PETAR SIMIDZIJA, University of Waterloo

Information carrying capacity of a cosmological constant

A question of fundamental importance in Relativistic Quantum Information asks what is the information carrying capacity of a quantum field. Previous studies have discussed that in curved spacetimes and in particular in cosmology, information flows decouple from energy flows. Remarkably, these studies show that information can travel in massless fields between timelike separated observers. In other words, the propagation of light signals leaves a timelike echo in the entire future lightcone of the emitter. In this setting we can imagine ourselves to be Bob, a late observer in an expanding de Sitter Universe attempting to retrieve information that was imprinted in a massless quantum field by an early time emitter Alice in our timelike past. We will show that, contrary to intuition, the faster the exponential expansion of the Universe the more information Alice can send Bob through a timelike communication channel via the quantum field. Even more remarkably, we will see that the channel capacity does not decay with Alice and Bob's spatial or temporal separations, in contrast with i) the capacity of conventional lightlike channels (suggesting that it is possible to gather information about the early Universe from timelike signals with much greater efficiency than by pointing our telescopes to distant light signals) and ii) with the timelike channel capacity in slower, polynomially-expanding cosmologies. I will try to convince you that if we wait a billion years before reading Alice's message, we could (in principle) recover the same amount of information as if we read the message today.