The Big Bang theory: two fatal flaws

Hartmut Traunmüller
Stockholm University
hartmut@ling.su.se

Abstract

The cosmic microwave background radiation is routinely cited as evidence for a hot Big Bang. Its isotropy harmonizes with the cosmological principle. However, in prototypical Big Bang models, all matter originates from a primeval fireball that also emits the light that is redshifted into these microwaves. Since light escapes from its source faster than matter can move, it would need to return for it to still be visible to material observers, but the universe is considered 'flat' and non-reflective. This prevents us from observing the redshifted glow of the primeval fireball. Like its observability, its homogeneity would also be transient. This is concealed by considering the light to expand with the 'Hubble flow' while disregarding that it escapes at *c*. This blunder reflects the practice of treating model universes in General Relativity as filled with a spatially homogeneous fluid. For radiation, this becomes inappropriate when it is no longer scattered. What we actually observe remains unexplained. Moreover, the calculation of line-of-sight distances allows an expanding view into a large pre-existing universe. For other aspects, the universe is assumed to have been smaller before. This creates contradictions such as between the observed source of the cosmic microwaves and their much smaller and closer assumed emitting source. The criticism expressed here goes against the 'hard core' of an established research program. Those cores are treated as inviolable, which blocks fundamental progress. Such blockage can persist for generations even if the theory that is promulgated as the best we have is actually irrational.

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1 Introduction

In the physical cosmology that established itself in the 20th century and that presupposes Einstein's general theory of relativity, the universe originated and expanded in a 'big bang' from a very dense, hot, and opaque initial state [1-3]. The universe became transparent after it had expanded for 380 000 years and thereby cooled to about 3000 K. The light waves that were emitted from the "primeval" or "primordial" fireball at this stage of decoupling and 'recombination', when electrons and protons formed electrically neutral atoms, mostly hydrogen, were then further stretched by the continued expansion. They are now, 13.8 billion years later, about 1100 times longer. In a confined space that slowly expands by this factor in each dimension, blackbody radiation will cool by the inverse factor, from 3000 to 2.7 K. This is thought to have happened because the cosmic microwave radiation that was accidentally discovered by Penzias and Wilson [4] is blackbody radiation with this temperature. It is commonly referred to as the "cosmic microwave background" (CMB). The cosmological principle, which implies that the universe at large scales should be homogeneous and, to stationary observers, isotropic, is compatible with these observations. The practice of modelling the universe in General Relativity by a spatially homogeneous fluid that expands with the "Hubble flow" and represents radiation as well as matter is also in line with this, but we shall see that homogeneity actually cannot be maintained under Big Bang conditions, which imply that the universe was substantially smaller in its distant past. My label "Big Bang" refers to an assumed occurrence that is still going on (and accelerating). It neither refers just to its onset nor just to the plasma state of the universe before recombination and last scattering.

It has long been known that standard cosmology suffers from several serious problems [5]. It has in its development become dependent on an increasing number of free parameters [6], each of which is symptomatic of a lack of understanding. Some of them involve hypothetical constituents and processes such as cold dark matter (CDM), dark energy (Λ), and cosmic inflation. These have often been criticized [7, 8], also by this author [9], for their fictitiousness or bare conventionality [10]. The standard (concordance) ΛCDM model, nominally a Big Bang cosmology, remains dominant nevertheless. It is promulgated as the best theory we have.

In the following, it will be shown that standard cosmology, as traditionally taught, involves contradictory basic assumptions in different models that are used to handle different aspects. This results in faulty reasoning, which can be obscured by the superficial generality of the invoked principles and by committing yet another fallacy. The present article is only concerned with such faulty reasoning – neither with the more often disputed dark sector of standard cosmology nor with free parameters or any independent disagreements between predictions and observations [8].

2 The first fatal flaw

2.1 Symptom: the primeval fireball delusion

In prototypical Big Bang models, the radiation we observe as the CMB is thought to be emitted from the primeval fireball and its abstract "surface of last scattering". However, it requires particular conditions for this to become observable in an expanding universe in which all matter shares its region of origin with this radiation. Since electromagnetic radiation propagates faster than matter can move, it should have caught up and passed every matter by now. If observers (constituted by matter) still see it now, it must have been reflected back or returned on a curved path.

