Cosmology in Crisis?

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Abstract

The recent discrepancy in the measurements of the Hubble Constant (the universe's rate of expansion) between the indirect, early method (+/- 67km/s/megaparsec) and the direct, late method (+/- 72km/s/megaparsec) has been characterized as a growing crisis for cosmology. To some, a transitory disagreement of less than 10% may not seem like that much of a concern. What would cause a real crisis, though, is if it were suddenly realized without doubt that universal expansion itself is conceptually impossible in our real nontheoretical world of three actual dimensions. Despite all of its obvious, potentially invalidating incongruities, universal expansion's fundamental viability is rarely questioned, if at all.

Inquiry

How can our big bang universe remain uniform, homogeneous and isotropic as we observe, if it's expanding? Wouldn't the inverse square law, a basic principle of (three-dimensional) spherical geometry, cause its density to be diffusing exponentially, decreasing inversely as the square of the distance from its origin? Given its innate finiteness, how could it not? ($\mathbf{I}$ or $\mathbf{D} \propto \mathbf{1/r^2}$, intensity at the surface of a sphere, which is the same as density, is proportional to the inverse of the square of its radius.)

Wouldn't that diffusion be easily discernible through the exponential dispersion of galaxies and their redshifts? Wouldn't their dispersion also reveal an origin's location, if one actually exists? If faster-than-light inflation occurred and created a visible horizon, wouldn't their dispersal still be perceivable and still indicate the origin's direction? If there's no diffusion, the universe cannot be expanding. And if it's not expanding, the big bang can't be real.

Even if it was somehow able to remain uniform, which isn't physically possible in three dimensions, expansion or not (see a tetrahedron, octahedron, and icosahedron, platonic shapes where the vertices of their equilateral triangles scribe a sphere with a radius that's always less than the distance between the vertices), but let's say it was, wouldn't its finiteness still be confirmed by a telltale pattern of galaxies that appeared to condense across the sky? Try to visualize what that would look like.

Let's assume that we didn't end up by chance at the universe's exact center but were located halfway between it and the perimeter. Wouldn't galaxies have to be arrayed two-dimensionally, condensing visually, not physically, over the entire sky into a single cluster that culminated in the direction of its center? From our vantage point, it'd be less dense in the direction where the perimeter is closest, one-quarter the total distance of its diameter, and more dense in the direction of its center, three-quarters its total diameter. Despite its uniformity, we'd still see a difference in the number of galaxies that proportionally was more than three to one.

Wouldn't the pattern have to be similar for an expanding universe that was diffusing? It'd just be more exaggerated with fewer galaxies in the direction where the perimeter was closest, our galaxy's outward-bound direction of travel, where they’d be more dispersed and more galaxies in the direction of its center, opposite our outward-bound direction of travel, where they'd be more condensed.

Wouldn't its expansion also be confirmed by cosmological redshifts that correlated with the pattern? Wouldn't they have to be progressively increasing in magnitude, peaking directly opposite our direction of travel? Isn't that the direction where their distance would be the farthest and their recessional velocity/space's stretching would be the greatest?

Wouldn't this distinct pattern also clearly indicate the location of the universe's origin? And wouldn't the pattern's existence also decisively confirm the big bang? But wouldn't the opposite have to be true? If it doesn't exist then the universe cannot be finite. Nor can it be expanding. And again, the big bang, even if it were uniform, can't be real.

Gravity's coalescing effect on a finite universe would have it condensing exponentially. It could not remain uniform. It'd express the same visual pattern across the sky as diffusion. If condensing doesn't exist, it cannot be finite. Even Einstein realized this.

In his book, *Relativity: The Special and the General Theory* (Three Rivers Press, 1961), he conjectures a curving non-Euclidean (a geometry that's not straight, square, or parallel) universe that's "finite and yet unbounded" that expresses two-dimensionally like the surface of a sphere. Its spherical two-dimensionality would theoretically explain away its exponential condensing from gravity. (It would do the same for its exponential diffusion from expansion.)

