Contribution ID: **10** Type: **not specified**

Quantum cosmology, eternal inflation, and swampland conjectures

Monday 26 June 2023 15:20 (20 minutes)

In light of the recent swampland conjectures, we explore quantum cosmology and eternal inflation beyond the slow roll regime. We consider a model of a closed universe with a scalar field ϕ in the framework of tunneling approach to quantum cosmology. The scalar field potential is assumed to have a maximum at $\phi = 0$ and can be approximated in its vicinity as $V(\phi) \approx 3H^2 - \frac{1}{2}m^2\phi^2$. Using the instanton method, we find that for $m < 2H$ the dominant nucleation channel for the universe is tunneling to a homogeneous, spherical de Sitter space. For larger values of m/H, the most probable tunneling is to an inhomogeneous closed universe with a domain wall wrapped around its equator. We determine the quantum state of the field ϕ in the nucleated universe by solving the Wheeler-DeWitt equation with tunneling boundary conditions. Our results agree with earlier work which assumed a slow-roll regime $m \ll H$. We finally show that spherical universes nucleating with $m < 2H$ undergo stochastic eternal inflation with inflating regions forming a fractal of dimension $d > 2$. For larger values of m the field ϕ is unstable with respect to formation of domain walls and cannot be described by a perturbative stochastic approach.

Authors: Prof. VILENKIN, Alexander (Tufts University); FANARAS, George

Presenter: FANARAS, George

Session Classification: Parallel

Track Classification: Cosmology