"la Caixa" Foundation

Instituto de Física Teórica UAM-CSIC

CSIC

# Premio Nazionale «Milla Baldo Ceolin» 2023

**Alessandra Grieco**

GGI Arcetri, 8 ottobre 2024

# Who am I?

- PhD student at Instituto de Fisica Teorica UAM-CSIC in Madrid, Spain
- Master's degree at University of Padova, thesis supervised by prof. Luca Martucci (UNIPD) and Irene Valenzuela (CERN/UAM)

Now my PhD supervisor!

«Non-invertible symmetries and quantum supergravities in four and five dimensions»

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## What is quantum gravity?

And why should we care?

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In the last (circa) 50 years, numerous attempts to "unify" all interactions/"quantize" gravity.

# String Theory

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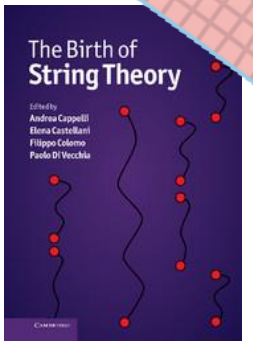


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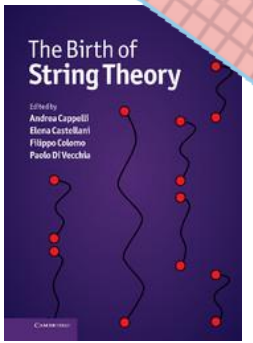


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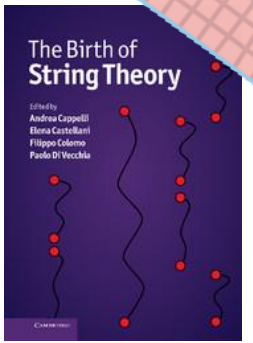
**Main issue**: we expect to see quantum gravitational effects at very high energies (Mpl?) , which are technologically not possible to reach today (or within a hundred years). Hence, **no experimental test** has been done.

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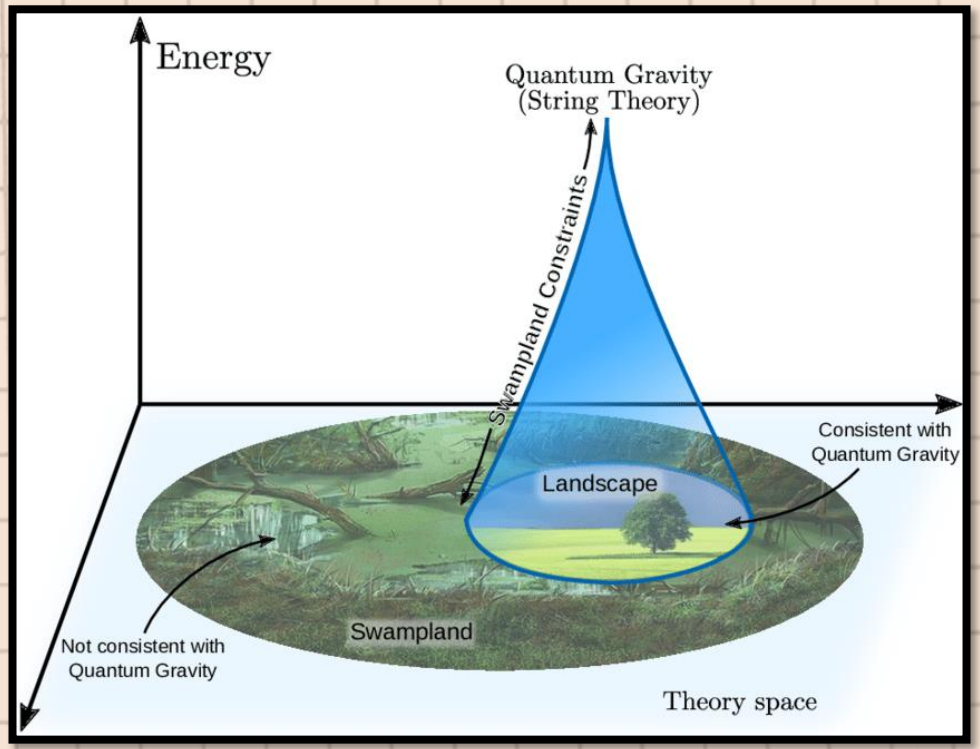
**Maybe not all of these low energy theories are consistent once we turn on gravity!**

