Tensionless Strings Limits in 4d Conformal Manifolds

José Calderón Infante

Based on ongoing work with Irene Valenzuela

String Phenomenology 2024, Padova, 25/06/2024

The Swampland Distance Conjecture

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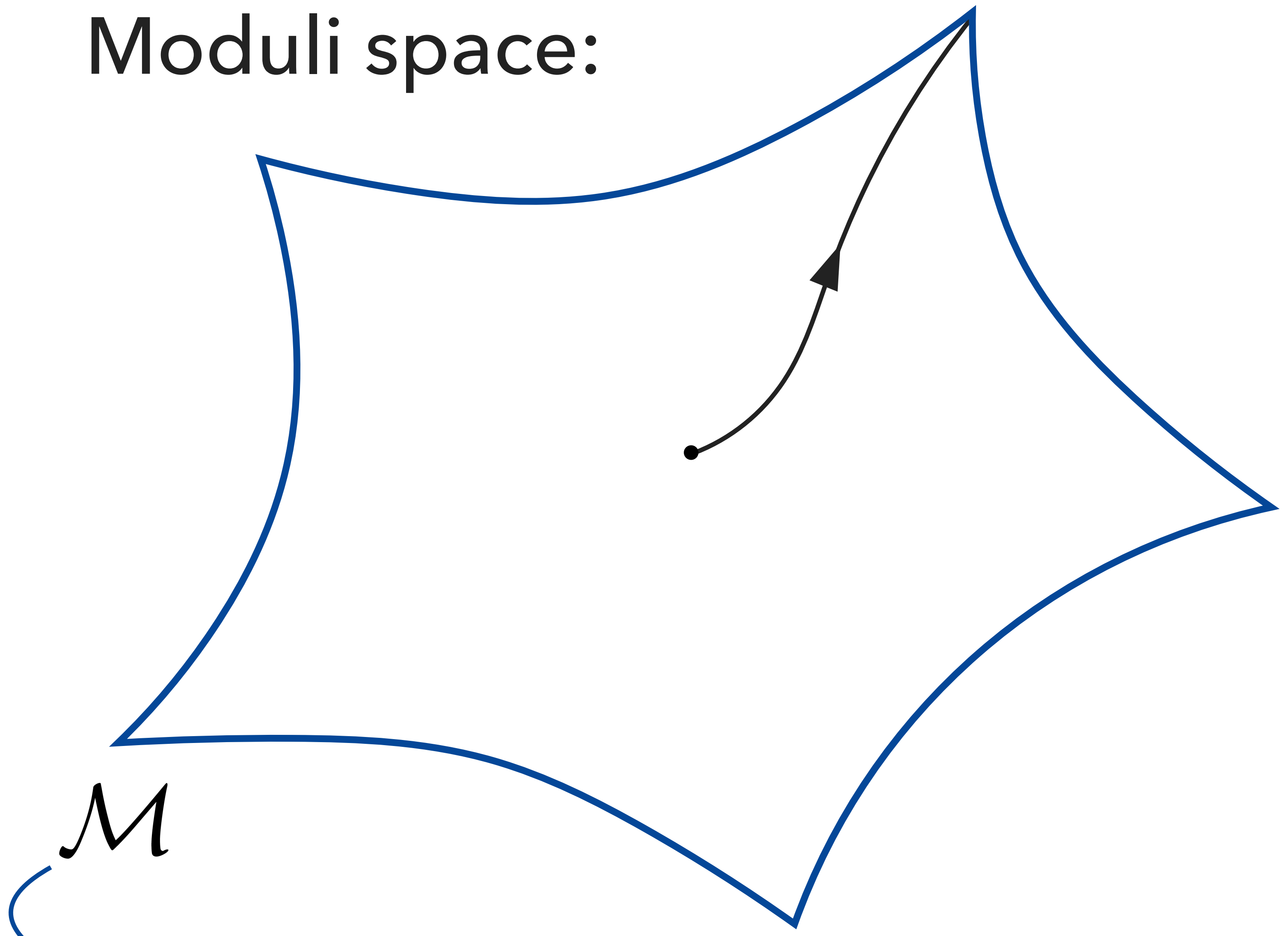

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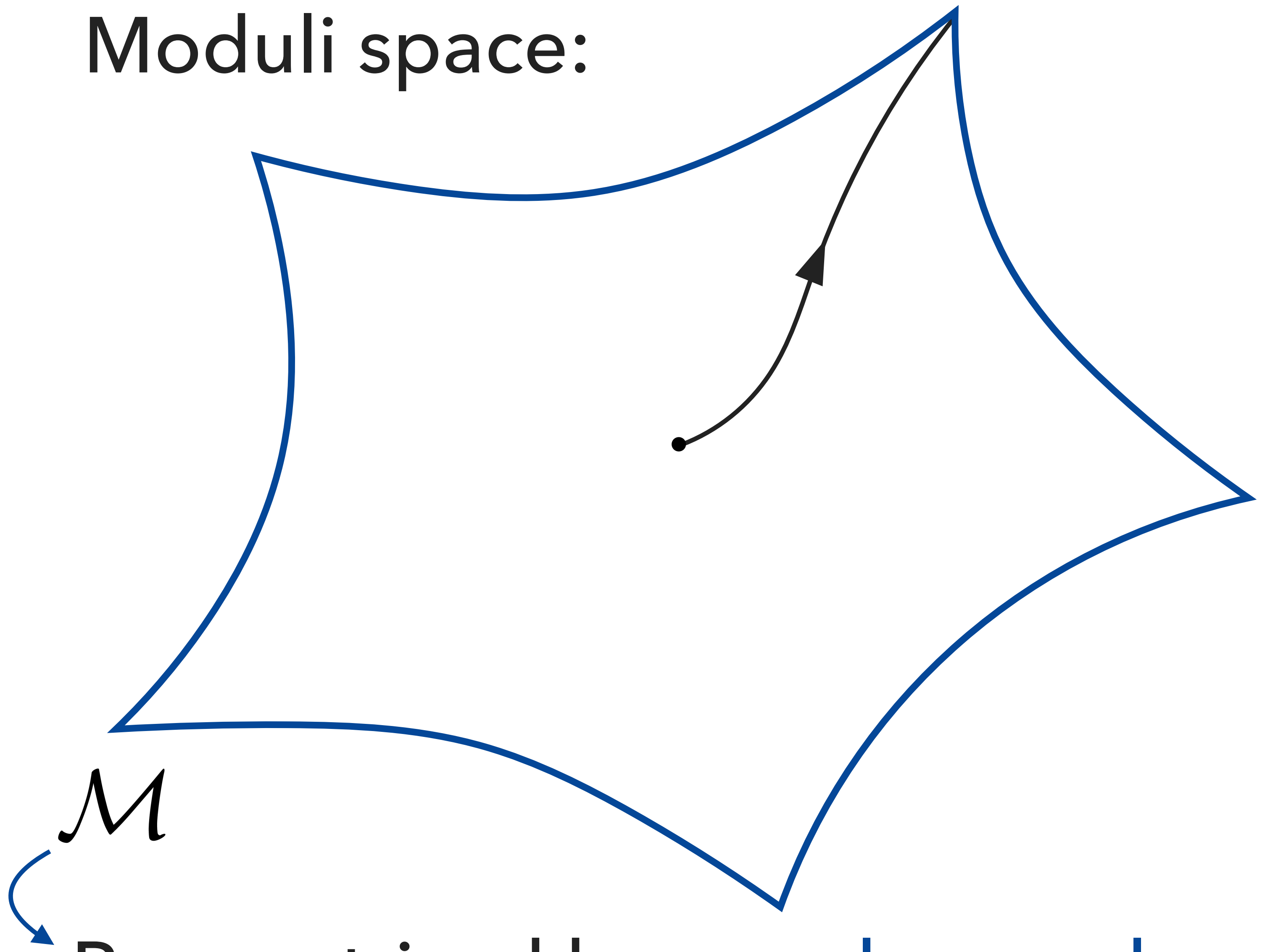