A curved return path is under certain conditions possible in positively curved universes, which can be pictured by the surface of an inflating balloon if one dimension is abstracted away. However, in standard cosmology, as conceived in the early 21st century, the universe at large is not curved like this. It is rather close to 'flat' (Euclidean) [11], and it lacks a reflective boundary surface. In a flat universe, the radiation from the primeval fireball escapes altogether from its region of origin when enough time has passed for the light to cross this region. This should have happened long ago and would have been followed by a 'dark age', which persisted as long as stars had not yet formed. In Fig. 1, model A, the radiation originated within the small red disk and fills now the golden ring. In the spacetime diagram, Fig. 2, it is last scattered at the central red dash and propagates within the golden V-shaped band, whose off-vertical slope represents the light speed *c* [one lightyear (x-axis) per year (y-axis)]. This *precludes* that we could still observe the cooled glow of a primeval fireball. Its observability is a mere delusion, in the sense of 'a belief or impression maintained despite being contradicted by rational argument'. It is not contradicted by reality. We actually see a CMB, but it must have a different origin. A prototypical Big Bang model offers no explanation for it.

Since we are *not* located within the golden V-shaped area in Fig. 2, but at the peak of the blue Λ-shaped line, there is no way for radiation that leaves the last scattering surface at *c* to still appear to us directly. However, as soon as the CMB had been detected [4], Dicke, Peebles, Roll, and Wilkinson [12] were quick to suggest its origin in the glow of the primeval fireball. Like Alpher and Herman [13, 14], who previously had predicted a background radiation with a temperature of about 5 K, they had a prior belief in the spatial homogeneity of the whole universe. In keeping with this, the CMB should look the same and be observable everywhere. The fact that the observations appear to corroborate this reasonable belief may have prevented researchers from inquiring under which conditions the glow of a primeval fireball is actually predicted to be observable in various Big Bang models. This inquiry may be less likely to be made if the radiation source is still referred to as a "fireball" when its temperature is said to have fallen from 3000 K all the way down to the 2.7 K of the CMB, as in [15] by Wilkinson and Peebles, but this has rarely been imitated.

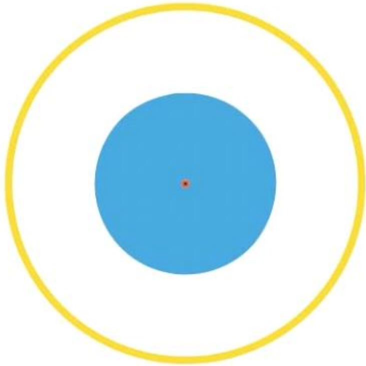

FIG. 1. The cosmic microwave background (CMB) in a Big Bang model with successive modifications. Section through a spherical universe shown to scale in comoving coordinates, in which the Hubble flow expansion of the universe is factored out [16].

A. Prototypical model

Center: original singularity and our approximate spatial location. Most matter is still nearby.

Surface of small red ball, radius 1 Gly: last scattering surface (LSS).

Blue ball (with small red ball inside), radius 23.3 Gly: region where now received radiation could have its origin.

Golden balloon, radius 46 Gly, thickness 2 Gly: region where radiation from the LSS is now directly observable.

This model provides no explanation for the actually observed CMB. It allows expanded radiation from a past epoch to fill the universe only during a limited epoch. An increasing share of the universe will be free from it. For matter, this holds with a different distribution.

The standard model is a combination of the incompatible models A, B and C.

B. Relic radiation model

In this model, matter and radiation are considered to comove with the Hubble flow, but the evolution of the CMB is calculated (section 2.5 in [3]) as if the radiation did not propagate any further.

Small red ball: expanding region in which radiation from the LSS remains observable ever since release. In comoving coordinates, this region has its expanded size to begin with.

C. Expanding view model

This describes an *expanding view* into regions that transcend those within which any now observable radiation must have originated in models A and B (the red-blue ball).

Center: our approximate spatial location, still as in models A and B.

(Small red ball: *emitting* source in the calculation of the properties of the CMB, still done as in model B.)

Golden balloon, at its mean radius: *observable* source of the CMB in the expanding view model (Fig. 10.2 in [2]; Fig. 8.4 and 10.1 in [3].) In a Big Bang model, this region did not yet exist at the time of last scattering.