He reasons that if gravity's effect were limited to the curving two-dimensional surface of a sphere, it would become uniform and could then be countered by employing a "cosmological term," a constant that would (mathematically) prevent the entire universe from collapsing in on itself. He later abandoned his cosmological constant (that we've all heard he regarded as his biggest mistake) in favor of Alexander Friedmann's (a Russian mathematician 1888-1925) idea of expanding space that he thought to be a more natural solution. Isn't this in essence the big bang orthodoxy we all embrace?

Two-dimensional space's counteracting uniform expansion conceptually works two-dimensionally, if existence in two dimensions were actually possible. But how could three-dimensional space's expansion ever counteract gravity's exponential condensing in three dimensions? To produce a uniform result, wouldn't that require it to be decreasing exponentially from the universe's center out? How's that physically possible?

He justifies his two-dimensional, finite yet unbounded universe by adopting "the three-dimensional spherical space which was discovered by [Bernhard] Riemann" (a German mathematician 1826-1866). It somehow melds our real three-dimensionality with a two-dimensional space that manifests as a sphere's surface. (Note how he references it as a discovery as if it were verified and has an actual physical existence.)

He asserts that in his universe, someone can "draw lines or stretch strings in all directions [meaning spherically, three-dimensionally] from a single point... At first, the straight lines which radiate from the starting point diverge farther and farther from one another, but later they approach each other, and finally they run together again at a 'counter-point' to the starting point. Under such conditions they have traversed the whole spherical space."

But he's mixing dimensions. He first has the strings diverging three-dimensionally, but then he has them somehow converging two-dimensionally. How's that possible? It's an inherently conflicted, physically impossible scenario that assumes existence in two-dimensions.

We affirm his reasoning by agreeing that someone with a powerful enough telescope could look out in any direction, three-dimensionally, and see the backside of our own galaxy, which is just as conflicted and impossible. But at the same time, we also hold that someone with a powerful enough telescope could look out, again in any direction three-dimensionally, and see back in time almost to the universe's inception.

How could we see the universe's beginning when we're supposedly looking at the backside of our own galaxy? And how can we look out in any direction, three-dimensionally, and see the universe's inception? In three dimensions, it would have to occur at a single location. It cannot be everywhere. That doesn't even work two-dimensionally.

Einstein asserts that visualizing his two-dimensional three-dimensional "...space means nothing else than that we imagine an epitome of our 'space' experience, *i.e.* of experience that we can have in the movement of 'rigid' bodies. In this sense we *can* imagine a spherical space." Does any of this have a rational interpretation? Maybe it just needs to be deciphered for those of us limited by normal intelligence.

It certainly looks sophisticated and legitimate. But when all of its high-sounding technical rhetoric is filtered out and all of its illusive mathematical gimmickry is stripped away, aren't we ultimately still left existing in two dimensions? That doesn't work. Any way you cut it, genius or not, two dimensions can only define a location that's planar. It might maintain the big bang's uniformity, theoretically, but without the third dimension there is no actual existence.

Its finiteness is another issue. How can the universe even be considered limited, in any way, when by definition it's infinite? It includes everything. So if space is something that defines its shape and extent, wouldn't the space that's outside of it have to also be included? Einstein explains (paraphrasing), there would always be "unbounded empty space" outside of the universe's "bounded space." By that reasoning, wouldn't a universe that's defined by space have to be inherently infinite?

But this raises another fundamental question. How can "space" determine the shape and size of the universe when it doesn't exist? By definition, it's the nothingness between objects. It is not a physical something. There's nothing there. So if it's nonexistent, how can it define the universe as finite?

Furthermore, if it doesn't exist, how can it curve, expand, or stretch as it expands, or cause light's redshift as it stretches? And if its expression is limited to two dimensions, it again still wouldn't exist. So why wouldn't its intrinsic nonexistence, which nullifies its curving, expanding, stretching, and light's redshift from its stretching (in either two or three dimensions), be enough by itself to render the big bang a fallacy?