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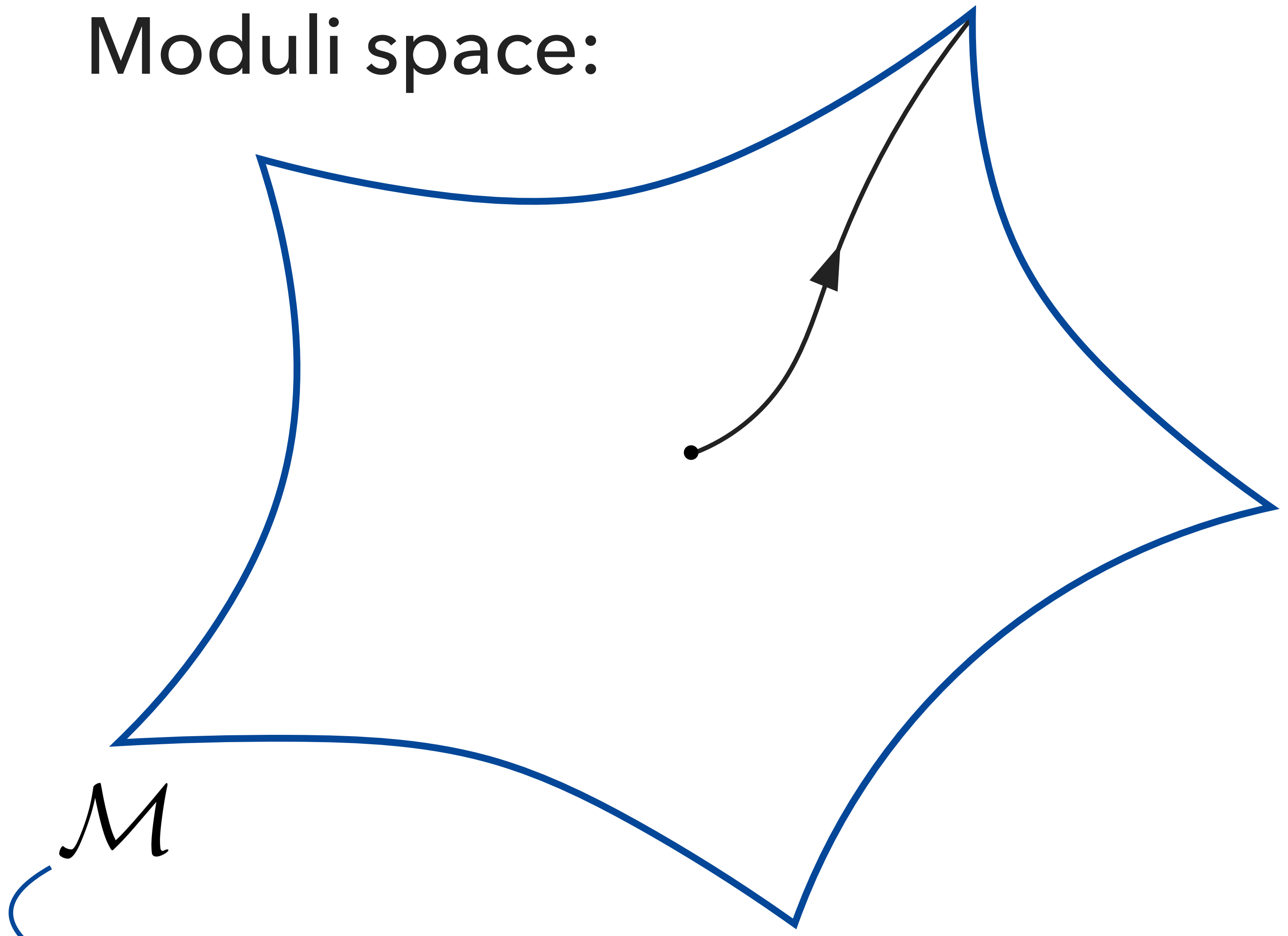

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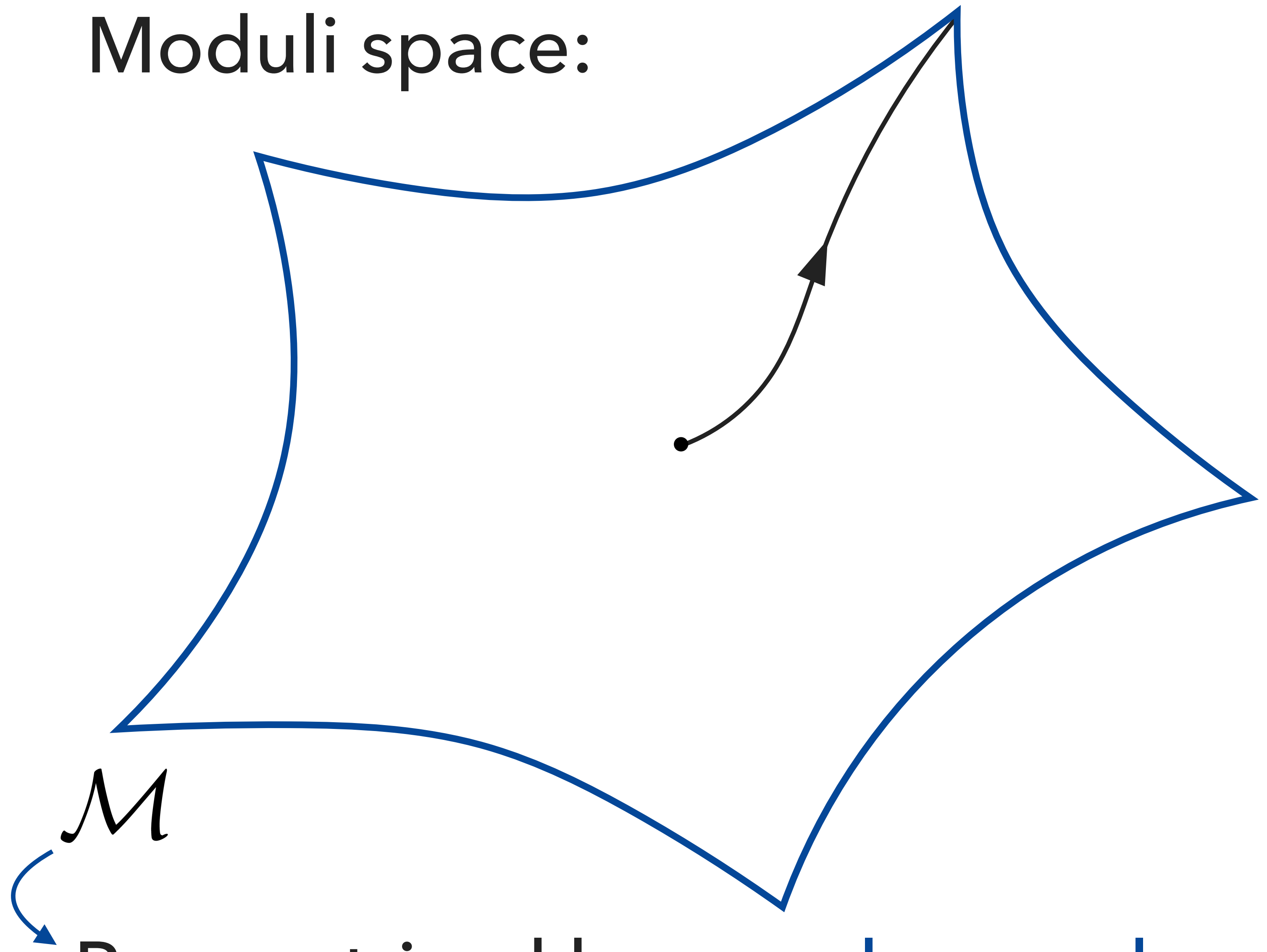

