

No Big Bang, no Strings, no Inflation

T. Gehrels*

Presenting and Corresponding Author: tgehrels@lpl.arizona.edu

www.lpl.arizona.edu/faculty/gehrels.html

Since I gave a recent LPL colloquium and we now have limited time, I will overview the topic only in the next paragraph (there are three papers in the above URL). This is a sales pitch for topics for research and dissertations.

Big-Bang, String, and Inflation theories have only a few, if any, supporting observations. Instead, the revised history of our universe is based on 14 sets of observations. It begins with decay in our universe and expansion of that into a multiverse derived from a powerful equation, which shows unified operation of quantum, relativity, gravity, and atomic physics. A cloud grows in the inter-universal medium (IUM) from the debris of sub-atomic, energy-seeking particles, which become re-energized by gravity to yield protons, photons, etc. for our universe at $t \sim 10^{-6}$ s (on the clock of Big-Bang and atomic models), *i.e.* 10^{37} Planck times later than the Big Bang, at proton density of 10^{18} kg m⁻³ (see Table).

The Schwarzschild radius provides an upper limit to a mass and radius combination below which radiation cannot escape, and the object may become a black hole. The arithmetic is simple because for light to escape, its kinetic energy must be greater than the local gravitational potential. For velocity of light, c , it follows that the limiting radius of the object is $R_S = 2GM/c^2$. Schwarzschild published that in 1916, but it was ignored. The Table shows the comparison of R_S with radius $R = (3M/4\pi\sigma)^{1/3}$ for a uniform sphere with density σ .

The first line is for when the universe's

radiation does get to escape, for which the standard theories predict the time $t = 380,000$ y. So, the Schwarzschild limit works well.

The second line is for the above proton density.

At first look, the Schwarzschild radius seems to prohibit the beginning of our universe at $t \sim 10^{-6}$ s. However, the size of the universe, 0.6 AU, is much larger than the sun, inside which it takes a million years for a photon to escape from its center. For the inert material, the escape might happen in 380,000 years, and $t \sim 10^{-6}$ s is alright. Radiative scattering is the mechanism providing radiation pressure by re-energized photons, and by dark energy (which is known to accelerate the expansion of inter-galactic space).

Radii and Schwarzschild Radii

R/R_S	t	σ	$R(\text{ly})$
1	380,000 y	10^{-20}	10^7
10^{-14}	10^{-6} s	10^{18}	10^{-5}
10^{-40}	0	10^{96}	10^{-31}

In the third line, the comparison is at Planck density, if our universe were ever at $t = 0$. The Big-Bang ideas came from thinking the expansion backwards to $t = 0$, *i.e.* all the mass in nearly-zero space, which is unrealistic. And this time, neither photons nor dark energy are available as yet to save the modeling. The Table shows then that the thought-experiment's reversal ought to have been halted well before that troublesome epoch. The second line does that at 10^{-6} s.