A More Coherent Big Bang Model

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ABSTRACT

Researchers are finding cosmic structures that are too large and too old to have been produced by the big bang. These suggest our big bang took place within an older and larger universe. Yet, the standard model assumes our big bang created the whole universe. That assumption has troubled scientists since the 1940s. The catch is that it makes them treat all evidence as though it was created by this one big bang. This seems to explain why the standard model has encountered so many anomalies.

This paper presents a cosmic model that negates the creation assumption. It describes a more logical paradigm; wherein big bangs are local events in a vastly larger universe. One with a natural means for generating big bangs. The standard model's many anomalies make more sense when viewed in light of a big bang overrunning and overlaying components of an older universe.

This simple paradigm shift would be all it takes to transform our current model to one that's more coherent, cohesive, and comprehensive. To make it comprehensive, the paper also includes unique speculations about dark matter, gravity, grand unification, and anthropic conditions.

Keywords: cosmology: theory, dark energy, dark matter, large-scale structure of the universe, galaxies: clusters: general, stars: black holes, quasars

While most of the cosmic evidence tracks closely with General Relativity and the Lambda Cold Dark Matter (ΛCDM) model of the universe, there's a large and growing number of exceptions that leave researchers hungry for a simpler and more compliant model.

The author posits that most of the discrepancy between cosmic theory and reality stems from a single unproven assumption that built a box around big bang theory. That one foundational assumption proclaims that the big bang created the whole universe. Moving our imaginations outside that box opens a new world of possibilities. What follows is an unexamined model that's simple to imagine when we explore beyond the confines of that creation assumption.

Most scientists accept that a big bang created the expanding sphere of galaxies we observe. If it were clear that this expanding sphere is the whole universe, it would be fair to say the big bang created the universe. However, such is not the case.

Georges Lemaître published the original big bang theory in 1927 and later said the universe originated from a "primeval atom" or "cosmic egg" whose initial expansion marked the beginning of time and space[1]. His tiny point of origin is now called the "big bang singularity". To most of his colleagues Lemaître's declaration must have seemed plausible, as more powerful telescopes and advancements in spectroscopy were beginning to reveal a trillion times more cosmic matter than had been recognized prior to 1920 and, at the time, it looked as though the big bang created all of it.

The case has been acceptably made that big bang nucleosynthesis created the quarks and electrons that compose protons, neutrons, and the light elements[2]. However, no convincing evidence has been presented to support the view that *all* of the universe's matter was created by this one big bang's nucleosynthesis.

In the late 1940s, Fred Hoyle and his associates disagreed with the notion a big bang created the universe. They proposed an alternative steady state model that had no big bang[3]. Since the mid-1960s, however, there's been a convincing body of cosmic microwave background (CMB) evidence that a big bang really did occur. This paper describes a steady state universe that's filled with the residues overlapping big bangs.

Neither Lemaître nor his contemporaries ever actually substantiated that our big bang's legacy constitutes the whole universe. And yet, cosmologist continue to accept his creation assumption as a foundational pillar of current theory.

In order to prove our big bang created the whole universe, we'd need to be able to examine the whole universe. On the other hand, disproving the big bang created the universe is much easier. It only requires evidence that some of the universe was not created by our big bang. That evidence has been before us for years, but our dedicated adherence to Lemaître's assumption has hampered our ability to see it.

The first step in replacing an established theory with a new one is to describe the flaws in the old one. In looking through the thousands of relevant research papers, I find many in which the authors are not satisfied their mathematical conclusions are consistent with both General Relativity and the big bang model. This results in more fine tuning of the inputs and occasionally brings the results closer to theory. While many of these quantitative discrepancies merit more investigation, I'm not mathematically astute enough to participate in those projects. Instead, I've focused on the dozen or so well-accepted big bang problems that can be dealt with in a puzzle solving exercise requiring mostly critical thinking and a bit of imagination.