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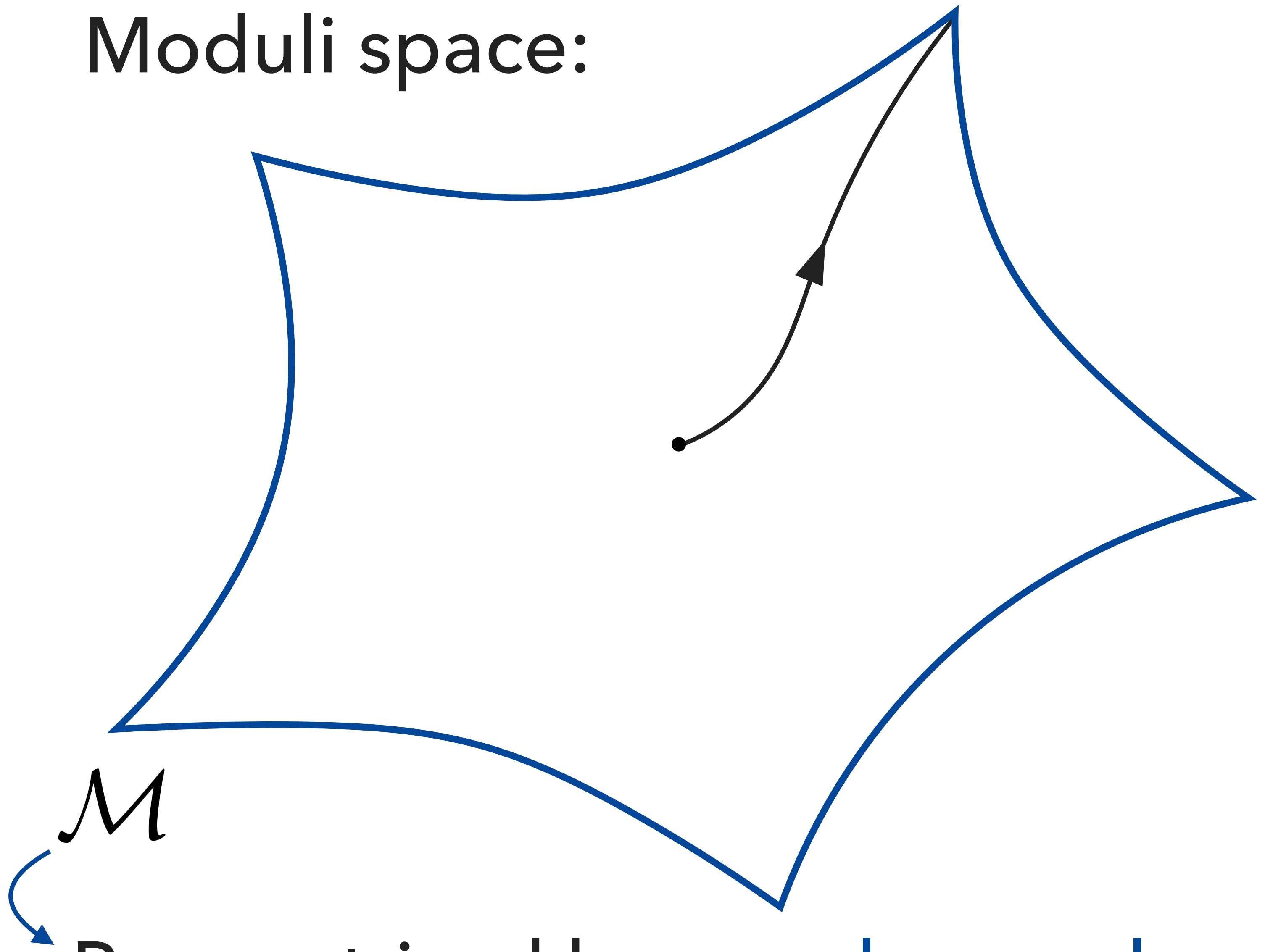

