The big bang problem of early maturity

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When astronomers look at objects at high redshift, they assume they formed early after the big bang. Population III stars are said to be the first stars to have formed in the first galaxies, which are assumed to have taken several billion years to develop.[1] These stars have not been observed in the universe and need even more specialized conditions for their theoretical formation than Population I and II stars.[2] Population III stars are thought to eventually die in supernova explosions, which spread dust and debris into space. It is from this debris that the next generation of stars, Population II, is supposedly formed. The same process repeats to form Population I stars, such as the sun. As part of the development of these stars, the elements heavier than helium are believed to be generated. This all is suppose to take many billions of years according to the standard big bang paradigm.

Recently, there have been a number of surprising discoveries of the apparent rapid formation of stars, galaxies, quasars, black holes, and heavy elements soon after the big bang that are causing theoretical difficulties with standard cosmological models based on the big bang.

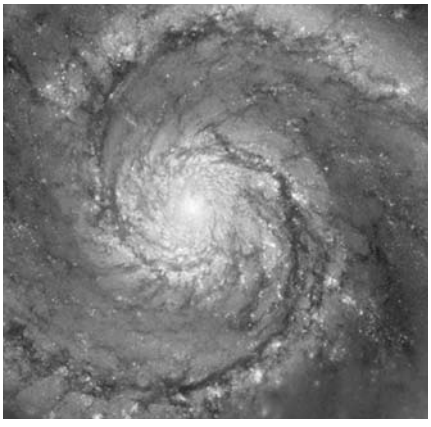

Photo by NASA.

Observations from the supposed early big bang show unexpectedly mature features.

Formation of stars and galaxies

For instance, when astronomers turned the Hubble telescope to deep space they were surprised to observe mature spiral and bar galaxies that must have formed quickly after the supposed big bang,[3,4] much sooner than big bang theorists predict.

Such rapidly forming galaxies so soon after the big bang are being reinforced by other discoveries in deep space.[5,6] Astronomers are finding light from galaxies that already had become 'old' a mere 2 billion years after the big bang. Furthermore, they were surprised to find that some of these galaxies were already the size of the largest galaxies in the universe today. Early galaxies are not supposed to be this large and some of these galaxies are believed to have formed in less than 1 billion years after the big bang.

Rapid formation of quasars and supermassive black holes

Another bombshell from the 'edge' of the universe is the discovery of the farthest quasars, suggesting that supermassive black holes, believed to be the energy source, according to the standard model,[7] had formed a mere billion years or less after the big bang.[8,9] Supermassive black holes imply that very large galaxies had already formed and collapsed. This discovery is a theoretical challenge: 'Thus, the very existence of quasars at such high redshifts is a challenge to models of structure formation.'[10] The only way astronomers believe such galaxies can form so early in the birth of the universe is if dark matter makes up most of the mass of the universe. This dark matter is claimed to provide the gravitational force required for the rapid formation of stars, galaxies, supermassive black holes and quasars. Despite the theoretical necessity for exotic dark matter, there is some observational evidence against its existence.[11]

Elements were formed early

The finding of many chemical elements from the 'early universe', based on the spectroscopic analysis of light, is reinforcing the idea that galaxies formed very early in the supposed big bang.[12] Twenty-five elements, including 10 with a molecular weight heavier than iron, were discovered in one far away galaxy. Some of these elements are 'heavy elements' such as zinc, germanium and lead. The supposed age of these elements is less than 2.5 billion years since the big bang. Elements higher in the periodic table than boron are thought to have been synthesized in nuclear reactions inside stars. The significance of this is:

> 'The presence of these elements, particularly those heavier than iron, in such a young galaxy is striking. Fundamentally, it seems to indicate that in the galaxies (or at least in this galaxy) that formed relatively shortly after the big bang, the onset of star formation and related element production was very rapid.'[13]

For the existence of all these elements deep in space, cosmologists are already suggesting that massive stars evolve quickly and died young. However, germanium is a fly in the ointment to this hypothesis because it is suppose to evolve over billions of years in *low-mass* stars. So, a new hypothesis will be needed to speed up the production of germanium.

Big bang model modified—again

These discoveries are putting a strain on the big bang model for the formation of the universe. Cosmologists need to continually tweak this model with subsidiary hypotheses to keep it going. 'If this portrait of precocious galaxies is confirmed by larger studies, astronomers may have to revise the accepted view of galaxy formation.'[1] The formation of a galaxy is tough enough, now they need to speed it up:

> 'In the model, the vast majority of galaxies are relatively late bloomers, taking many billions of years to pack on mass either by pulling in gas from the surrounding intergalactic medium or merging with neighboring galaxies. In regions

of the universe that started out particularly dense, this mass-gathering action could begin sooner than elsewhere. But the standard model still can't easily account for a large number of mature or massive galaxies in the early universe.'[1]

Since the big bang model is the evolutionary ruling paradigm of cosmology, one would expect that it will be modified to account for this new evidence of maturity. On the other hand, it is looking a bit more like, 'In the beginning God created the heavens and the earth.'[14]

References

1. Cowen, R., Mature before their time, *Science News* **163**(9):139, 2003.
2. Bernitt, R., Stellar evolution and the problem of the 'first' stars, *TJ* **16**(1):12–14, 2002.
3. The light is supposed to have traveled billions of years to get to Earth, thus the observations should be of the early formation of these galaxies.
4. Oard, M.J., Galaxies near the edge of the universe may be mature, *TJ* **10**(3):291–292, 1996.
5. Cowan, ref. 1, pp. 139–140.
6. Cowan, R., Once upon a time in the cosmos, *Science News* **163**(15):227–228, 2003
7. Other explanations of quasars redshifts don't place them at such great distances and therefore age.
8. Cowan, R., In the beginning, *Science News* **163**(4):51–52, 2003.
9. Barkana, R. and Loeb, A., Spectral signature of cosmological infall of gas around the first quasars, *Nature* **421**:341–343, 2003.
10. Ferrarese, L., Feeding the first quasars, *Nature* **421**: 329, 2003.
11. Oard, M.J. and Sarfati, J., No dark matter found in the Milky Way galaxy, *TJ* **13**(1):3–4, 1999.
12. Prochaska, J.X., Howk, J.C. and Wolfe, A.M., The elemental abundance pattern in a galaxy at z = 2.626, *Nature* **423**:57–59, 2003.
13. Cowan, J., Elements of surprise. *Nature* **423**:29, 2003.
14. Genesis 1:1.