The challenge that stimulated my research stems from the long list of anomalies for which the standard model either has no answer or provides dubious answers that are not disprovable. Here are some key questions these mysteries pose:

- How can structures be larger than the cosmological principle allows?
- How can there be structures older than the big bang?
- What causes dark energy behavior?
- What causes big bangs?
- Where are all the missing monopoles?
- Why is there vastly more matter than antimatter?
- What gave the cosmic microwave background (CMB) its uniform temperature?
- What gave the CMB its rough texture?
- How did galaxies and stars form so soon after the big bang?
- What will ultimately become of our expanding big bang?
- How did we get so many quasars, back when stars were just beginning to form?
- What is dark matter?
- How did improbable anthropic conditions evolve, in just 13.8 billion years?

The following analysis treats these mysteries as compatible puzzle pieces that fit together nicely in a less constrained picture of the universe. Numerous researchers have analyzed each piece individually, but I've never seen an analysis that treats them all as part of the same puzzle.

I'll describe each puzzle piece in more detail as we broach its topic. Combined, these pieces form the image of a grander universe, whose simple mechanics are logical and easy to visualize. My sense was that each of these mysteries would have a straightforward solution if our big bang took place in a preexisting universe. One whose general characteristics look like multiple layers of past big bangs.

We'll start by contrasting the difference between the assumption the big bang created the universe and a big bang that isn't constrained by that assumption. Here's a first principles overview of these two alternatives:

The "creation" model is based on an explosion that created the universe from a hot mass that burst forth from a singularity that appeared out of nowhere and was surrounded by nothing but emptiness. The most logical way to explain its formation from nothing is to assume half of its mass is matter and the other half antimatter. That way if you add it back together, it annihilates itself and you end up where you started, with nothing.

In the absence of outside influences, its hot matter should expand smoothly with no means for texturizing it and only its internal gravitational force to slow or contain it. One way to give it texture would be to throw in a brief hiccup at the beginning of its expansion; one that amplifies the texture of the hot quantum froth. This "inflation" preamble could also be used to hold all matter in contact for an instant, to give the big bang a uniform temperature in all directions. The big bang is bathed in electromagnetic energies, but there's no reason to expect them to behave non-uniformly.

That's it! Nothing else existed. So, theoreticians must be veerrrry creative to explain all the weirdness seen in the big bang's expansion.

In contrast: If an older, vaster and far more massive universe creates big bangs, it would have all the background environment necessary to explain everything researchers are finding—without the need for unproven physics. And it would do so in the confines of a natural 3D space.

FINDINGS DISMISSED WITH TOO LITTLE PRESS

The cosmological principle says that on a sufficiently large scale the universe is homogeneous and isotropic; meaning its mass is expected to be distributed uniformly throughout its volume. Mathematicians have determined that a universe produced by our big bang's observed metrics, could produce structures as big as 1.2 billion light years across[4]. Well, researchers are finding structures a lot bigger than that[5].

Wikipedia maintains a list of Largest Cosmic Structures[6]. As of mid-2016, there were six that are more than 1.2 billion light years across. The Hercules–Corona Borealis Great Wall is 10 billion light years across, 7.2 billion light years wide, and 900 million light years thick[7]. It was the largest structure recorded at that time, but the search for massive structures is just beginning and better instrumentation will likely reveal far more of these monstrous anomalies.

Scientists had earlier determined that even smaller structures take longer to form than the age of the big bang; concluding that it takes more than 100 billion years for galaxies to lose outflowing momentum, reverse directions, and gravitationally form these huge structures[8].

In a more global concern about mismatches in the cosmological principle and the findings, Wen Zhao and Larissa Santos recently published a paper summarizing these discrepancies[9]. They say, "… several directional anomalies have been reported in various observations: the polarization distribution of the quasars, the velocity flow, the handedness of the spiral galaxies, the anisotropy of the acceleration, the anisotropic evolution of the fine-structure constant, including anomalies in the CMB low multipoles, such as the CMB parity asymmetry. Although the confidence level for each individual anomaly is not too high, the directional alignment of all these anomalies is quite significant, which strongly suggests a common origin of these anomalies.