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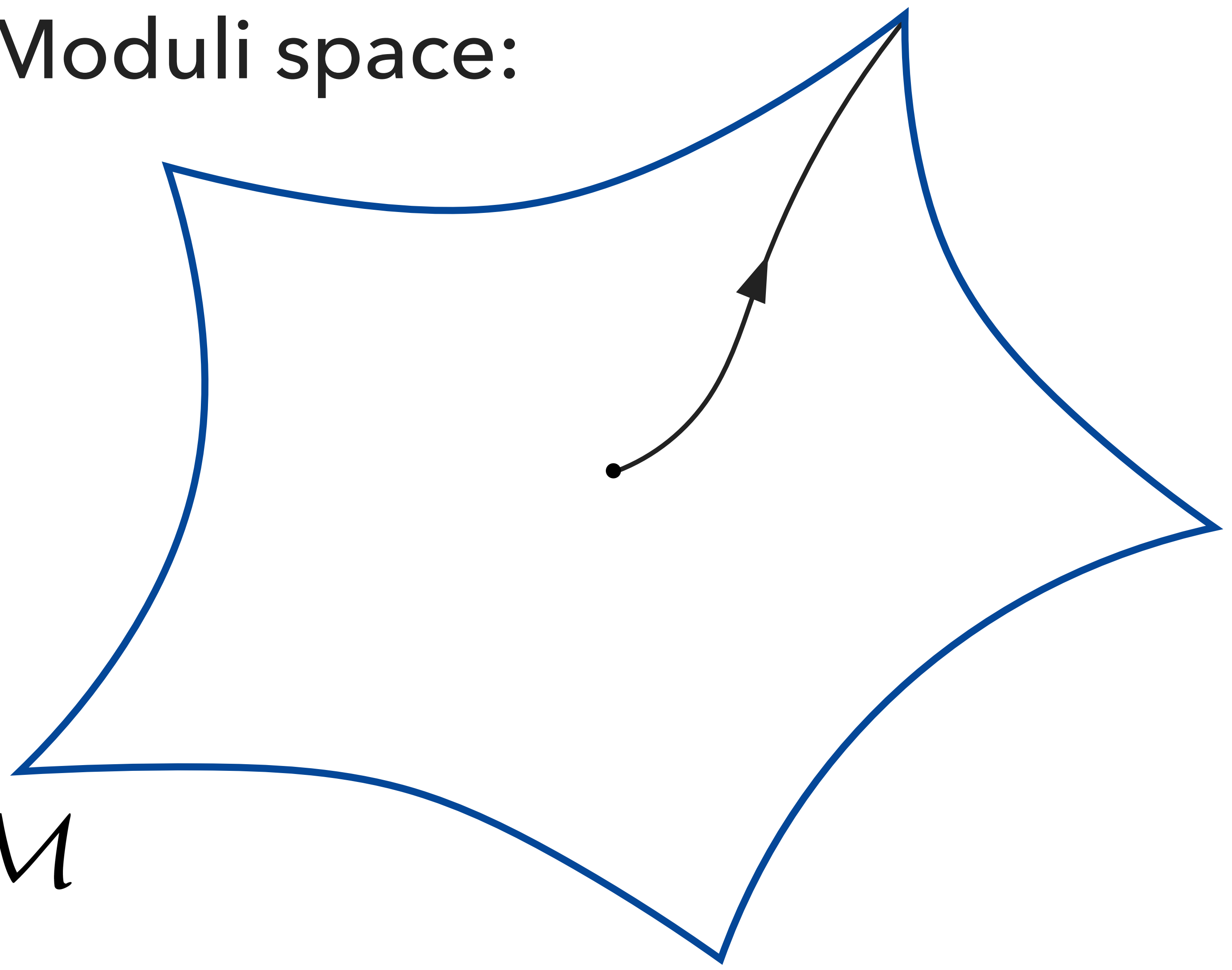

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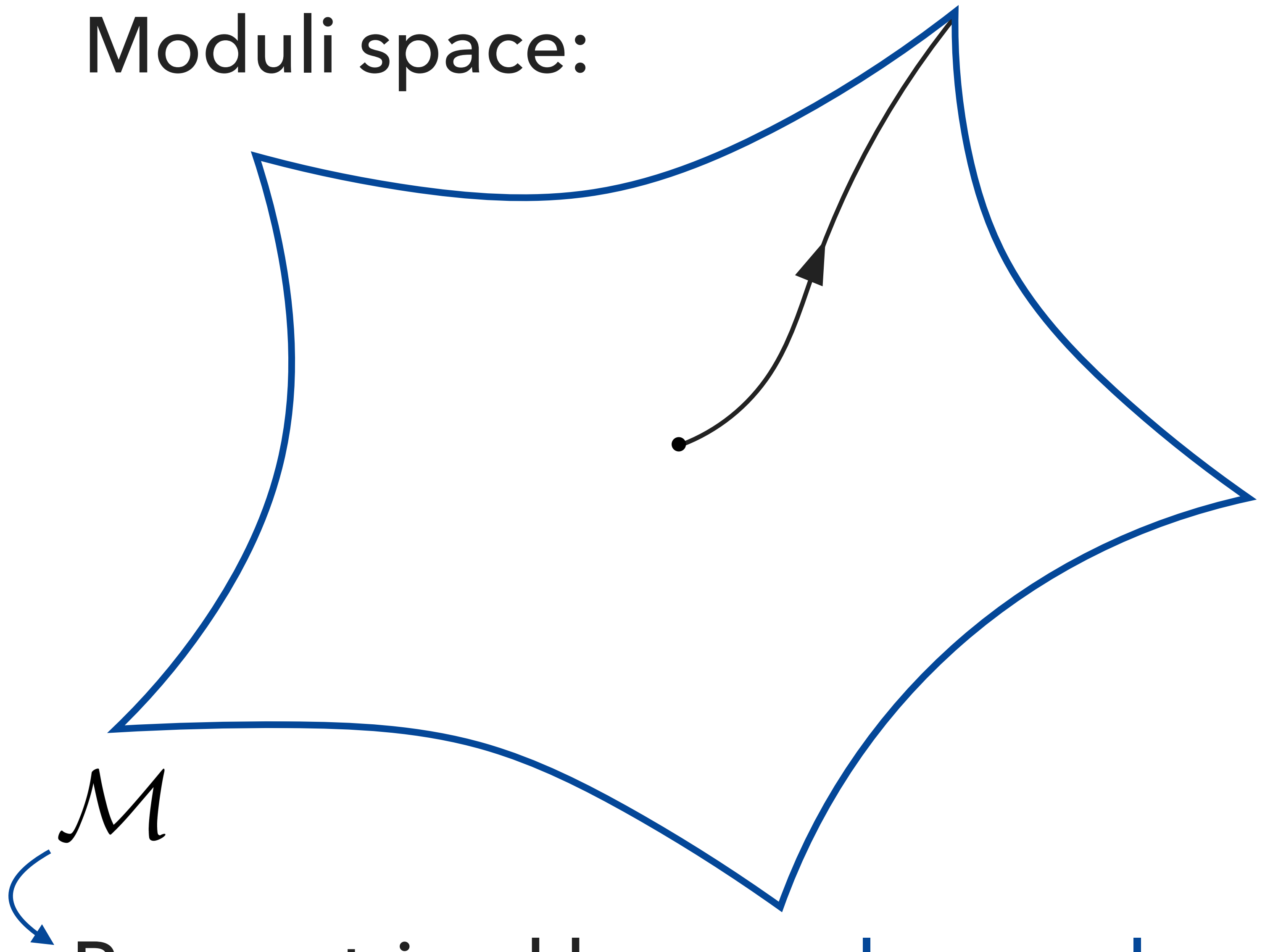

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Conformal manifold of local CFT in d>2

I. HS point $\longrightarrow$ Infinite distance

II. Infinite distance $\longrightarrow$ HS point

III. $\gamma_\ell = \Delta_\ell - (\ell + d - 2) \sim e^{-\alpha_\ell\, t}$

Local CFT: Posses stress tensor

$\Longrightarrow$ Dynamical gravity in the bulk!

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Today: Stringy origin of HS points at infinite distance ? [JCI, Valenzuela '24]

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Problem: $T_s \lesssim R_{AdS}^{-2}$ ⟶ String in a highly-curved background… **hard to study!**

→ Rely on CFT results and extract clues !

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In the paper: First SDC Convex Hull in AdS/CFT

Sharpened SDC non-trivially satisfied**!**

+ Connection to no scale separation

See Irene's talk!

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2. Hagedorn temperature at large N

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$\boxed{\text{Only theories with } \alpha = \frac{1}{\sqrt{2}} \text{ have Einstein gravity duals}}$ **!**

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Same as for SU(N) !

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[Gadde, Pomoni, Rastelli '09] → Restrict to flavor singlets!

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Preliminary prescription/result!

Hagedorn condition

$$\boxed{z_v(T_H) + 3\left(3 - 4\alpha^2\right) z_c(T_H) + \frac{1}{2} z_c(T_H)^2 = 1}$$

Still works!

