ICTS String Seminar

Title : Free Energy from Replica Wormholes

Speaker : Netta Englehardt (Massachusetts Institute of Technology)

Date : Wednesday, 02 September 2020

Time : 07:00 pm (IST)

Abstract : Recent developments on the black hole information paradox have shown that Euclidean wormholes — so called "replica wormholes'' can dominate the von Neumann entropy as computed by a gravitational path integral, and that inclusion of these wormholes results in a unitary Page curve. This development raises some puzzles from the perspective of factorization, and has raised questions regarding what the gravitational path integral is computing. In this talk, I will focus on understanding the relationship between the gravitational path integral and the partition function via the gravitational free energy (more generally the generating functional). A proper computation of the free energy requires a replica trick distinct from the usual one used to compute the entropy. I will show that in JT gravity there is a regime where the free energy computed without replica wormholes is pathological. Interestingly, the inclusion of replica wormholes is not quite sufficient to resolve the pathology: an alternative analytic continuation is required. I will discuss the implications of this for various interpretations of the gravitational path integral (e.g. as computing an ensemble average) and also mention some parallels with spin glasses.

ICTS virtual seminar : Please register at https://docs.google.com/forms/d/e/1FAIpQLSf0jLgoqiOgDnxbEBGiuIWiOmh9WX8caH-pr13qDBZOO91lmg/viewform

(Links to join the seminars will be sent to your registered email address)

Recordings of past talks can be found here:
https://www.youtube.com/channel/UCw9LdPQ5t7Q7muD0qzn70TA