There is, then, a drastic discrepancy between the locations of the *observed* and the *emitting* source. Consistency requires the radiation source to be one and the same.

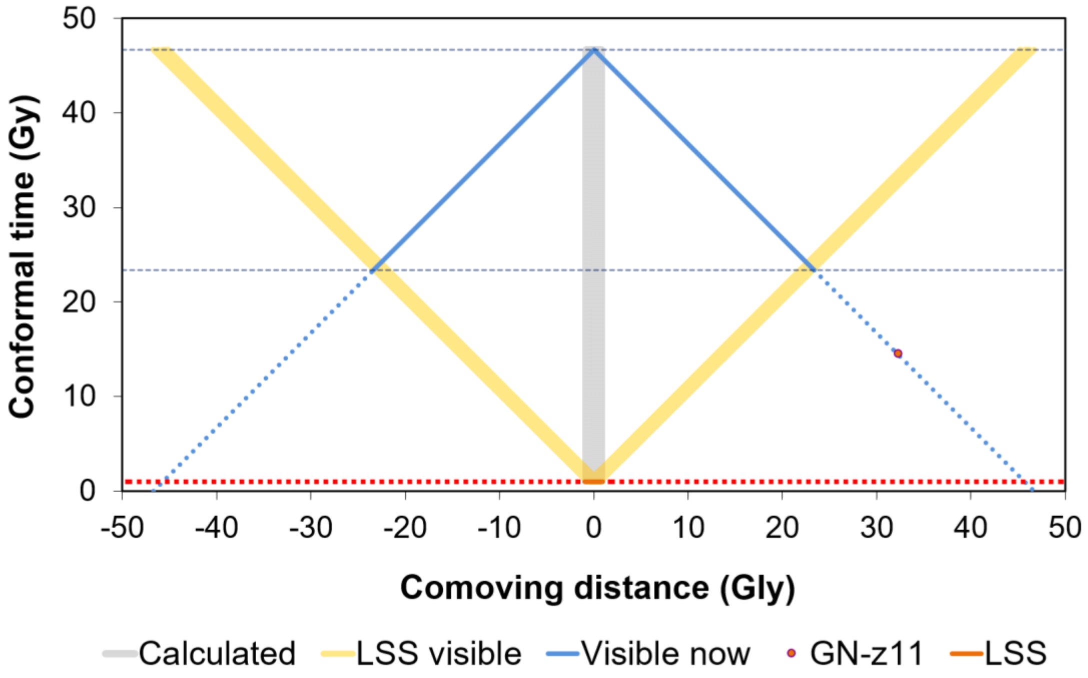

FIG. 2. Spacetime diagram of a flat Big Bang universe [16].

Golden V: rays from the last scattering surface (LSS, the red horizontal dash close to zero distance). The LSS is directly observable from positions within the golden band, which represents all future light cones of the LSS. We are not within this band but at the peak of the blue Λ.

Silver I: The Hubble flow through a region with the comoving diameter of the LSS. Bulk matter with negligible peculiar motion remains within this region. The traditional calculation of the CMB properties erroneously presupposes this also for radiation. This is the relic radiation blunder.

Blue Λ: This represents our past light cone and connects us with everything we can now see straight on.

In a cosmogonic Big Bang universe, the region below the golden V has not come into existence. The dotting of the lines in this region is meant to remind of this. In standard cosmology, the galaxy GN-z11 is placed in this region nevertheless, actually in an expanding view model. The radiation from the LSS is supposed to be observable where the dotted Λ crosses the dotted red horizontal that indicates the time of last scattering. This is at present at a comoving distance of about 46 Gly in any direction.

Red dotted horizontal: The time of last scattering, in the expanding view model also its place.

The existence of the CMB is routinely cited as evidence for a hot Big Bang, even as the strongest piece of evidence for it. This contrasts sharply with the preceding considerations, which clearly show the opposite to be the case: The observability of the CMB constitutes evidence *against* its supposed emission from a surface of last scattering in a formerly less extended universe. As I tried to communicate previously [17], it would not be observable if it had been emitted there. However, it is believed to have been emitted there if the "relic radiation blunder" is committed, which is described in subsection 2.3. The primeval fireball delusion can be considered a clear symptom, manifestation, or consequence of this blunder.