Stay tuned!

Bonus Track: A New AdS String from Top-down?

Setup: $\mathrm{AdS}_5 \times \mathrm{S}^5/\mathrm{Z}_k \leftrightarrow \mathcal{N} = 2$ necklace quivers

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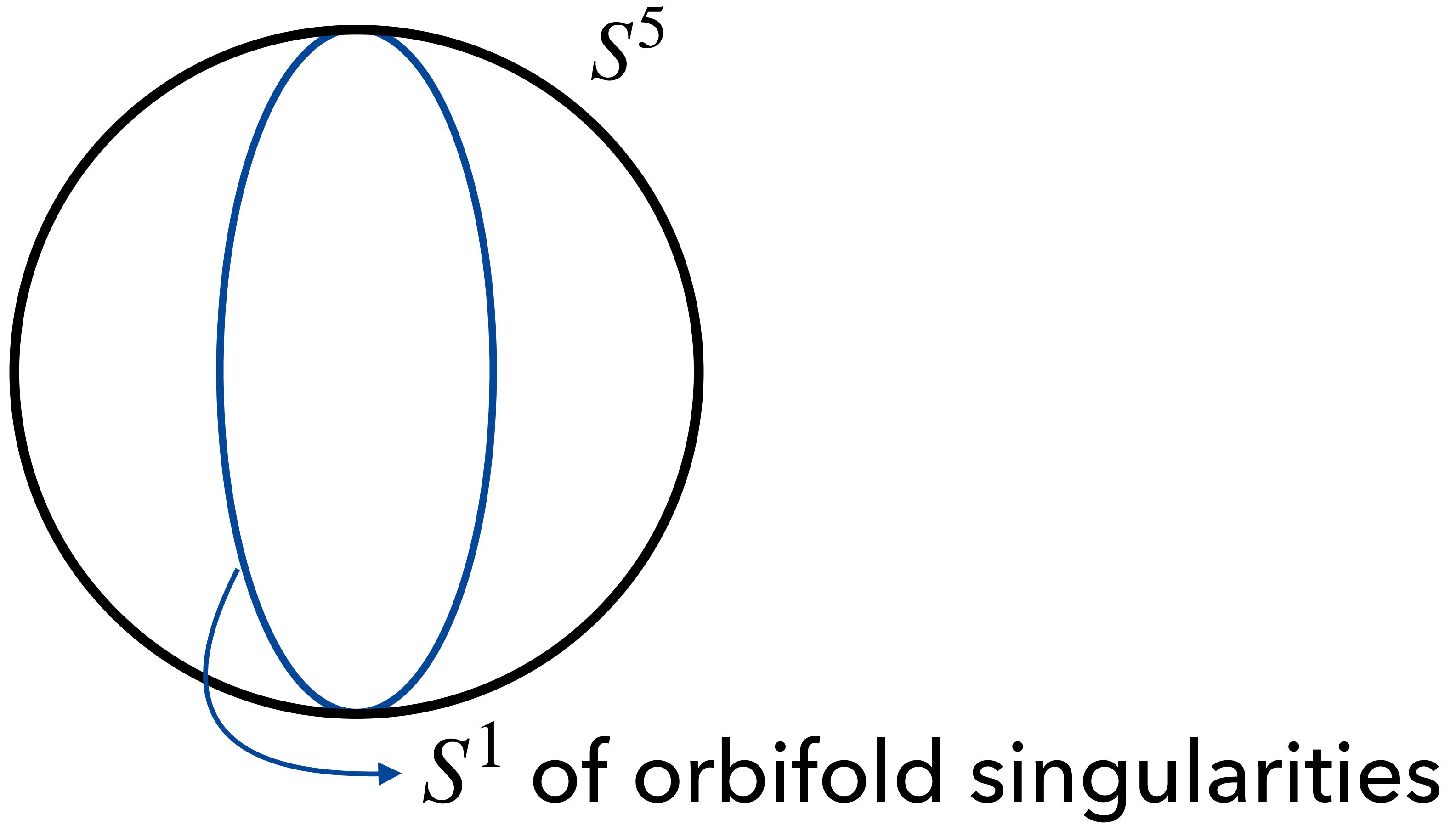

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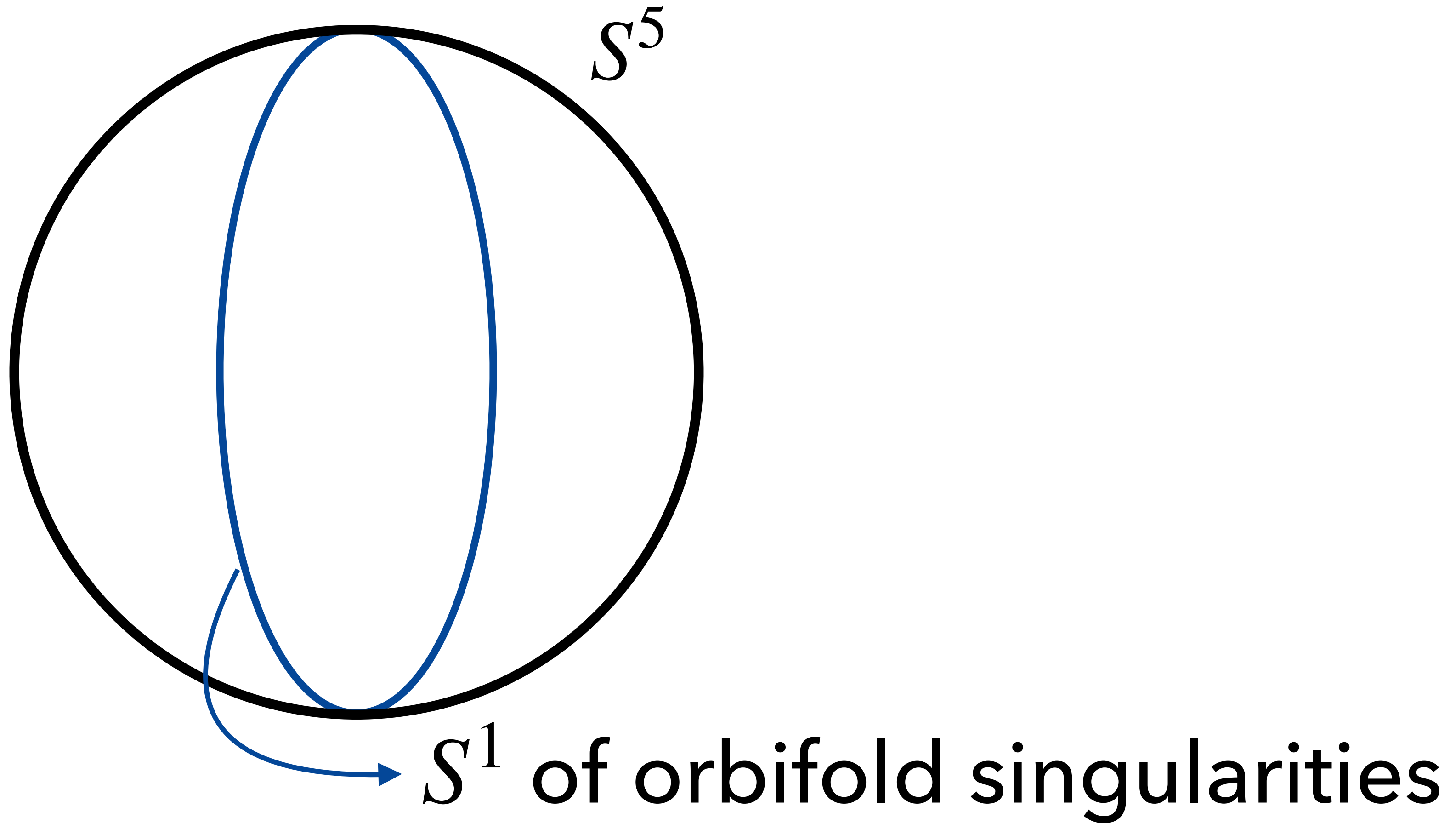

