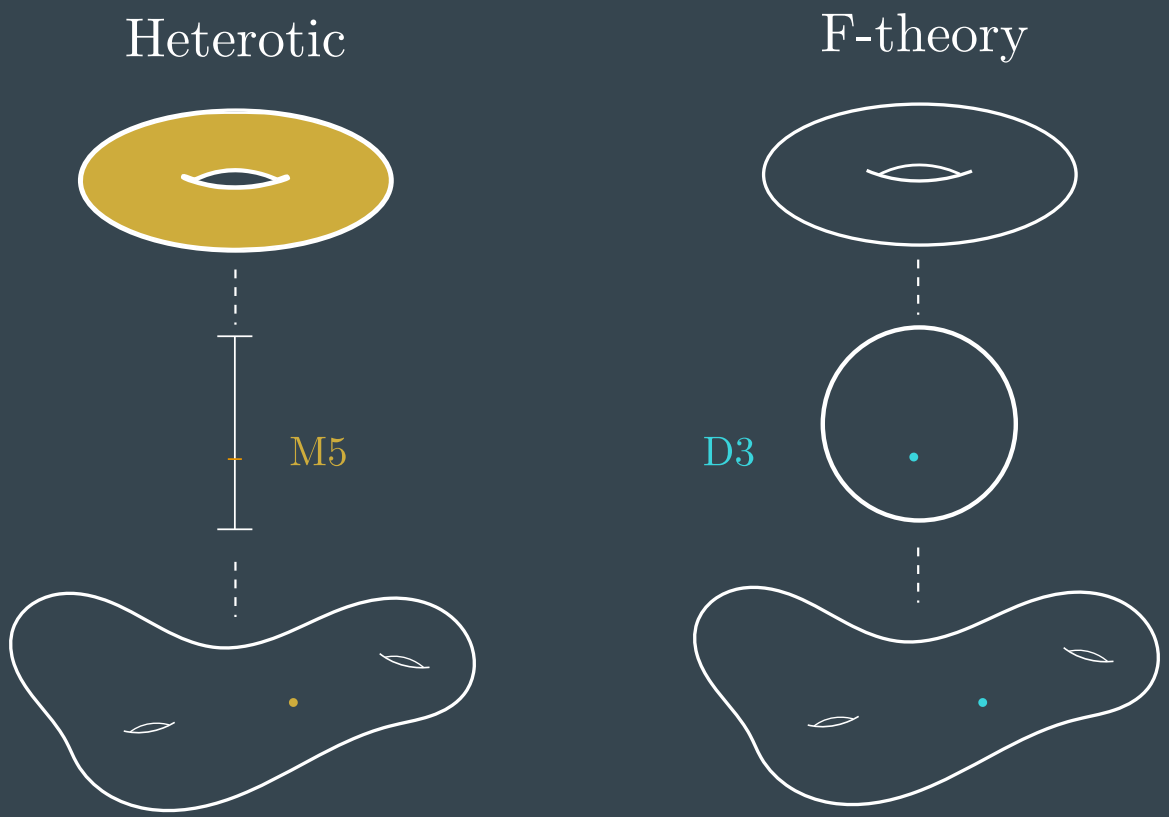
- The dual is well understood: D3-brane.



- Position of M5 in 11D interval $\sim$ position of D3 in S^2.

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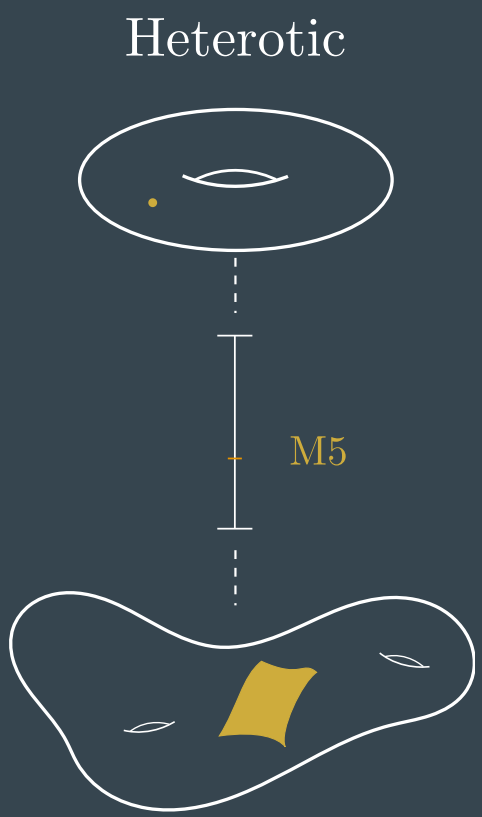