If these anomalies are due to cosmological effects, e.g. the alternative theory of gravity or geometry, the non-trivial topology of the universe, the anisotropic dark energy or the particular large-scale fluctuation modes, they indicate the violation of the cosmological principal. So, one should consider to build a new cosmological model to explain the large-scale data."

It looks like our big bang is failing both its homogeneity and its isotropy tests.

These findings don't mean the universe is not homogeneous and isotropic or that the cosmological principle is wrong. It suggests, however, that by using a single big bang as their point of reference, mathematicians assumed far too small a scale when they calculated the limits of the universe's homogeneity and isotropy. That underestimation would stem from believing the big bang created everything.

It wasn't unreasonable for 20th-Century physicists to think the big bang created the universe, as they had no knowledge of the huge structures. If we stop ignoring this data, it suggests our big bang is but a local event that took place in a much grander universe. Big bangs, themselves, may represent the true upper limit of the universe's granularity. Other standard model anomalies lend credence to this argument.

There are investigations we can do to determine if these structures really are older than our big bang. Older matter is colder and denser than big bang matter. It also has more metallicity, contains more black holes and many of those black holes will be more massive than those created by our big bang. This ancient matter will have been overlaid by a dense layer of new gasses, bringing old white dwarfs back to life and quickly spawning supernovas; which further increase the metallicity and number of black holes. Old supermassive black holes would become quasars when immersed in a cloud of new gasses. Their active age would determine how long it took our big bang to overrun them. Massive structures are the homogenization of old and new big bangs.

It's difficult to perceive an infinite universe, so let's be practical. The universe became a trillion times larger when astronomers discovered our solar system is but a speck in the Milky Way. It grew another trillion-fold when we discovered the big bang and all the other galaxies. The model, hypothesized here, expands the universe another trillion times. That's sufficient to accommodate the evidence, for now. While huge, this hypothesized 10^{36} solar mass universe isn't close to being infinite.

Picture an ancient universe littered with prior big bangs. Their expanding spheres overrun one another, creating domains wherein we find those oversize structures that are too old to have been created by our big bang (Fig. 1).

Recent big bangs are hotter, smaller, and more uniform. Older ones are colder, larger, and lumpier—due to having overrun a lot of other ancient matter. The oldest and coldest structures act like heat sinks, gravitationally attracting and cooling the hot gasses of more recent bangs; forming CMB cold spots.

Each new big bang behaves much like those that preceded it, with the most notable differences being their initial masses and energies. This simple model provides a means for explaining the many anomalous structures and processes we find within the bounds of our own big bang.

It's not surprising that most evidence supports the standard model, since our big bang is a subset of this grander paradigm. But theoretical elements tailored to conform with the creation assumption need to be revisited; e.g. the creation of space—as space was already in place. This suggests the big bang's outer boundary is nearer than current theory posits.

The standard model's puzzling list of anomalies tend to substantiate this grander paradigm. This simple model change allows those anomalies to fit together nicely to form a more cohesive picture.

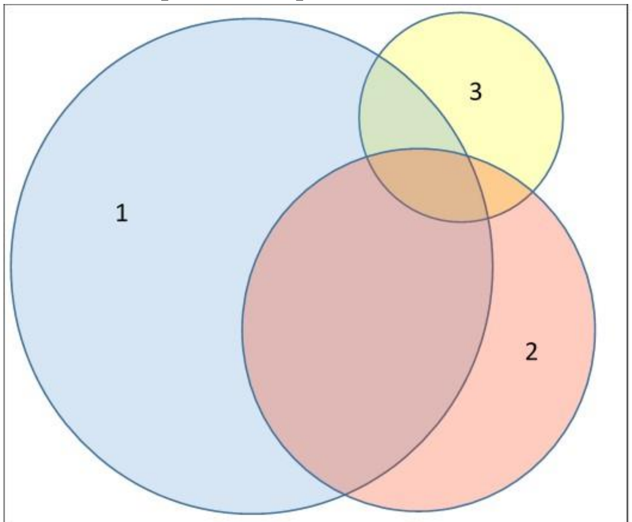

Figure 1: Three overlapping big bangs in a common universe

Sphere 3 represents our big bang. It overlaps two progressively older and larger big bangs, creating unique environmental domains.

