Abstract Submitted
for the CUWIP21 Meeting of
The American Physical Society

Quantum Gravitational Onset of Starobinsky Inflation in the k=1 FLRW Model[1] LUCIA GORDON, Harvard University, BAO-FEI LI, PARAMPREET SINGH, Louisiana State University — Inflation is a period of expansion in the early universe explaining many cosmological observations, though its cause is not well understood. The chaotic and Starobinsky inflationary models are valid in a flat universe, but recent observations suggest that the universe is spatially closed. In this case, for most initial conditions the universe undergoes a recollapse, resulting in a Big Crunch singularity using the classical theory of General Relativity. This makes it very unlikely for inflation to begin in the Starobinsky model, even though this model is favored over the chaotic model by CMB data. In Loop Quantum Cosmology (LQC), there are no singularities, and a recollapse of the universe results in a bounce, allowing the universe to enter an expanding phase following its recollapse. We applied LQC to the Starobinsky model in a closed universe to investigate how the removal of singularities affects the likelihood of inflation. For many initial conditions we found that the universe enters inflation after undergoing various bounces, depending on how favorable the initial conditions are to inflation. Thus by using quantum gravity we have provided insights into the naturalness of initial conditions capable of leading to Starobinsky inflation in a closed universe.

[1]Completed during the 2020 LSU REU program and sponsored by the grant NSF PHY-1852356

Lucia Gordon
Harvard University

Date submitted: 03 Jan 2021 Electronic form version 1.4