

ACADIA PHYSICS SEMINAR

Quantum mechanics in one space, general relativity in another

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Friday, November 28, 2025 at 12:30 pm
Huggins Science Hall 206 (HSH 206)

The holography that can be done in a lab records 3d information on a 2d surface. In theoretical physics, there is another definition of holography which states that theories of gravity are secretly lower-dimensional. While this idea sounds surprising at first, it has a long history, motivated by the fact that the system with the densest possible packing of qubits is a black hole. I will give an overview of why we believe this holographic principle and then discuss the most well-established realization of it, which comes from string theory. This latter form is remarkable for two reasons --- it suggests features that a quantum theory of gravity should have and also simplifies calculations in various ordinary quantum systems. I will survey some of these research directions, especially the ones which are being pursued in Canada.

Dr. Connor Behan obtained his PhD from Stony Brook University in 2019 and recently started a postdoctoral position at the Perimeter Institute for Theoretical Physics. He studies quantum field theory, which is the mathematical framework underlying the Standard Model. A particular focus for him is the "holographic dictionary", providing a relation to gravitational theories in a higher-dimensional space. The details of how this works are sometimes very concrete and sometimes very conjectural. Connor has done foundational work on extending the most concrete calculational tools of holography to a wider class of theories.