DARK ENERGY?

The 2011 Nobel Prize in Physics went to Saul Perlmutter, Adam Riess, and Brian Schmidt for their discovery that the big bang's expansion is accelerating[10]. More accurately, the prize was awarded for the discovery that the *universe's* expansion is accelerating; as the standard model assumes the big bang *is* the universe.

The force accelerating this expansion is called dark energy. From our perspective dark energy behaves like negative gravity[11]. So when dark energy modulates the expansion, we find an early decelerating expansion caused by the big bang's gravitational mass; then, several billion years later, the dark energy caused a gradual reacceleration[12]. From appearances, the universe's three spatial dimensions are becoming infinite—if they weren't already infinite.

In 2016, Adam Riess et al were still refining the dark energy parameters accelerating this expansion[13]. They ponder the possibility of "gravitational physics beyond General Relativity, additional relativistic particles, or non-zero curvature. Indeed, none of these features has been excluded by anything more compelling than a theoretical preference for simplicity over complexity. In the case of dark energy, there is no simple explanation at present …". What natural force could possibly cause this behavior?

Actually, this decelerating and reaccelerating velocity profile is a common ballistics behavior. Here's a simple example:

If we shoot a projectile to earth from our moon, the moon's gravity decelerates it until earth's gravity becomes dominant; then the missile reaccelerates as it approaches the earth. The big bang's expansion has the velocity profile we'd expect if our big bang is surrounded by huge masses, sharing its 3D space. Its reacceleration in all directions means the expanding mass is receding from its own dispersing center and getting closer to surrounding masses. There seems to be more mass in any given direction beyond our big bang than there is within it. Thus, in an all-natural 3D world, dark energy behavior supports the view that our big bang took place in an older and grander universe.

Instead of our big bang spawning a new universe, it looks like it's our old universe that spawns big bangs.

We know how the universe creates and grows black hole singularities[14,15]. Once a stellar mass black hole is formed, there's nothing to stop its continuous growth by accretion and mergers with other black holes. Matter at the center of each black hole gets crushed into a singularity. And we already have well-developed theories wherein exploding singularities create big bangs[16,17]. So, in a vastly larger universe, it's just a matter of time before singularities grow massive enough to fuel big bangs. And a steady state universe never runs out of time.

Let's examine how a mature universe might cycle through a process of perpetual renewal.

HOW COULD SINGULARITIES CREATE BIG BANGS?

Black holes crush particles until they collapse and can no longer move. This squeezes out all their heat. Stephen Hawking says the more massive a black hole gets the lower its temperature gets[18]. "A black hole with a mass a few times that of the sun would have a temperature of only one ten millionth of a degree above absolute zero." (He also says black holes will continue to absorb more mass than they emit until the background radiation temperature falls below the temperature of the black hole. At that point the black hole begins its virtual eternity (10^{60} years) of slow evaporation. I'll revisit this in my summary.) Now, if we had a hundred billion trillion solar mass black hole—on the order of the mass of our big bang—at absolute zero, it would be the most stable mass imaginable. How could it possibly blow itself to smithereens?

One of CERN's missions is to simulate big bangs by bashing heavy particles together[19]. Singularities *are* heavy particles and gravity bashes them far more forcefully than man-made colliders bash heavy elements. That process requires *two* singularities.

While there have been several computer simulations of black hole collisions, I've not yet found one that simulates the collision of singularities massive enough to create big bangs.

An awesome force

Gravity's accelerating force equation is: $F = G(m1m2)/d^2$, where G is Newton's gravitational constant, $m1$ and $m2$ are the masses of our two singularities, and d is their ever-closing distance. Singularity radii are said to be zero; so, when two singularities collide, d becomes zero and gravity's force becomes infinite. This not only means gravity is powerful enough to generate big bangs, it seems to overthrow the notion that gravity couldn't possibly be the strong nuclear force. Both gravity and the strong force fall off abruptly at distances greater than .8 femtometers[20]. Uniting gravity and the nuclear forces may be just a quark stacking and elasticity problem. We'll explore this later.