A finite yet unbounded universe, no matter how it's rationalized, is an inconceivable reality that's even more absurd. And its inherent nonphysical two-dimensionality and impossible curvature, expansion, and stretching of a nonexistent space permanently relegate it to the theoretical realm anyway. So again, the big bang can't be real.

Unable to refute this elemental logic, some have devised an ad hoc workaround in an attempt to salvage it that theoretically would justify its uniformity. They retained its nonexistent space's expansion but abandoned its impossible two-dimensionality and finiteness. It's now a normal, three-dimensional, but infinite big bang. Without its finiteness, the inverse square law's invalidating diffusion would no longer be an issue.

But now that it's infinite, what's the impetus for its expansion? It has none. It's just expanding for no particular reason, and so is its increasing rate. At least a finite big bang could claim its condensed state as a potential catalyst for its initial eruption, ongoing expansion, and expansion's acceleration.

But don't all of the big bang's presumed primeval conditions arise from and are contingent on its finiteness? Size, density, pressure, temperature, the creation of cosmic microwave background radiation, matter's inception and maturation, universal expansion/condensing, universal self-gravity, the theorized big crunch, and so on, wouldn't they all become meaningless in an infinite reality? Sure they would. How can the universe begin smaller than the size of an atom but at the same time be infinitely vast? The whole notion is fundamentally ill-conceived. It's a nonstarter.

In 1949, Fred Hoyle (a British astronomer 1915-2001) who coined the term "big bang" proposed along with others an alternative steady-state theory. It attempts to keep the density of an expanding infinite universe constant with the continual creation of new matter. This would occur in between galaxies, filling the enlarging void between them caused by universal expansion.

But the issue is not constant density, maintaining the same distance between galaxies as they move away from one another equally. It's uniform density, maintaining the universe's homogeneous isotropic properties from its center out as it expands. How would it ever be possible for a finite (three-dimensional) big bang, which would have to be subject to the principles of spherical geometry, to not diffuse as it expands?

Also, wouldn't the creation of new galaxies in between the existing cause all of the older galaxies to be surrounded by and nested within a spherical shell of younger galaxies? Wouldn't this produce an easily discernible three-dimensional polka dot pattern of older galaxies? But what's more important, universal expansion for an infinite universe is again fundamentally nonsensical.

Aside from lacking an impetus for all of its presumed conditions from expansion and expansion itself, if it's run backward, don't we quickly end up with an infinitely small universe that's still somehow infinitely vast? How can the distance between galaxies remain constant when it's infinitely small? It'd be larger than the entire universe. These unresolvable paradoxes make no sense, not that an expanding finite universe is that much more rational.

The creation of new matter for a finite (three-dimensional) big bang is another solution. But it's still unworkable. New material would have to spawn out of nothingness at its expanding perimeter. And it'd have to be increasing exponentially, coinciding with the inverse square law to exactly counter its diffusion to generate a homogeneous result.

Also, its exponential rate of creation would have to be increasing to match expansion's increasing rate. All this is highly improbable and problematic to say the least. The age of galaxies for example, the youngest would be at the universe's expanding perimeter while the older ones would remain near its center. So the whole idea is another nonstarter.

The bottom line is, if the universe is not diffusing and can't express two-dimensionally, the big bang has to be a fallacy and the Hubble Constant has to be a misinterpretation. So cosmological redshifts have to be indicative of something other than (nonexistent) space's stretching and cosmic microwave background radiation has to originate from a source other than the big bang's primordial conditions.

Why is it unreasonable that cosmic microwave background radiation might originate from a different source? It's just a theory, and it's based on the big bang at that. If the big bang never occurred, wouldn't it have to? Being that it corresponds to galaxies as they appear across the sky today, not where it would have been shortly after the big bang, why aren't galaxies themselves considered the most likely source?