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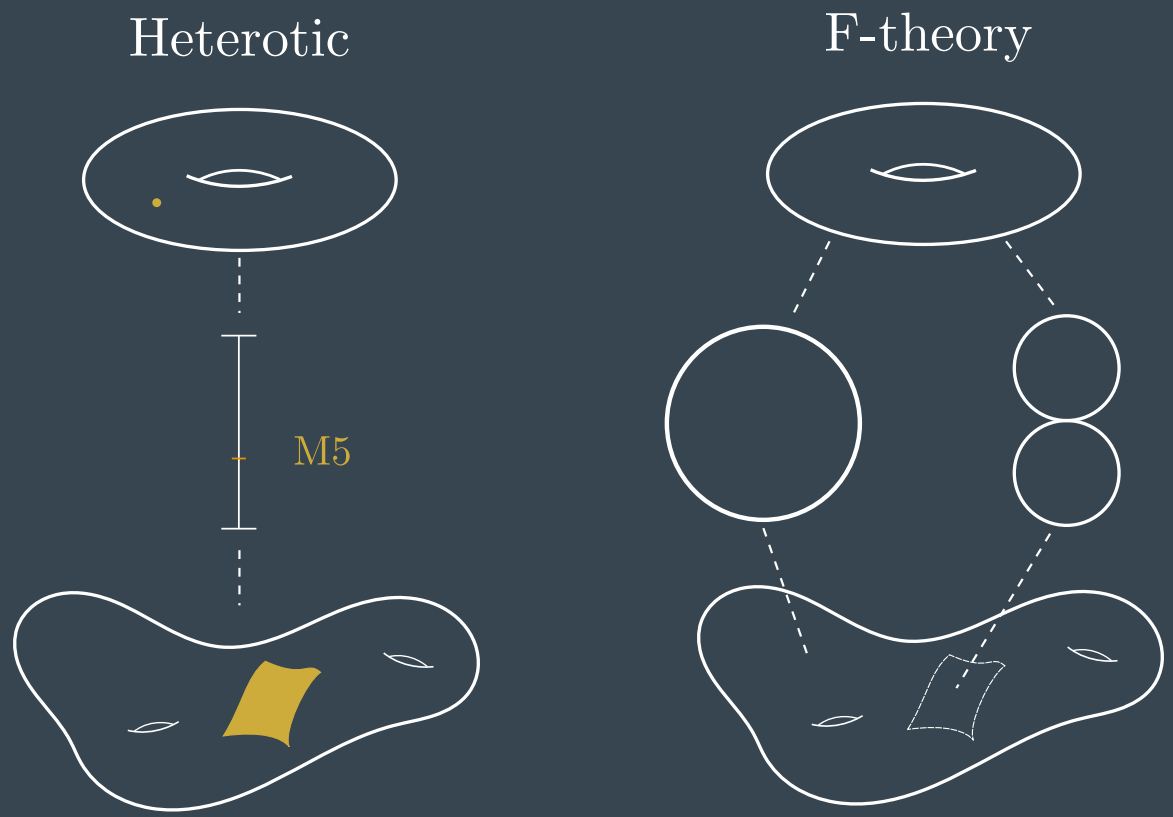
- Dual is a pinch in the F-theory sphere.



- Position of M5 in 11D interval $\sim$ position of pinch.