2.2 Homogeneity loss in a Big Bang universe

Within physical cosmology and CMB research, it has long been taken for granted that the universe at large remains homogeneously filled with matter and radiation. This assumption is a simplistic idealization of the cosmological principle. It is convenient because it makes it practicable to apply General Relativity to the universe as a whole. For matter in hypothetical universes, it can be traced back to Einstein (1918) [18]. However, it is well known that the cosmological principle, i.e., the 'perfect cosmological principle' cannot hold over time in a Big Bang cosmology, which is more recent than Einstein's universe [18]. From astronomy, it is further known that the distribution of matter in space is far from homogeneous. It is rather fractal in a sense [19], although the cosmological principle may still remain tenable at the very largest scales.

The homogeneity assumption was also applied to radiation when the conditions in the early stages of an expanding universe were considered [13]. When, more recently, the actual presence of highly isotropic background radiation was noticed [4], this was taken to mean that radiation that fills the universe homogeneously remains present over time. Subsequently, one may be tempted to believe that the observed background radiation has its origin in the glow of the primeval fireball.

However, this cannot be so in a flat expanding universe, but this went unnoticed or at least untold.

A flat Big Bang universe is *incompatible* with the cosmological principle even if variation over time is allowed. In such a universe, radiation that is no longer scattered cannot fail to separate ever more (as in the golden band of Fig. 2) from its material content (primarily in the silver band). Even matter with a higher speed of peculiar motion will increasingly distance itself from matter with a lower speed. Neither matter nor radiation would thus remain homogeneously distributed. Large-scale homogeneities would be transient and shell-bound at best. Hence, one has to reject the idea of a Big Bang if the cosmological principle is to be kept.

In all models that use the Friedmann-Lemaître-Robertson-Walker metric or the ΛCDM model, large-scale homogeneity of the universe is postulated to begin with. The impressive observable near-isotropy of the CMB (attributed to its homogeneity) was puzzling nevertheless, because there are limits to communication between different regions in an expanding universe and communication appears necessary for homogeneity to be maintained. There is a theory, the cosmological inflation theory (with several variants), which, among other things, is supposed to handle this. This theory postulates an otherwise unphysical process of expansion at a superluminal speed. This process is said to end within 10^{-32} seconds of absolute cosmic time. Even if this had kept the universe homogeneous until it became transparent, 380 000 years later, the homogeneity of the CMB would anyway have been lost thereafter, and all consistency checks considered in this article are concerned with the circumstances that prevail in standard cosmology then, i.e., after recombination and last scattering.

In traditional reasoning, neither the observability of the last scattering surface nor the homogeneity of the radiation from it is thought to be lost, but this is due to the fatal blunder described next.

2.3 The relic radiation blunder

The vertical silver band in Fig. 2 shows a region with the comoving diameter of the last scattering surface. This region contains matter that is now largely gathered in galaxies, but an increasing number of these are now outside the band due to their peculiar motion. In ordinary coordinates, the width of the band grows in proportion to a scale factor *a(t)* that is set equal to 1 at present and was 1/1100 at the time of last scattering. The diameter of the region expanded from 1.8 Mly to 2 Gly by now; but in comoving coordinates, which are used in both figures, it is already 2 Gly from the beginning and remains constant because *a(t)* is factored out in these coordinates.

The traditional explanation of the CMB and its temperature, section 2.5 in [3], assumes black-body radiation from the last scattering surface to remain within the vertical silver band in Fig. 2. It considers that the radiation expands in proportion to $a(t)$, by the factor of 1100 in all three spatial dimensions. In order for c to remain constant as it must, given the present definition of the meter and the second, time must scale in proportion to length. The density of the radiation scales as $1/a(t)^4$, whereby its blackbody nature is retained. Its temperature T scales as $T \propto 1/a(t)$, so that $T_{em} = T_{obs}(1+z) = T_{obs}/a(t_{em})$, as in equations 6.3 and 6.4 in [1].

In its model of 'relic radiation' (also 'relict radiation', 'fossil radiation' or 'comoving radiation'), standard cosmology simply disregards the propagation of light, i.e., the fact that electromagnetic waves *move away* from their source at c as long as they meet no hindrance. This 'relic radiation blunder' [17] may be obscured to traditionally educated cosmologists by its origin in the practice of considering model universes based on General Relativity to be filled with a homogeneous fluid, in the case of radiation with a diffuse 'photon gas', with photons in random motion and, in [20] and 50 years later in [3] thought of as contained within an imaginary box that expands with the Hubble flow, i.e., with $a(t)$.

