Strings 2024 discussion

Thomas Van Riet-Leuven U

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Reflection I

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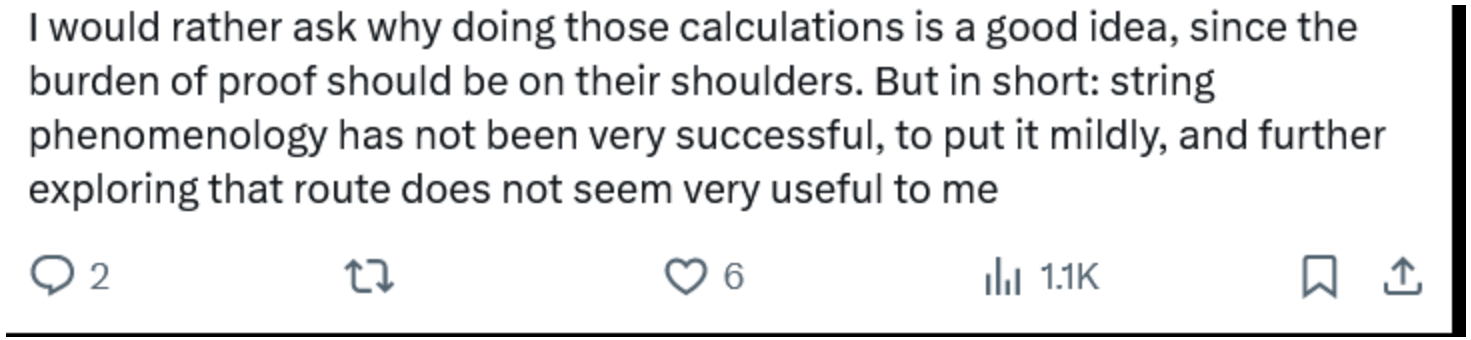
→*We have always known that the principle of decoupling is somewhat of an obstacle.*

How much is decoupling an obstacle? (Not just for ST but all alternatives, if any.)

→ *Not everything is an issue of energy scales: axions are a low-energy prediction.*

Reflection II

What have we learned from model building &string-pheno exercising?



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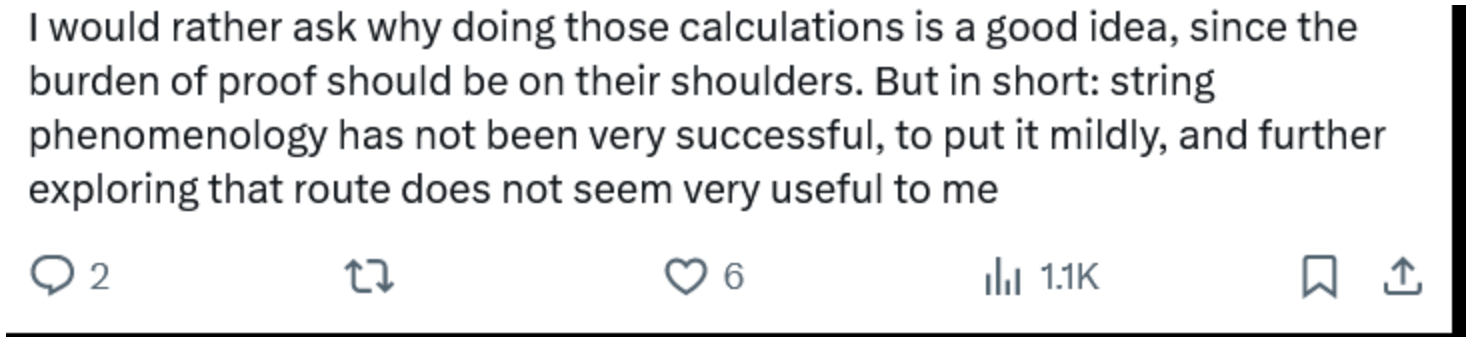

Regardless, we have learned tons by practicing string pheno: new geometry, how field theories geometrize, (reasons for) patterns in EFTs (eg WGC), ideas for new EFTs, new D-brane physics,....

How? Because pheno triggers questions we might not think about otherwise.

Example (AdS/CFT): how many compact bulk dimensions does a CFT reconstruct and how small can they be?

Reflection III: Impact of the Swampland program

To describe the real world, are we working in the right direction?

Asking how a certain EFT can be obtained from ST *(“pre Swampland”)*
[My (controversial?) opinion: by itself this is a dead-end. No predictability.]

vs

asking ST how our universe should look like *(“post Swampland”)?*

Should we focus more on patterns of vacua&EFTs and why the patterns occur?

→ Are we using the right paradigm?

The paradigm, part I

1. Critical superstring vacua M_4 x M_6 with M_6 compact and *small*. Is there more? Perhaps more braneworld style with M_6 less finetuned (dark dimensions, dark bubbles)? **Are we thinking sufficiently out of the box**?

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Do we need a theory of initial conditions for that? Is quantum cosmology too naive? Is inflation just the **dream** of using 4d EFT to describe the early universe?

Perhaps the dynamics of the early universe caused the universe to become 4d ?
(then the dynamics can not be described using 4d language)

The paradigm, part II

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A lack of formal string theory progress (new revolution) is hampering us.

But is our own universe weakly coupled? → *Look at the SM couplings, the cosmological constant. Is its smallness a reason to think we are in an asymptotic regime?*

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Back in 1985…

Is the superstring weakly coupled?

Michael Dine[1] *, Nathan Seiberg[2] *

Abstract

We argue that if the superstring is to describe our world, it is probably strongly coupled. Several other (unlikely) possibilities are discussed.

Potential questions for debate

1. How much is decoupling an obstacle?

2. Should we (have) focus(ed) more on patterns/bounds in the landscape?

3. Is our universe weakly coupled in a string theory sense?

4. Is the critical superstring with small compact dimensions the correct paradigm?

5. Can we decouple (early universe) cosmology from (late time) particle physics?

6. Which is our best/worst target for observing string theory? Particle colliders? Cosmological observations? Astrophysical?...?