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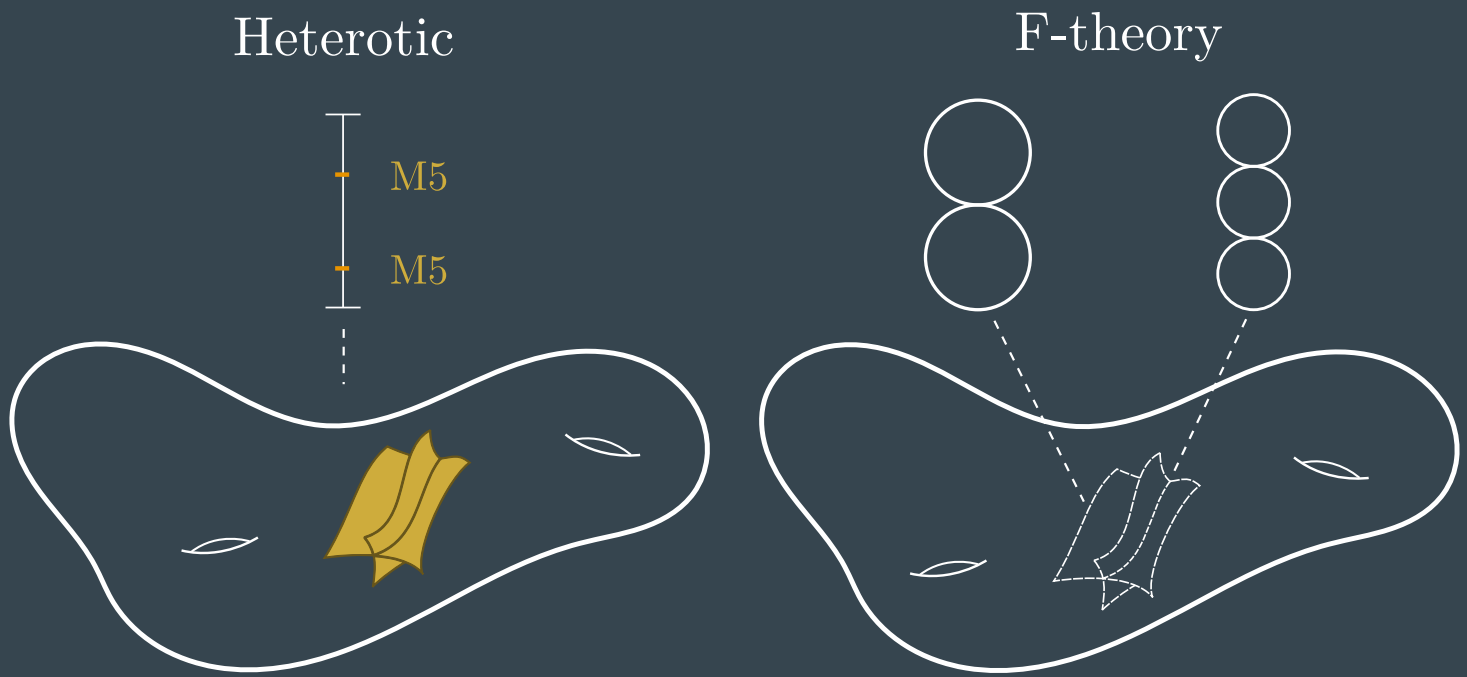