The disregard of the free streaming propagation of light might be justifiable if the outflow of radiation from a region was always balanced by a compensatory inflow from outside. However, while certain model universes may satisfy this condition, a flat Big Bang universe as a whole cannot do this, because it would require contributions *from outside itself*.

Even if the radiation released from the last scattering surface of the primeval fireball can be described as a photon gas with 3000 K, this description becomes invalid after release from the primeval plasma, when the photons and the corresponding electromagnetic waves are no longer scattered but free to escape at *c*. It has been noted before that free photons do not constitute a thermodynamic system and cannot leave a relict behind [21]. Fortunately, the radiation that reaches us from our local fireball, the Sun, cannot either be correctly thought of as a photon gas. A solar photon gas might keep us comfortable at 300 K, but it would not give rise to any visible light. This would be bad for life.

The CMB may still be a residue of some radiation, but it certainly cannot come from a stage at which the universe was much less extended.

During the history of Big Bang cosmology, the relic radiation blunder was copied carelessly. It was treated as part of the irrefutable 'hard core' [22] of the cosmological research program, because it seems to follow from prior assumptions whose physical incompatibility failed to be noticed.

We have already seen in subsections 2.1 and 2.2 that radiation that is no longer scattered cannot maintain homogeneity and not even observability throughout a universe that grows in size even in comoving coordinates. Radiation from the last scattering surface would only fill the V-shaped golden band in Fig. 2 and remain outside the view of observers located anywhere above it. In Fig. 1, the CMB would now only be observable in the region represented by the golden ring. Since we are not there and still can see a CMB, its presence requires a different explanation, but this is outside the scope of the present study.

An equivalent to the relic radiation blunder arises also when neutrinos are considered, but here we do not need to do so.

3 The second fatal flaw

There is also a geometric contradiction that shows itself most markedly in calculated distances that do not fit into a Big Bang universe. We can call this the transcendent distance blunder if we take a Big Bang model as given. Otherwise, the idea of a Big Bang itself constitutes the blunder.

The blue Λ in Fig. 2 represents our past light cone, which connects us, located at its peak, to everything that we can see directly. The line-of-sight comoving distance D_C between us and a radiation source on this light cone is computed [23] by integrating the infinitesimal contributions $d_{comov}(x, y) = d_{proper}(x, y)/a(t)$ between nearby events over time from t_{em}, when the radiation from the source was emitted, to t_{obs}, when it is observed:

$$D_C = \int_{t_{em}}^{t_{obs}} \frac{c\,dt}{a(t)}\,, \qquad (1)$$

where $a(t) = 1/(1+z)$, and z is the observed redshift.

However, this light cone transcends the existence region of the Big Bang universe. Everything below the golden V in Fig. 2 is *outside* the space within which the Big Bang might have dispersed anything at all. It would require a superluminal speed to bring anything there. This is why the blue Λ and the red horizontal that indicates the time of recombination and last scattering in Fig. 2 have been dotted in this area. Before one can reasonably claim to see anything there, be it a galaxy or the source of the CMB, one has to reject the idea of a formerly smaller universe.

There are several galaxies whose observed redshifts z place them in the transcendent region. For one of these, GN-z11 [24], z has been reported to be 11.09. The authors wisely did not publish an explicit distance measure for it, but if one assumes that this z is the cumulative effect over time of an expansion in accordance with Eq. (1), then the galaxy must have been at a comoving distance of about 32 Gly when it emitted the observed light. At this instant, only 15 Gy conformal time had passed after the onset of the Big Bang, while almost 32 Gy would be needed to bring anything there, as can be seen in Fig. 2. [16]

In the standard approach to cosmology, the idea of a Big Bang is, nevertheless, retained in a model that is already marred by the relic radiation blunder (model B to Fig. 1). When it comes to considering line-of-sight distances, which can be based on redshift or luminosity, the Big Bang model is silently *replaced* by a model that presupposes an *expanding view* – a *transcendentally* expanding view (model 5 in [17]). In this model, time appears now to have arisen 13.8 Gy ago, while the universe immediately after inflation already had at least the comoving spatial extension that it has at present in the prototypical Big Bang model. The first radiation sources that became visible in this universe were all cosmically nearby. As time passed on, the span of distances at which sources could be seen became successively wider. This span increased at *c*, so that radiation emitted during the last scattering epoch was observable *ever* since. It is now observable where the dotted blue and red lines intersect in Fig. 2, at $D_C \approx 46$ Gly – not far from the present comoving radius of the Big Bang universe (in the golden ring of Fig. 1, model C).

