

## **Ask A Genius 24 - The Future of the Big Bang**

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**Scott: If you look at the Big Bang, one thing that might puncture holes in it is if you find extremely large, young objects in the universe or things not expected in the early universe.**

Rick: Obviously, according to the Big Bang, time started with everything as a single point-like object and then rapidly expanded to a hypersphere that expands everywhere until we have the size of space that we do now, which is something like 30 billion light years in circumference or diameter, or some damn thing with an apparent age of 13,800,000,000 years.

In a big bang, everything had to begin with a certain level of homogeneousness. Otherwise, you get clustering or swathes of the universe where all of the matter is clustered. You need exactly the right amount of anisotropy, tiny clumpiness, to get the galaxies that we have today.

What you wouldn't expect, and this would be a fairly convincing disproof of standard Big Bang cosmology, is a lot of old junk in the early universe, by "old junk," I mean collapsed matter.

Matter that takes a long time to collapse. For a star to burn out and collapse into a black hole, depending on the size of the star, takes tens of millions to tens of billions of years.

That process takes a long time. If you find black holes in the early, early universe, there are chances to have black holes like the matter clumped up in a certain way, but that tends to go against the expected clumpiness such as finding a bunch of black holes.

If a large percentage of dark matter, assuming that it exists and there are good arguments for it, neutron stars, black holes, brown dwarfs, old burned out stuff, then somebody would have to raise his or her hand and say, “This stuff looks like it's older than what we think of as the first moment of the universe.”

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