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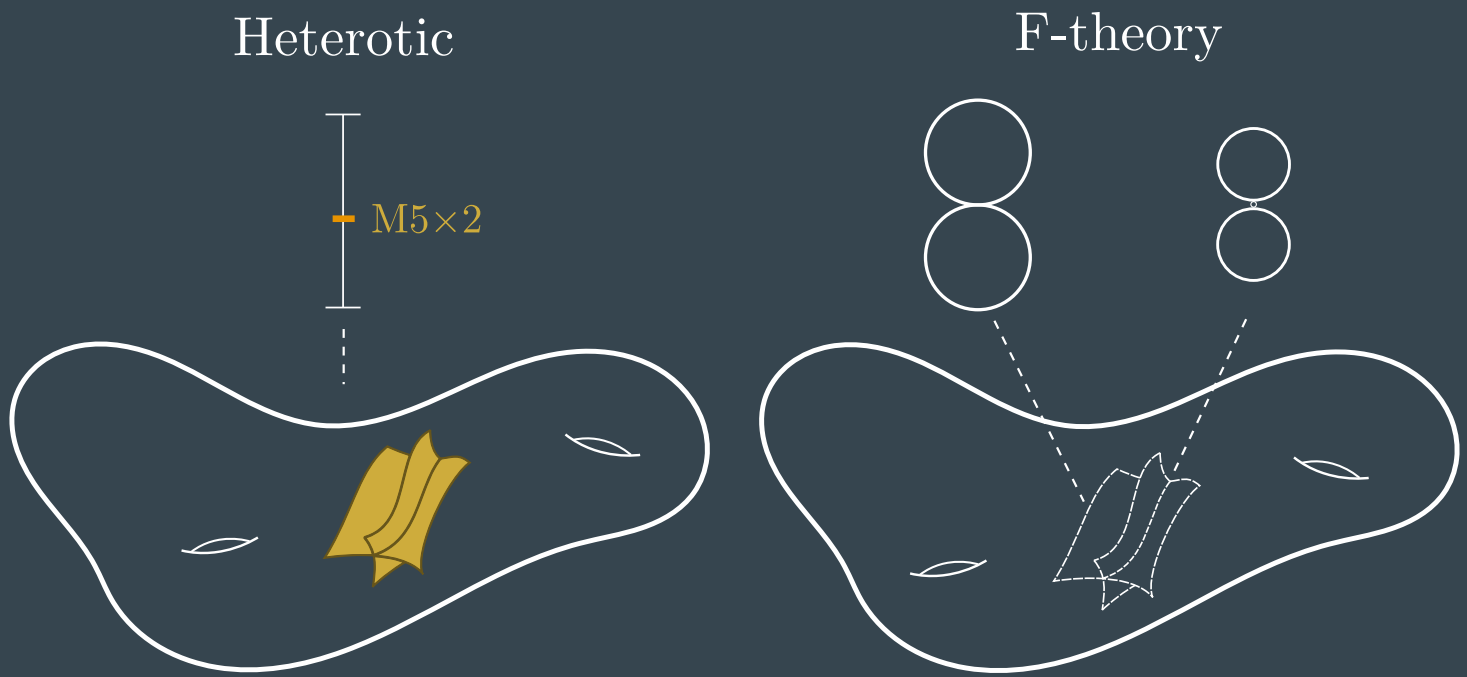

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◦ So we've mapped the problem of intersecting/coincident M5-branes to IIB or M-theory on singularities.

Part 4:

