

Exploding the Big Bang Hypothesis

Most people believe the recession of the galaxies means that the universe must have originated in a single cosmic event. Evidence that challenges the notion that large redshifts indicate recessional velocities has been increasing, and debate on the question has been growing. But even if the universe were expanding, that would not necessarily require a Big Bang origin, because it could be the case that matter and galaxies are continually created throughout an expanding space.

The crucial cosmogonic question is whether all matter originated at a single point in space-time. It turns out that this is precisely where we can test the Big Bang hypothesis. The key question is, Are there young galaxies? Under the Big Bang hypothesis all galaxies are supposed to have formed approximately 2×10^{10} years ago. But it is readily apparent even to nonspecialists that we see many galaxies filled with young, blue stars. The obvious conclusion, that these galaxies were created recently, was dismissed some time ago with the argument that all galaxies formed at about the same epoch in the early universe but that some have been forming stars more slowly than others. In principle this argument says you might have a galaxy most of whose stars are about 10^8 years old but containing one star around 2×10^{10} years old. Thus it is difficult to prove observationally that any given galaxy is not approximately 2×10^{10} years old. This key argument underpinning Big Bang genesis has so far avoided critical evaluation.

I would like to point to evidence that refutes this key requirement of the Big Bang. It is simply that if galaxies all formed around 2×10^{10} years ago and star formation proceeded more slowly in some, today we should see galaxies in all stages of apparent youth, including many galaxy-sized masses of hydrogen gas that have not yet started forming stars. We do not.

Galaxy-sized masses of hydrogen are easily detectable out to considerable distances in the universe. This has been particularly true in recent decades, with the development of sensitive radiotelescopes. In an important review of this subject, Morton Roberts reported: "Isolated hydrogen clouds have been sought for in many experiments. None have been found."¹ A search for hydrogen clouds in the redshift velocity range 3000–10 000 km/sec that was report-

ed in 1989 found no definite or even probable clouds.² In another search, at redshift $z = 4$, where galaxy formation should be very active according to the Big Bang hypothesis, galaxy-sized clouds of hydrogen were again not found.³

In essence my argument is that if galaxy-sized hydrogen clouds were all born approximately 2×10^{10} years ago they would have had to, one by one, flare up in episodes of star formation between that epoch and the present time. But this peculiar behavior would have had to stop suddenly at just the particular time in the universe at which we are observing (since there are no more protogalaxy-sized clouds). This is so unlikely a circumstance as to constitute, in my opinion, a disproof of the Big Bang.

For direct evidence let us examine actual young galaxies. Do they look as if they are ancient gas clouds now suddenly condensing stars throughout their volumes? On the contrary—they are characteristically centered on a small, energetic core out of which most of the material in the galaxy appears to flow. One example is 3C120, a compact galaxy originally classified as a quasar, which has optical jets, young stars and extensive radio jets emanating from its condensed, active nucleus.⁴

If the initial argument that all galaxies cannot be old forces us to accept that these active blue galaxies are more recently created, then the evidence forces us to say they are created at some small central point and flow outward over time to form the new galaxy. We have now arrived at the empirical alternative to the Big Bang, namely, continuous creation.

Theoretically this situation is not forbidden; in fact it has been strongly suggested for a long time. More than 40 years ago P. A. M. Dirac hypothesized additive or multiplicative creation of matter in the universe. (Multiplicative creation would be the creation of matter enhanced by the presence of other matter—as in the nucleus of an active galaxy.) Fred Hoyle in 1960 incorporated the C field ("C" for "creation") into the general relativistic equations that the universe must satisfy. Much later Alan Guth described fluctuations in the "material vacuum" that created mass. He and Andrei Linde have followed the implications of creating "baby universes." (See Linde's article in *PHYSICS TODAY*, September 1987, page 61.) Ilya Prigogine and collaborators reaffirmed the validity of introducing a mass creation term into the Einstein geometry-energy tensor.⁵ It would seem that it has taken a

long time for the obvious idea to occur to people: If a Big Bang happened once, why not again? And again? The Big Bang, which is not a scientific concept because its origin is excluded from observational verification, can now be scientifically investigated because we have the possibility of observing "minibangs" in different stages of development in different places in space.

An argument that will almost surely be ventured to defend the "all galaxies are old" assumption is the collision-merger hypothesis. In this currently popular explanation of a wide range of galaxy phenomena, two galaxies, at least one of which contains gas, collide from time to time, causing rapid star formation to be initiated. This hypothesis is an obvious way to "light up" old galaxies. The argument against this is that feeding energy into a gas cloud should inhibit rather than promote star condensation.⁶ Crashing galaxies together is the least likely way to make stars. Moreover it was calculated long ago that such collisions are so rare as to be negligible. But an even more decisive counterargument is simply that isolated, noninteracting galaxies are observed to be rapid star formers. NGC 253 is a symmetric, unperturbed star burster in which star formation is caused by outflow from the center.⁷ Other examples of newly formed galaxies include the compact, dwarf galaxies sometimes called extragalactic HII regions. Their color characteristics alone almost entirely rule out the existence of a star burst on top of an old population.⁸ They are isolated, precluding any involvement in collisions, and no nearby hydrogen clouds are evident out of which they could have condensed.

Logically, there are many arguments against the Big Bang.⁹ The continuous-creation alternative opens solutions to numerous observational paradoxes via fundamental physics.¹⁰ But of course, it is not our preference that determines the real situation, but the objective observations. Since theories can never be proved, only disproved, it is the existence of obviously young galaxies that is so crucial in disproving the Big Bang.

References

1. M. S. Roberts, *New Ideas In Astronomy* 65, Cambridge U. P., New York (1987).
2. N. Brosch, *Astrophys. J.* **344**, 597 (1989).
3. R. Subrahmanyam, PhD thesis, Indian Institute of Science, Bangalore (1989).

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- April, page 80**—The table entitled “Department of Energy physics-related programs” could have listed three additional national labs participating in heavy-ion research: Argonne, Los Alamos and Lawrence Livermore. ■

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