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# Theory Seminar

## "Controlling quantum cosmology"

Holographic dualities have allowed the construction of UV complete, nonperturbative models of quantum gravity in spacetimes with negative cosmological constant. In contrast, despite suggestive formal similarities, very little progress along these lines has been made for their positive cosmological constant counterparts, or more generally in the construction of complete models of quantum gravity in an expanding universe. I will review some of the attempts of the past, what the obstacles are to the construction of holographic duals, and how the first explicit, recent proposal for such a dual --- the  $Sp(N)$  model of Anninos, Hartman and Strominger, conjectured to be dual to 4d higher spin gravity with positive cosmological constant --- manages to circumvent these issues. I will then describe our recent and ongoing work exploring whether this model indeed makes sense beyond perturbation theory, more precisely in its interpretation as providing an exact expression for the "wave function of the (Vasiliev) universe". At this point the evidence is mixed but intriguing. I will also outline a related line of work, addressing the question how the characteristic "evolutionary tree" of macroscopically distinct geometries generated by quantum fluctuations and inflation can be extracted from the late time wave function. Inspired by ideas developed in the theory of spin glasses, we propose to consider certain distance distributions on state space.



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