There is no deliberate reflection behind the expanding view model. Therefore, it is not surprising that no name had been attached to it before. In a Big Bang model, Eq. (1) holds approximately for small values of z. If extrapolated without an upper limit for z, the model turns without further action into a radically different expanding view model.

The spatial location of GN-z11, shown in Fig. 2, is compatible with an expanding view model, which allows the galaxy to have been close to its calculated spatial distance already at the apparent onset of time. However, the highly problematic nature of a time onset or its equivalent in a process of cosmological inflation is rarely ever discussed in more than a narrow selection of its aspects.

In Fig. 1, the golden shell in which the observable source of the CMB appears to be located is very remote from the fireball represented by the small red disk, i.e., from the region from which the radiation is said to have been emitted. The *observable* source is also much larger than the *emitting* one. In ordinary units, the surface area of the former is more than a million (1100^2) times larger than that of the latter. However, consistency requires these sources to be identically the same. In investigations of the CMB, its apparent source is routinely treated as if it represented its emitting source in an expanding universe, but this actually involves committing a transcendent distance blunder – not only a relic radiation blunder.

By putting an expanding view model over an expanding universe model, it is, in fact, taught that the universe was at least as large as it is now, or even infinite, when it was much younger and smaller than now, or even arose out of a point-like singularity. Although it is extremely conspicuous, this contradiction is rarely paid attention to. Liddle [2], p. 82, appears to have expressed it unintentionally – its contrariety remained in any case uncommented: "*Since decoupling happened when the Universe was only about one thousandth of its present size, and the photons have been travelling uninterrupted since then, they come from a considerable distance away. Indeed, a distance close to the size of the observable Universe.*"

The first part of this quotation, "*Since decoupling happened when the Universe was only about one thousandth of its present size*" presupposes a formerly smaller expanding universe, while the remainder "*and the photons … come from … a distance close to the size of the observable Universe*" presupposes a transcendentally expanding view into a universe that had already its present size when the radiation was emitted. (In comoving coordinates, as in Fig. 1 and 2, the discrepancy is less extreme. In these, one could equivalently say that the universe was about one-fiftieth of its present size when decoupling happened.)

In other cases, there is a size discrepancy by a factor of two. A cosmogonic expanding universe model, in which the extension of space is limited to and above the golden V in Fig. 2, allows at present for rays with a maximum comoving length of about 23 Gly, i.e., from no farther than the blue sphere in Fig. 1. At any given time, the expanding view model allows for rays that are twice as long. The size of the observable universe is commonly defined on this basis and so given a radius of 46 Gly. Thereby, the spatial limitation of the model is removed altogether – only the temporal one remains. Instead of a cosmogonic model, we then get a merely "chronogonic" model in which there is no primeval fireball and no surface of last scattering – only a *time* of last scattering that is valid everywhere in a much larger pre-existing universe and whose absoluteness defies relativity.

For getting rid of the inconsistency, it is neither sufficient to follow the custom of refraining from any explicit mention of the 'primeval fireball', nor is it workable to just skip the model in which such a fireball exists. The expanding view model does not stand on its own feet. It depends on input from the model of an expanding universe, which 'explains' the cosmic redshift z and produces the scale factor $a(t)$ needed in Eq. (1). If this model is skipped, it needs to be replaced by a more well-founded and consistent model that explains the phenomena in the absence of a Big Bang. In this case, distances calculated with Eq. (1) may be correct, given an appropriate $a(t)$, while the idea of a Big Bang constitutes itself a fundamental flaw.

The calculation of a related distance measure, the angular diameter distance d_A as $d_A = D_C/(1+z)$, should then also be considered as specific to an expanding view model that presupposes an incompatible Big Bang model in which comoving distances $D_C > 23.3$ Gly (redshift $z > 3.76$) are transcendental and therefore fictitious.