Further aspects

Further aspect: transitions between configurations

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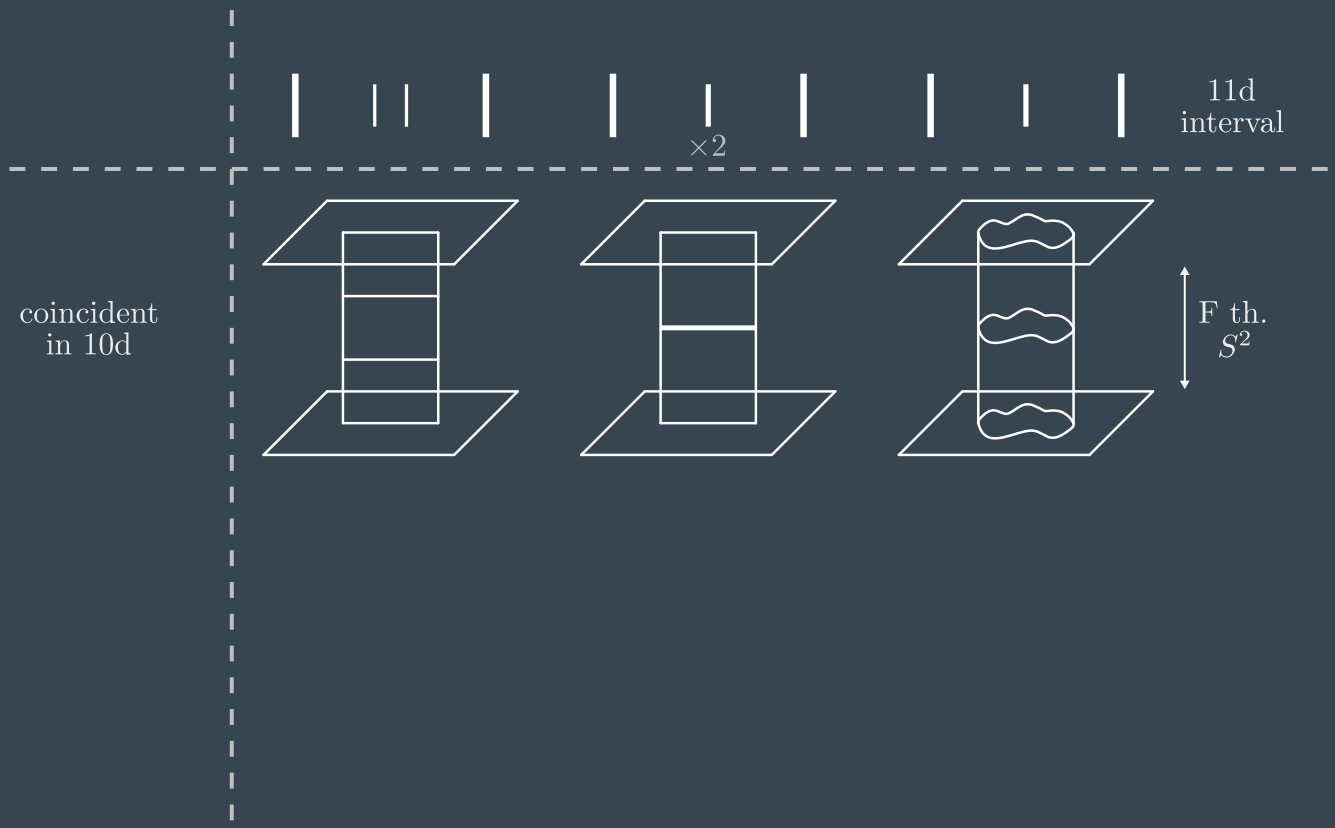

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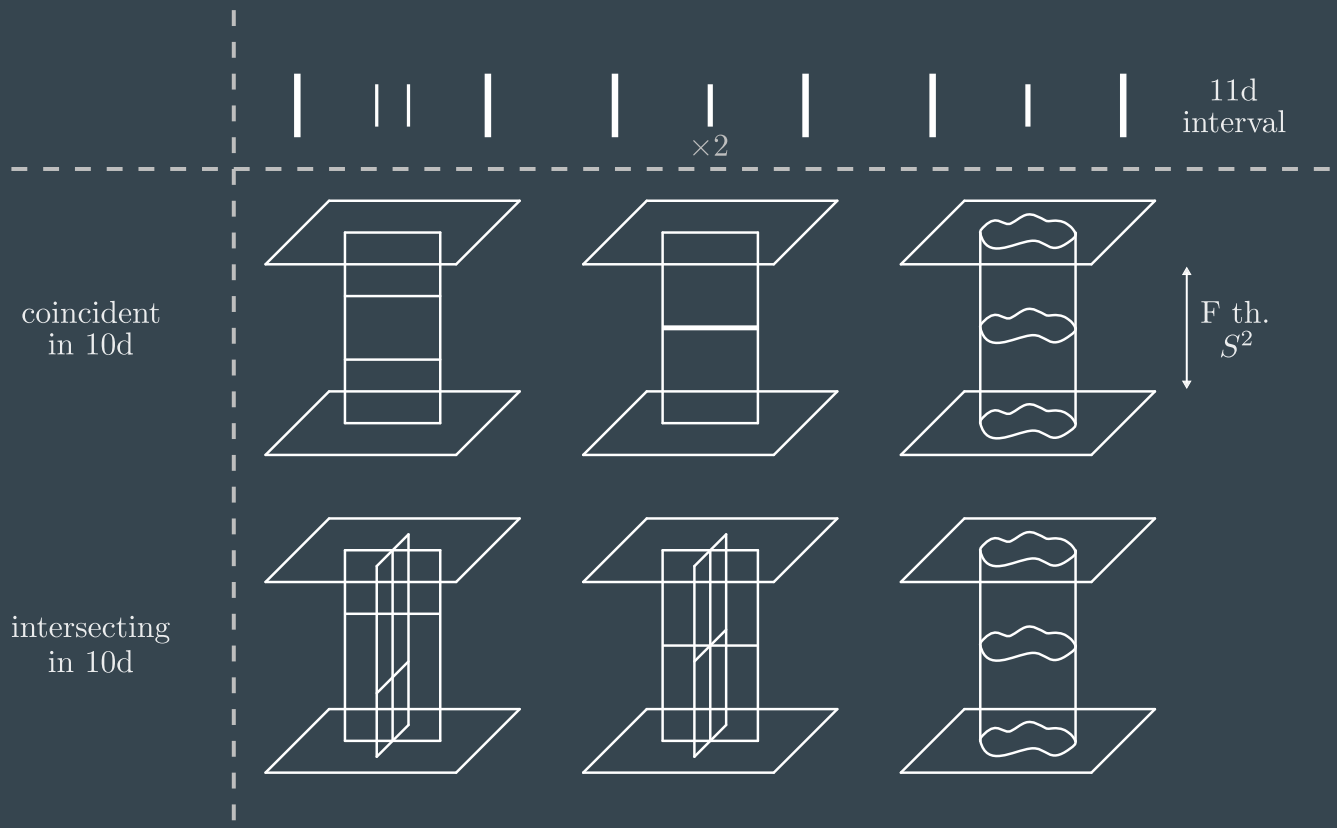