Aren't there many possible sources of cosmological redshifting? At last count, nine seem to have viability. There may be more:

- tired light's energy loss over distance,
- the charge induced to atoms by a galaxy's rotation and linear motion,
- relativistic time dilation from a galaxy's rotation and linear motion,
- light's slower velocity in a galaxy's gravity field,
- gravitational redshift from light's energy loss in gravity fields,
- Einstein's gravitational redshift that's based on relativistic time dilation,
- the Doppler effect from the recessional velocity of each entire galaxy caused by the big bang's expansion,
- the Doppler effect from the recessional velocity of each galaxy's constant infall of ever-condensing material caused by gravity's runaway coalescing,
- and the currently accepted source, (nonexistent) space's stretching caused by the big bang's expansion that displaces light toward the red.

And what about cosmological blueshifting? Are we actually expected to believe that (nonexistent) space is contracting in the direction of the small number of galaxies that exhibit a blueshift? How would that work? None of the other redshift sources, except a galaxy's constant infall of coalescing material, has a consistent explanation for blueshifted galaxies either.

Given gravity's inherent runaway nature, wouldn't it have to be increasingly condensing all of a galaxy's material, constantly coalescing it inward exponentially toward its common center of mass? Wouldn't this have to give it a recessional velocity and associated redshift from the material of every other galaxy, including our own?

Isn't it also entirely plausible that in some circumstances their material would have a closing velocity with ours caused by any combination of a variety of conditions, their gravitational interplay with our or other galaxies, the type of galaxy, its orientation, its density, its rotation's direction and rate, the location and the line of sight infall velocity of the material where the light is being measured? Couldn't even just one of these rationally account for the blueshifting of their light?

As a galaxy's infalling material continues to accumulate, wouldn't the resultant pressure from its ongoing condensing have to continue to build and eventually trigger fusion reactions? Wouldn't it then be transmuted back into the radiant/plasma energy it originated from and be radiated back out of the galaxy, or in well-developed spirals be spewed out in huge jets that act as a drain for its whirlpooling vortex of ever-condensing/collapsing infalling material?

As the expelled radiant/plasma energy slows and cools, wouldn't it eventually reconstitute back into ordinary matter? And then over time, wouldn't it have to begin to gravitate back to its or another nearby galaxy? Wouldn't this set up a never-ending process of perpetual recycling at each galaxy?

Doesn't this sensibly explain how galaxies might remain relatively static while exhibiting a redshift from recessional velocity and occasionally a blueshift from closing velocity? Wouldn't this yield an infinitely vast, ageless universe in a persistent steady-state condition that at the same time is very dynamic?

Convention has the material of galaxies not continuously coalescing and condensing but held at bay in a constant circular orbit by its centrifugal force due to the conservation of angular momentum. That's an argument that might be made if the system were closed and static. But an infinite universe that's perpetually recycling its material through, and between, galaxies can't be a closed system.

Also, how could centrifugal forces that under many conditions wouldn't even exist, especially for ellipticals and some irregulars, counter gravitation's ever-increasing condensing and forestall its material's inward migration? If there's no rotation, there'd be no counteracting centrifugal force.

For spirals, which manifest a whirlpool of ever-condensing infalling material, there is more centrifugal force. But it originates from the gravitating material's own coalescing. So how could it ever counter its inward migration and push it out into a fixed circular orbit? Wouldn't that require additional tangential velocity from an outside source?

How can we assert gravity's runaway nature is a universal principle that applies to all bodies beginning with subatomic particles, but it doesn't apply to galaxies that are composed of those bodies and subatomic particles?

If the material of a galaxy is held in a fixed circular orbit, how is it even conceptually possible for any of it to ever make its way to the galaxy's core to then be consumed by its supermassive black hole? And then, how would it be possible for it to begin to ceaselessly gravitate and endlessly "spaghettify," stretching not condensing as gravity actually does, as it falls forever toward infinity down the black hole's two-dimensional, funnel-shaped (nonexistent) space?

In the three actual dimensions of our tangible environment, wouldn't gravitation immediately condense it together at its common center of mass? It has no place else to go. Isn't all this just more illusive mathematical gimmickry that's also based solely on abstract nonphysical two-dimensional geometry that has no practical relevance to our real three-dimensional world?