# The Swampland (Vafa '05)

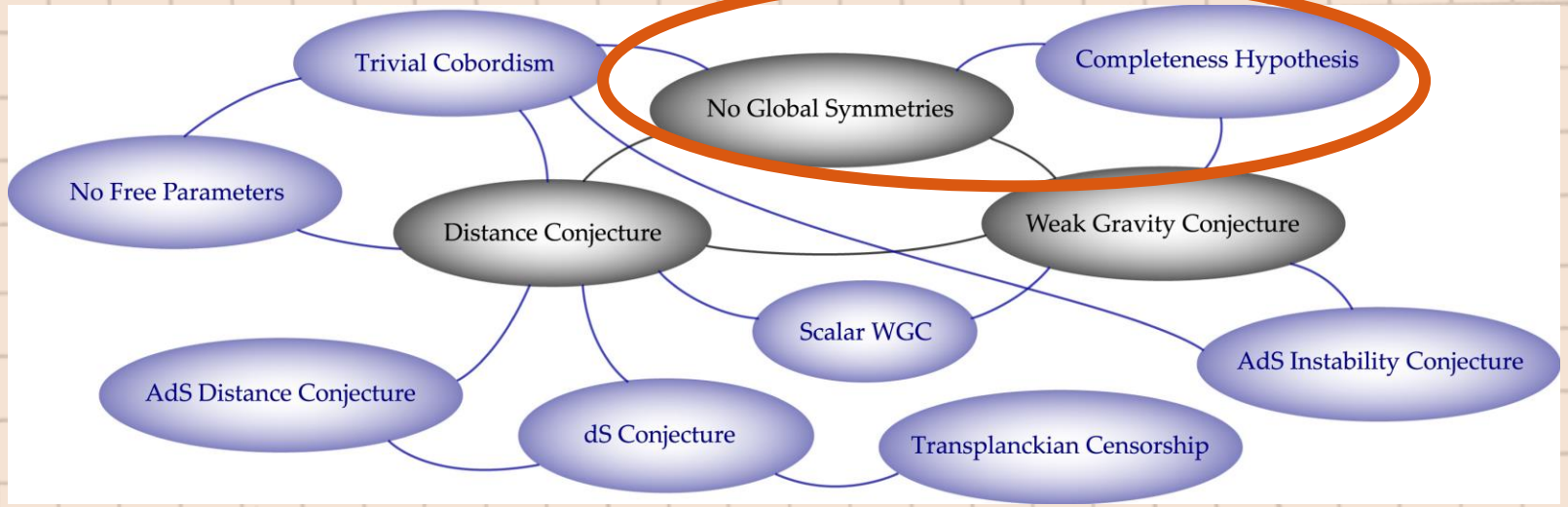



What are the **conditions** on **low energy physics** selecting the theories which can be **UV completed** to **quantum gravity**?

This is the **main topic** of my PhD research

# The Swampland

My thesis!



## «Non-invertible symmetries and quantum supergravities in four and five dimensions»

- Analyzing a class of supergravities, which are low energy theories which can be realized from string theory, we find an argument which supports the connection between the **absence of global symmetries** in quantum gravities and the **completeness of the spectrum** of charged objects.

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- We consider **non-invertible symmetries**, which are a recent generalization of the concept of global symmetries (Gaiotto, Kapustin, Seiberg, Willett, 2014) that is fundamental for our argument to work.

# Thanks for your attention!