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Driven by only axions $\rightarrow$ Typically finite distance

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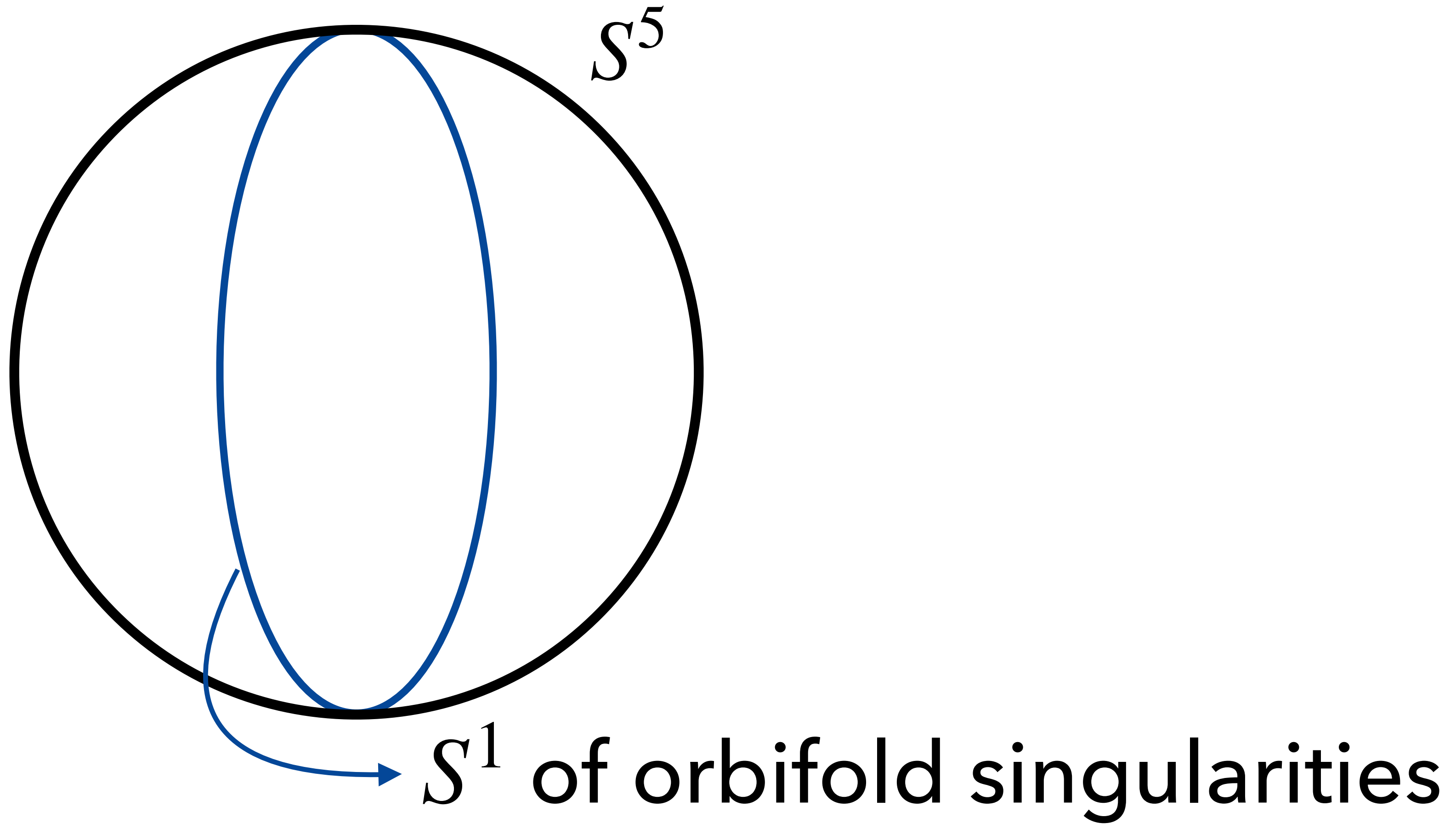

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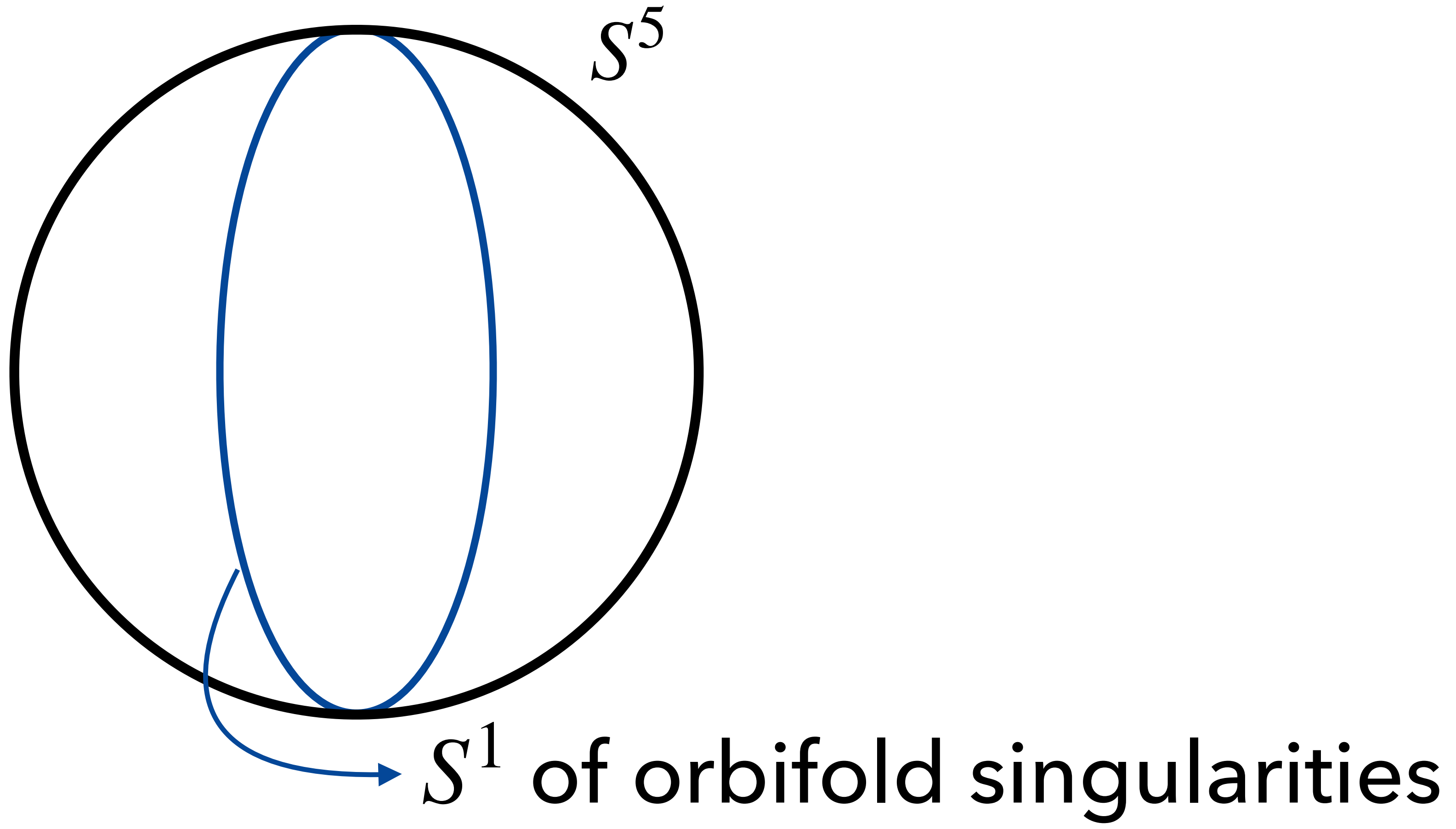

