Charles Peterson

Nikodem Poplawski

Chris Haynes

**Abstract**

Currently, the general theory of relativity is incomplete. The mathematical framework of general relativity asserts that black holes collapse into points of infinite density. General relativity assumes that quantum angular momentum is an insignificant factor, but at great densities quantum angular momentum fundamentally changes the characteristics of black holes.

**Introduction**

According to the general theory of relativity,matter inside of a black hole collapses to a point of infinite density (singularity). The Universe also started from a point (Big Bang). However, infinities are unphysical. The Einstein-Cartan theory offers a solution to this dilemma. The solution comes from adding the quantum-mechanical angular momentum (spin) of elementary particles. These particles generate a repulsive force (torsion) at extremely high densities which opposes gravitational attraction and prevents singularities. We argue that the matter in a black hole collapses into an extremely high but finite density, bounces, and expands into a new space (it cannot go back). Every black hole, because of torsion, becomes a wormhole (Einstein-Rosen bridge) to a new universe on the other side of its boundary (event horizon). Such scenario would result in a universe which never contracts to a point and consequently does not violate the laws of physics. Our Universe may thus have been formed in a black hole existing in another universe. The last bounce would be the Big Bang (Big Bounce).

**Methods**

In order to evaluate our expectations we wrote a code in the Fortran programming language which solves the equations that describe the dynamics of the closed universe in a black hole (NP, arXiv:1410.3881) and then graph the solutions. These equations give the size (scale factor) a and temperature T of the universe as functions of time t (see Fig. 1). From the obtained graphs we found the values of the scalar spectral index ns and compared them with the observed CMB value (see Fig. 2).

**Results**

The simulated values of ns in our model are consistent with the observed CMB value ns for a small range of β and a wide range of a0 (m) (See Fig. 3). From this we can make several conclusions. The dynamics of the early universe formed in a black hole depends on the quantum-gravitational particle production rate β, but is not too sensitive to the initial scale factor a0. Further, inflation (exponential expansion) can be caused by particle production with torsion if β is near some critical value βcr. Since our results for ns are consistent with the 2015 CMB data we can further support our assertion that our Universe may have been formed in a black hole.

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**Biography**

Charles Peterson is a sophomore at the University of New Haven currently pursing a bachelors degree for mechanical engineering. His hobbies include writing research paper biographies and taking selfies which feel like they’re always staring at you.

selfie.jpg