4 Conclusions

The preceding considerations reveal two blatant flaws to which explicit attention has been paid neither in the textbooks [1-3] nor in the critical literature [5-10] mentioned in section 1, to which [25] can be added.

The first one is the disregard of the radiant nature of light (section 2, esp. 2.3), which can make cosmologists believe that we still can see the light from the primeval fireball, although outsiders understand that the light from this source must have passed our place and become invisible long ago if we consist of matter from the same fireball.

The second one (section 3) arises from failing to notice that a line-of-sight distance between us and a radiation source is a distance in a universe whose observable spatial extension increases the further back we look in time. This transcends the space of a formerly *less* extended Big Bang universe. Each of these flaws requires a rejection of the Big Bang idea.

Although they appear conspicuous to attentive unindoctrinated outsiders, most experts in the field, even critical ones, failed to take notice of these flaws. Some who noticed that the idea of a Big Bang is not always convenient use to say that it should not be taken literally. In their view, the universe was always rather large, perhaps infinite, has no unique center and it is 'space' that expands. This view would need to be developed into a complete and consistent model instead of being offered as a half-baked afterthought to a self-contradictory attempt. It would not be a Big Bang model.

For traditional cosmologists, the observability of the CMB follows right away from the cosmological principle and the established practice of treating radiation in cosmological models based on General Relativity as a fluid that expands or 'comoves' with the Hubble flow. Disregarding the fact that radiation propagates faster than by this expansion in particular when it becomes free to escape beds for missing that the radiation from the primeval fireball in a proper Big Bang model loses in addition to its homogeneity (section 2.2) also its observability at our place (section 2.1). This happens already before the first stars are formed. But in this matter, the established practice has largely prevented a simple rational analysis. One can object that standard cosmology is not really a proper Big Bang model. We have actually seen that it is a *contradictory* fusion of such a model with two different ones – a comoving model erroneously applied to radiation (section 2.3) and an expanding view model incompatible with the other models (section 3).

It appears as if the difference between the three models was ignored by thinking of cosmic distances as distances in time only. Eq. (1) can tempt one to do so. However, it remains enigmatic why even explicitly contradictory statements like the one cited from Liddle's textbook [2] are not sufficient to elicit the insight that there is a conflict if spatial extensions are also considered.

While, in the absence of independent confirmation, fudge factors such as dark energy and exotic dark matter remain hypothetical excuses for observations that do not fit, they still give the reasoning the status of rational speculation. This quality level is not reached if blunders and contradictions like those revealed here occur. These make the reasoning irrational and thereby entirely untenable, even as a speculation.

The criticism expressed here goes sharply against what Kuhn [26] called "normal science" and Lakatos [22] the "hard core" of a research program. This core consists of those tenets of established theories that are taken for granted by the members of the respective research community (the insiders). Kuhn and Lakatos [26, 22] noticed half a century ago that these cores are treated as inviolable. It is permissible to question the *completeness* of an established theory, but any really fundamental progress is blocked in fields in which a single paradigm dominates. Physical cosmology demonstrates that such blockage can persist for generations even if the theory that is praised as the best we have is actually irrational.

Although scientific journals often publish articles on speculative modifications not only of mainstream doctrines, articles that discredit the hard core in the respective research program run a very high risk of being rejected right away by the editors of reputable and trusted journals and, if not, then by referees established in the field. These can easily notice deviations from orthodoxy and insider practice. The willpower required for evaluating an outsider's reasoning is rarely present. It is kept low by the experience that unconventional approaches are more often substandard than excellent and by conformity bias. Together with the similarly biased attitude by most teachers and grant providers, this leads to the tenacious perseverance of traditional deficiencies in science.

Contrary to expectations expressed in a recent analysis of peer review behavior [27], the open review procedure adopted by *Qeios* seems to have scared off the most wanted referees: all 10 invited reviewers of version 1 abstained while 4 spontaneous ones rejected my reasoning without appraising any of its points and without pointing out any other fault in it than the openly stated fact that it contradicts a firmly established research program, which the establishment at worst allows to be labeled as incomplete, no matter how absurd it actually is. It is contradictorily overcomplete.

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