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Fundamental string remains tensionful…

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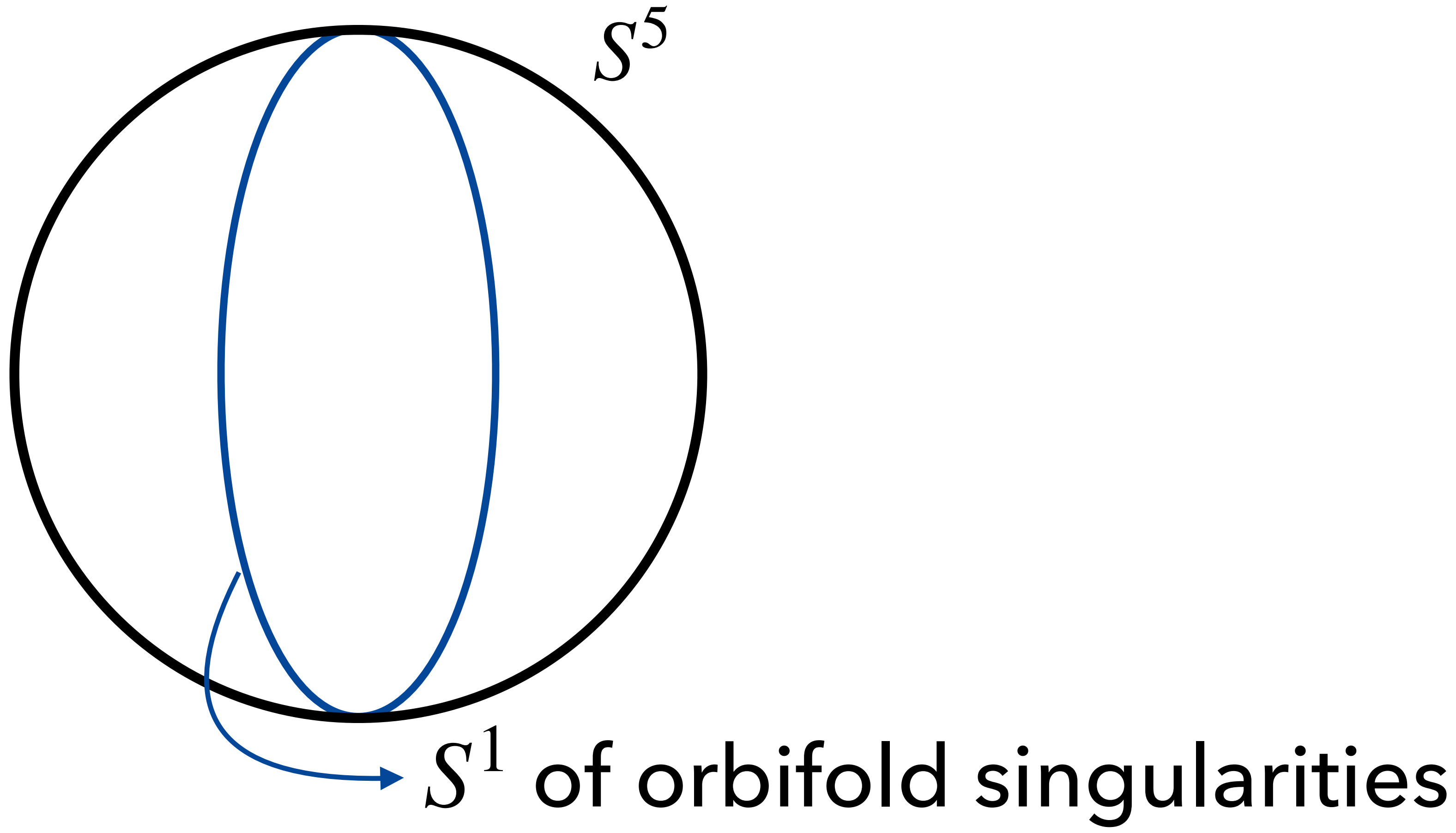