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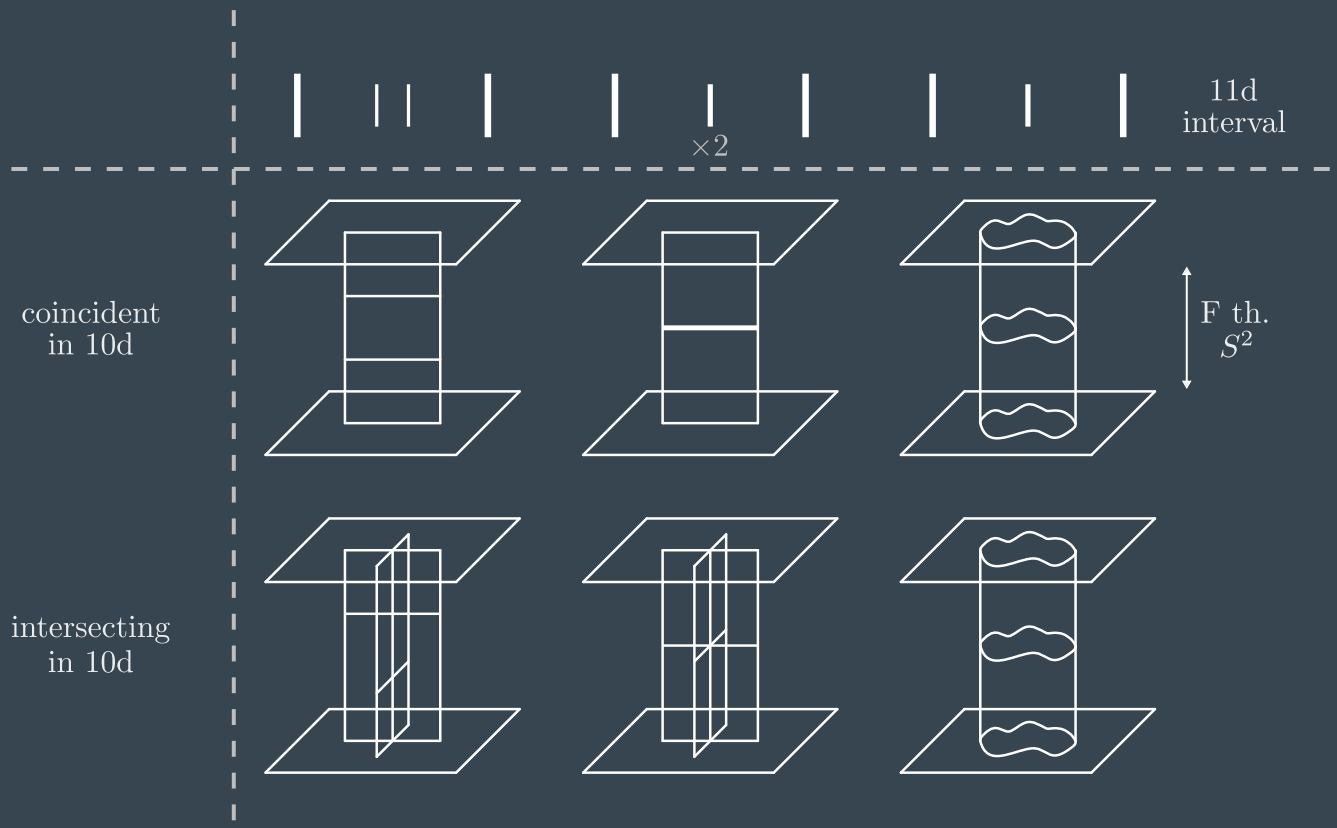

