Embarrassing blunders in Big Bang cosmology

In Big Bang cosmology, the universe expanded from a very dense, hot and opaque initial state. It became transparent when it had expanded for 380,000 years and cooled to about 3000 kelvins. At this stage, light was last scattered by elementary particles and released. The light waves were then further stretched by the expansion of the universe. They are now, 13.7 billion years later, about 1100 times longer. This is thought to have resulted in the observable thermal radiation with 2.7 kelvins – the cosmic microwave background (CMB).

But how can we even see this radiation if the matter of which we consist shares its origin with the light? Since light propagates faster than matter can move, it must have come further than us. If we see it now, it must have returned by reflection or on a curved path.

A curved return path is possible in spatially closed universes, which resemble the surface of a balloon if one spatial dimension is abstracted away. However, in standard Big Bang cosmology, the universe is "flat" rather than balloon-like, and it lacks a reflective boundary surface. This *precludes* that we could still see any radiation that was released at an early stage.

In a flat Big Bang universe, the radiation from any event escapes eventually altogether from the expanding matter-filled region, and this should have happened long ago to the radiation from the last scattering event. In the adjoining spacetime diagram, all rays from this event propagate within the golden V-shaped band.

The I-shaped silver band shows the primary matter-filled region. Some galaxies will now be outside it because of their proper motion. The width of both bands is given by the diameter of the "last scattering surface". In ordinary coordinates, this width expands by the above-mentioned factor of 1100, but in comoving coordinates, which are used in the diagram, it remains constant, because in these coordinates the expansion of space is factored out. The speed of light remains one lightyear per year.

In the traditional calculation of the CMB temperature, it is considered that light waves expand by the factor of 1100 in all three spatial dimensions as well as in time. However, it is a long-standing tradition to disregard the additional fact that light *escapes* from its source (at the speed of light). This disregard would be permissible if the radiation lost from a region was balanced by an equal amount gained from outside, and it is so motivated. However, while boundless universes may satisfy this condition, a flat Big Bang universe cannot do this, because it would require contributions from outside this universe. The calculation is done as if the "relic radiation" did not propagate and so remained within the I-shaped silver band. This is an embarrassing blunder. Properly, the radiation is bound to fill the V-shaped golden band and to remain unobservable to us.

Consider now what *is* observable to us. In the diagram, this is shown by the blue Λ-shaped line, which, with us at its peak, connects us with everything in our direct view. The CMB might, then, emerge from a spherical surface at a comoving distance of about 46 billion lightyears (almost the present radius of the universe). This surface is strikingly remote from and much larger than the originally conjectured last scattering surface. Worse yet, anything below the golden V in the diagram is *outside* the spacetime that the Big Bang is said to have brought into existence. The idea of a Big Bang must be rejected if we can see anything there. In fact, it must already be rejected if we can see any galaxies far outside the silver band – which we do.

Although advanced as evidence for a hot Big Bang, the CMB actually *precludes* that the universe could have been smaller at an earlier stage if the CMB originates at the inferred distance.