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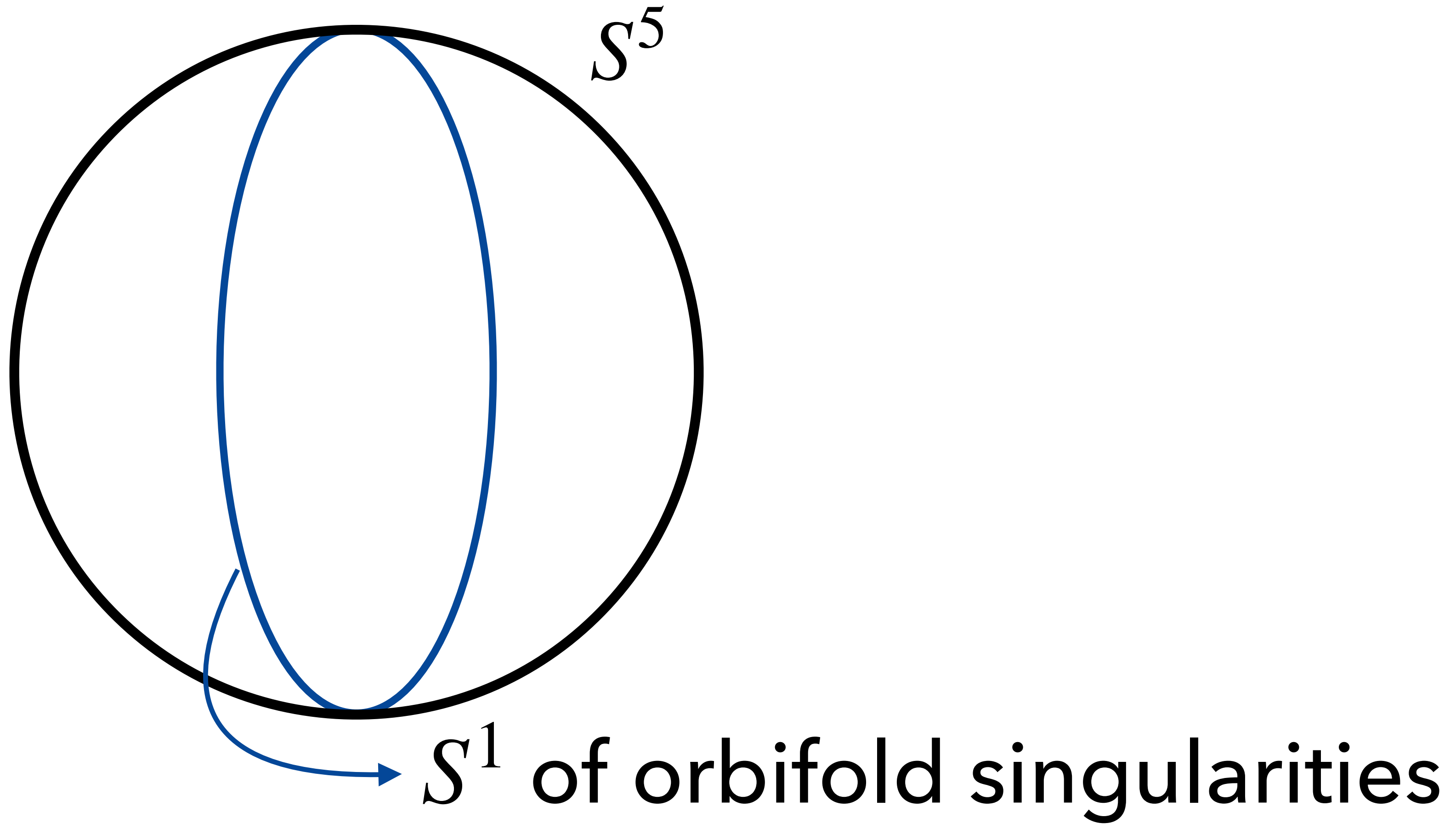

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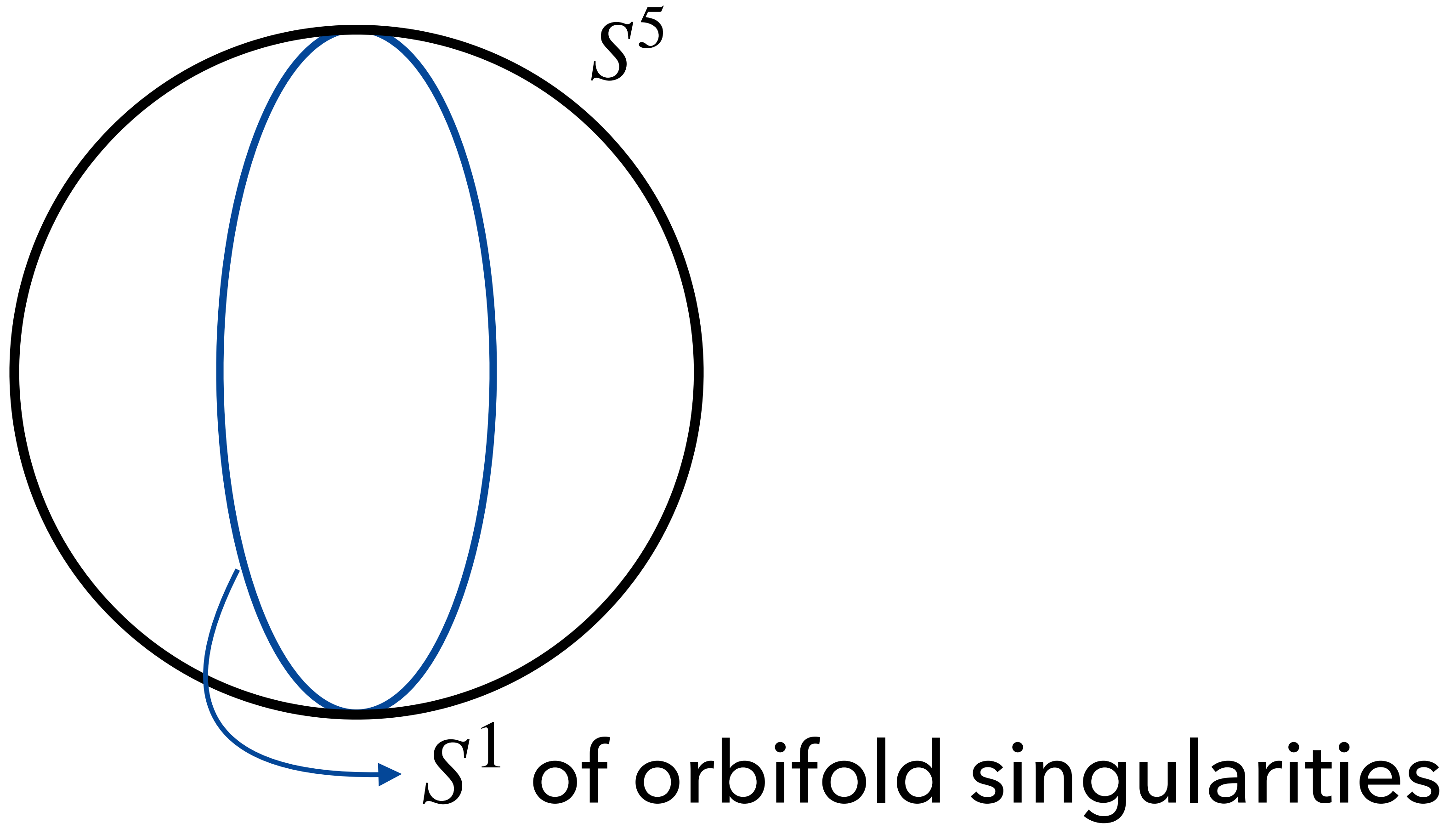
String propagating in $\mathrm{AdS}_5 \times \mathrm{S}^1$**!**

Bonus Track: A New AdS String from Top-down?

Setup: $\mathrm{AdS}_5 \times \mathrm{S}^5/\mathrm{Z}_k \leftrightarrow \mathcal{N} = 2$ necklace quivers



A very peculiar limit:

Driven by only axions $\rightarrow$ Typically finite distance

But! CFT predicts infinite distance + HS conserved currents [Aharony, Berkooz, Rey '15]

Stringy origin?

Fundamental string remains tensionful…

D3 wrapping blow-up 2-cycle become tensionless! [Aharony, Berkooz, Rey '15]

String propagating in $\mathrm{AdS}_5 \times \mathrm{S}^1$! Candidate for new emergent string in AdS? [Baume, JCI '20]

Conclusions and More Questions

There is much to learn about/from the Distance Conjecture in AdS/CFT !

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CFT side	**Stringy side**
Prove rest of CFT Distance Conjecture ?	New strings in AdS ?
Distance in N-direction ?	Building them: D3 wrapping blow-ups in AdS ?

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New strings in AdS ?

Building them: D3 wrapping blow-ups in AdS ?

Thank you for your attention!