- Can study effective theory through geometric transitions.

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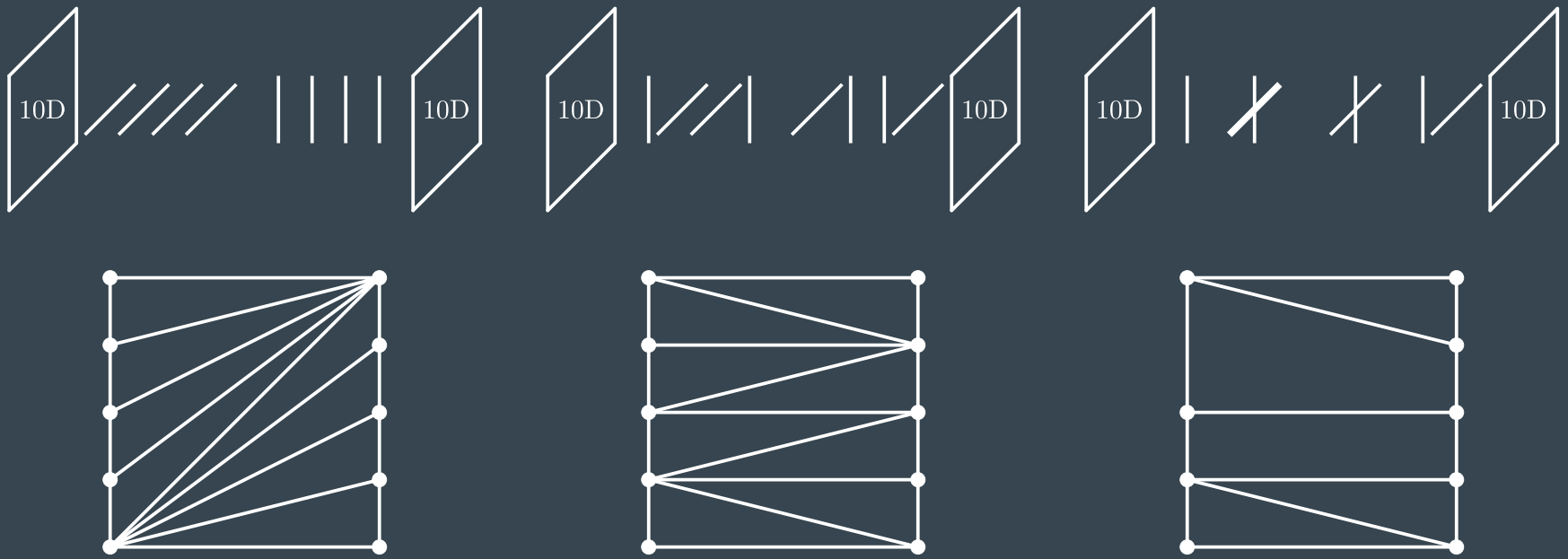

Thanks for your attention!