J Astrophys Aerospace Technol 2017, 5:3 (Suppl)
DOI: 10.4172/2329-6542-C1-012

On the horizon problem in discrete quantum gravity

Benjamin F Dribus
William Carey University, USA

The horizon problem in the cosmology of the early universe involves uniformity of structure difficult to explain without a mechanism for interchange of information among spacetime regions that appear causally unrelated. This problem was a principal motivation for the inflationary theory developed by Guth and Linde around 1980. Inflation posits an inflaton field driving vast exponential expansion of spacetime during a very brief period in the early universe, leading to large separation of regions previously sufficiently close to interact. While the inflaton field may possess certain unconventional properties, the inflationary mechanism otherwise fits into a relatively conventional cosmological framework, without involving any essentially new ideas beyond general relativity and quantum field theory. Recent debate about inflation, epitomized by the exchange of scientific American articles by Steinhardt *et al*. and Guth *et al*., is spurred partly by unforeseen implications of simple versions of the inflationary mechanism and partly by a desire to explain the structure of the early universe in a more-fundamental quantum-gravity context. Here, the author presents an approach to the horizon problem assuming discrete spacetime microstructure. In this context, early interchange of information leading to uniformity among distant regions can be explained by an abrupt decrease in the sizes of causal horizons due to a phase transition in the sense of random graph theory, whereby qualitative properties of a network of events change suddenly under gradual change of a connectivity parameter. Numerical evidence is examined and analytical results are proven for certain classes of finite universes.

bdribus@wmcarey.edu