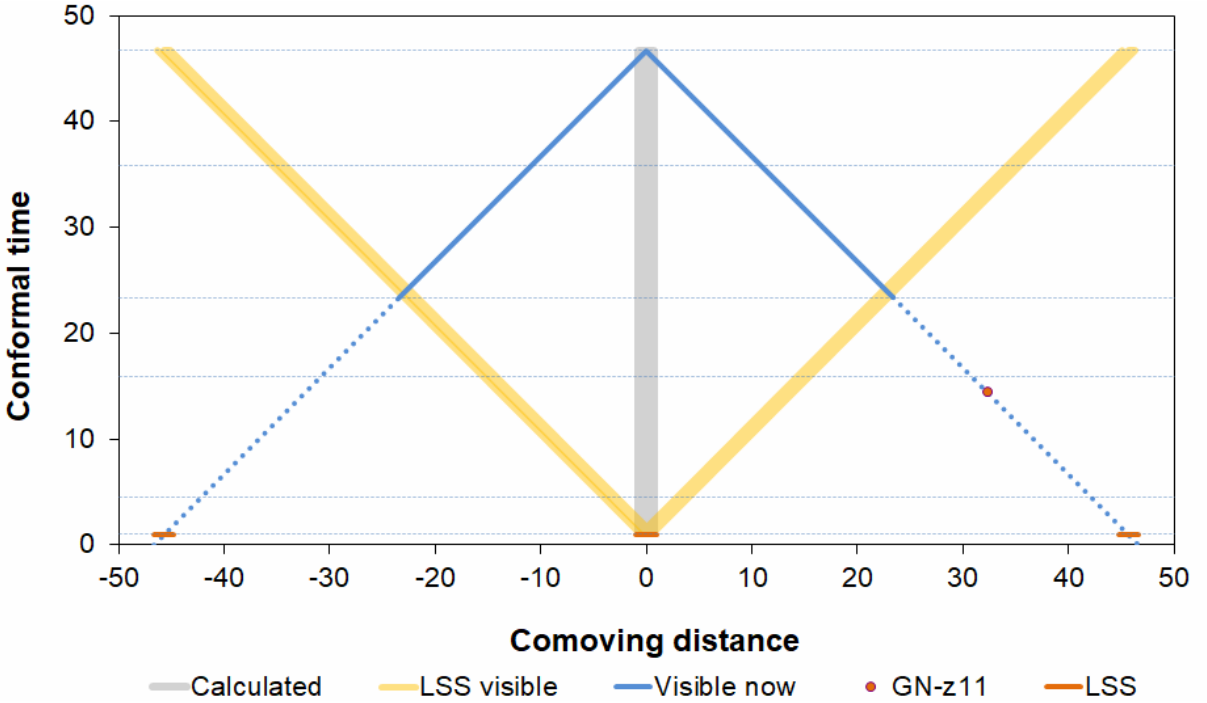
Within physical cosmology and CMB-research, it has long been taken for granted that the universe at large remains homogeneously filled with matter and blackbody radiation. This is to hold in space, not in spacetime (no constancy over time) and it appears compatible with several types of universes that general relativity allows. However, it has gone unnoticed or at least untold that it is *incompatible* with a flat expanding one, in which radiation that is no longer scattered cannot fail to separate ever more (in the golden band) from the material content of the universe (primarily in the silver band). In the Big Bang universe, neither matter nor radiation remains homogeneously distributed.

The inconsistency may pass unnoticed if homogeneity is assumed in one context and a Big Bang episode in another. However, some astrophysicists contradict themselves quite noticeably when they assume that their homogeneous universe was at least as large as it is now, or even infinite, at the time at which they *also* assume that it was much smaller or even emerged out of a point-like singularity. This is exceedingly irrational and obfuscating.

Standard Big Bang cosmology has often been criticized for promoting fictitious excuses such as dark energy and exotic dark matter for observations that do not fit. While such excuses make the theory fairy-tale-like but not irrational, inconsistencies like those detailed here clash with rationality and so are never acceptable in science.

Among previously criticized inconsistencies, this one is comparable: mainstream cosmologists agree that coherent and gravitationally bound objects up to the size of galaxy clusters are exempt from the general expansion of the universe. However, if only the voids between these clusters expanded, then the matter density within the universe could never have been higher than it is within galaxy clusters – never as high as required during last scattering and before.

The retention of deficiencies in research programs reflects the ordinary uncritical transmission of human culture from generation to generation. Science requires a more critical attitude, but arguments that fundamentally discredit a currently established doctrine confront too strong prejudices to find support and to be published in ordinary scientific journals. For editors of these and the reviewers they might choose, as well as for a wider, non-expert readership, it seems inconceivable that the whole community of experts, which in this case includes several Nobel laureates, all could have made the same cardinal blunder. They all rather suspect the outsider to be guilty of a blunder, whether or not they believe to see any. However, it is indeed arguable that "science is the belief in the ignorance of experts", and the inconsistencies complained about here should be conspicuous enough to unprejudiced self-reliant thinkers.



Spacetime diagram of flat Big Bang universe

Comoving spatial distance in billion lightyears and conformal time in billion years. V-shaped golden band: rays from last scattering surface (LSS, red horizontal dash close to zero-point, visible only from within golden band). Blue Λ-shaped line connects us with everything we can see straight on. In Big Bang universe, region below golden V has not come into existence (blue line dotted there). In standard cosmology, galaxy GN-z11 and fictitious LSS (around ±46 billion lightyears away) placed in this region nevertheless. I-shaped silver band: region with comoving diameter of LSS. Most matter remains within this region. Traditional calculation of CMB temperature erroneously presupposes this also for radiation.

Author's Profile

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I worked as an engineer in the telecom industry before turning to studies of speech. After defending a thesis on vowel perception, I did further research on articulatory, acoustic and psychoacoustic phonetics / variation in the acoustic properties of utterances as a function of speaker age and sex, phonation type, vocal effort and liveliness / synthesis of speech modified in these respects / perception of para- and extralinguistic information in speech / perception of phonological quantity as a function of language, context and speech rate / auditory, audiovisual and visual perception of vowels, etc. I proposed a theory of speech, the modulation theory, in which speech is considered as modulated voice (and face).

After retirement, I focused on the scientific method and on physical cosmology as a field in which methodological deficiencies show themselves in particular diversity.

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