Given the implausibility of fixed circular orbits for a galaxy's material and the objective, near certainty of gravitation's runaway coalescing, wouldn't galaxies with a higher concentration of mass produce faster infall velocities for its ever-coalescing/condensing material? Doesn't this suggest that for those galaxies whose recycling is waning, the more condensed they become, the smaller their size, the faster the infall of their material, and the higher their redshift?

Wouldn't this appear as more distant galaxies (or quasars) with faster recessional velocity because their decreasing size (and/or brightness) corresponds to increasing redshifts? Isn't this what we presume to observe? But isn't it reasonably possible that it's a simple misinterpretation where we've been mistaking this for universal expansion/stretching and its increasing rate when in reality it's just gravitation's natural runaway coalescing/condensing?

If gravitation really is a runaway process and if recessional velocity actually does produce a redshift, wouldn't the constant infall of ever-coalescing material at each galaxy have to produce a recessional velocity with an associated redshift that has to be accounted for at each galaxy in addition to the redshift presumably produced by universal expansion/stretching? There's no way to avoid it.

Why is it that no one has noticed that if even one other redshift source at galaxies is found to be legitimate, it would coexist and conflict with the redshift from (nonexistent) space's stretching? How then could we ever know how much redshift to attribute to each? We could never determine the universe's rate of expansion, or whether it was even expanding at all. Again, if there's no expansion, there's no big bang.

If we want to preserve the big bang, wouldn't we have to disregard all other redshift sources? But redshift from recessional velocity is still widely held. Gravitational redshift is also widely accepted. So is Einstein's relativistic version of gravitational redshift.

He himself asserts, "If the displacement of spectral lines towards the red by the gravitational potential does not exist then the general theory of relativity will be untenable." (Actually, all of it would be. Its special and general theories are interdependent for his interpretation of gravitational redshift.) But discounting all other redshift sources other than expansion's would mean discounting Einstein's gravitational redshift. And that would nullify relativity.

But if we retain gravitational redshift to preserve relativity then we have contradictory redshift sources and the big bang is invalidated. At the most fundamental level, the big bang and relativity are conflicted. They can't coexist. And we find ourselves abruptly confronted with an intolerable predicament. We're forced to choose one or the other. Quite the dilemma, isn't it?

Conclusion

Unless uniformity can somehow be rationally explained, cosmology is facing a significant if not a catastrophic crisis. We're wholly unprepared for the total collapse of our relativity-based big bang orthodoxy. Imagine the havoc that would be wrought. A mistake so colossal, elemental, consequential, and yet so overtly conspicuous will be devastating, not just for cosmology but throughout all of science. How will the public ever be able trust their authorities again?

But don't expect that paradigm shift to occur anytime soon. Admitting error is not in our nature. But it will eventually happen. We can't disregard the mounting evidence and ignore the irrefutable logic forever.

Any cursory but truly objective inquiry will quickly reveal that our homogeneous, isotropic universe can't be expanding. Nor can it be finite. Expansion would have it diffusing exponentially. And if it were finite, gravity would have it condensing exponentially, even if space was something that actually existed and was expanding.

If our universe was somehow able to express two-dimensionally, it could conceptually remain uniform as it expands. But there's no existence in two dimensions. So Einstein's finite yet unbounded musings are also out of the question. An expanding, three-dimensional, but infinite universe is just as unfeasible. It's nullified from the outset by its inherent contradictions. So the big bang cannot be real. It's strictly a theoretical exercise.

If universal expansion is not real, (nonexistent) space can't be stretching to redshift the light of galaxies. So cosmological redshift must originate from a different source. If the big bang never occurred then no primordial conditions existed to produce the cosmic microwave background radiation. So it must originate from a different source as well.

The most practical way to reconcile observation with an infinite, non-expanding reality is if cosmological redshift originates from the recessional velocity of each galaxy's constant infall of ever-coalescing material and cosmic microwave background radiation is produced innately by the galaxies it corresponds to. This yields an infinitely vast, eternal universe (that we all know it really is) that's in an extremely dynamic but steady-state condition where runaway gravitation is perpetually recycling all matter through galaxies, continuously condensing, collapsing, and transforming it back into its original state of pure radiant energy.

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