

Title: Panel Discussion - Future Directions in QG (Dittrich, Gregory, Loll, Sakellariadou, Surya)

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Collection: Puzzles in the Quantum Gravity Landscape: viewpoints from different approaches

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## **Panel discussion Future directions in QG**

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Puzzles in the quantum gravity landscape,  
Perimeter Institute  
27/10/2023

## State of the art

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What are we to make of the common statement that  
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of gravity"

What is the most striking prediction made by the particular  
version of quantum gravity you work with?  
Same for any version of quantum gravity?

## Conceptual foundations

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*"The most difficult part [in the development of a new theory] is abandoning some of the important old concepts. Any good physicist would be willing to acquire new concepts but even the best physicists are sometimes quite unwilling to leave some of the old and apparently safe concepts" (W. Heisenberg)*

What concepts should be abandoned in order to arrive at a quantum theory of spacetime?

## Gravity and matter

Can we learn anything from the existing theories of the strong and electroweak interactions?

Does it make sense to look for a quantum theory of spacetime without taking matter into account?

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Does it make sense to look for a quantum theory of spacetime without taking matter into account?

Will it be useful/necessary to start from modified gravity?

Is unification desirable? possible?



## The maths of QG

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Global symmetries?

Gauge symmetries/diffeomorphisms?

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What role will symmetries play in a quantum theory of spacetime?  
Global symmetries?  
Gauge symmetries/diffeomorphisms?

Could a quantum theory of spacetime treat space and time differently?

## Applied QG

S-matrix, Cosmology, Black holes, gravitational waves, effects of QG on particle properties...

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Is the CC problem a problem of QG? If so, is it solvable in the EFT? Does it require a quantum theory of spacetime?

When experimental evidence will finally appear, will it

- confirm one of the established approaches?
- be unable to discriminate between different approaches?
- require a radical revision, going beyond current approaches?