Einstein's enhancement of Newton's formula increases the collision force even more—if that's possible—by growing the inertial masses as the singularity speeds approach the speed of light.

When the singularities reach the collision point—at the speed of light—they'll splatter, transforming their inert masses into the expanding plasma cloud that spawned the big bang's nucleosynthesis[21]. For simplicity, assume our singularities had equal masses and—being at absolute zero—each had a rest energy of zero. As gravity draws them together their kinetic energies are each $\frac{1}{2} mv^2$ and at their collision speed, c, each has a kinetic energy of $\frac{1}{2} mc^2$. Summing their energies yields: $E=mc^2$, the big bang's total system energy. The inertial force of gravity gets transformed into all other energy forms.

This Big Bash model uses colliding singularities as entropy's rechargeable batteries and thus supports the viability of a perpetually animated, steady state universe.

Gravity sparks all the heat, pressure, electrostatic and electrodynamic energy forms, when it bashes singularities together. It later quiesces those energies by squeezing heat out of the atoms in stars; where smaller atoms are fused into ever more massive, but cooler and less energetic, elements. The less stable radioactive elements are formed by ultra-high pressures, like those in supernova implosions. This creates a compressed super-cooling of particles that gives them a temporary stability. As they absorb radiated energy and begin to warm up, the particles expand and begin their various rates of decay.

Gravity eventually halts all particle motion and quenches their heat by crushing them back into singularities. The collision inflates the singularity masses and its friction charges the electrons, muons, quarks, and any other particles that trap charges. Heat becomes the electromagnetic background, existing as photons and other defined energy packets.

MONOPOLES?

Physicists have long felt magnetic monopoles should be key ingredients of General Relativity and big bang theories, but have difficulty identifying monopoles in nature[22]. It appears to me that our big bang *is* a monopole. The explosion's electromagnetic pulse forms a sphere whose extremity exhibits a single magnetic polarity. It's an expanding electric field that stretches radially outward from the point of impact, creating a ball of radially flowing heat and electricity. If monopoles are real, it seems we live in one.

Black holes are monopoles with a reversed polarity. There the heat flows from their exteriors to their cold interiors. Big bangs are scatterers and black holes are gatherers. Black holes may be nature's only effective means for gathering up runaway neutrinos.

In both kinds of monopoles, heat and electricity flow from hot to cold. Every radial of these monopoles is a dipole, with one pole at the center and the other at the periphery. Stars may also be monopoles, but big bangs and black holes are the alpha and omega of energy flow.

While a big bang begins its life as a sphere of pure energy, it quickly begins to cool and form ionized gasses. As this ball of plasma overruns old black holes, its smooth periphery becomes pockmarked as each black hole rips off blobs of gas to form protogalaxies.

In contrast to big bang/big crunch models, whose expansion and contraction takes place around one center point; this model's big bang expansions disperse their energies into many different prior big bang environments. The oldest and coldest regions of space grow the singularities that will generate new big bashes.

MATTER/ANTIMATTER DISPARITY

One unanswered standard model question is: why isn't the universe 50% antimatter[23]? The belief that our big bang should be 50% antimatter stems from Georges Lemaître's assumption that the big bang singularity materialized out of nothingness. Shouldn't that generate matter and antimatter in equal quantities?

The singularities we see today are not 50% antimatter. If we bash two of them together it's reasonable to expect some positrons and antiprotons to form, but they'd be as rare and fleeting as they are today. Lemaître's unwarranted creation assumption appears to have sent theoreticians on a wild goose chase.

HORIZON AND TEXTURE PROBLEMS

Opposite sides of the big bang recede from one another faster than the speed of light. This "horizon problem" prevents the most distant masses from mixing with each other. Yet, researchers find that average temperatures across the sky are at a uniform 2.725 K, within few parts in a hundred thousand[24]. What could have created such a uniform temperature?

Another question is: How did the CMB get its patchy texture? If all matter originated in a uniform ball of heat, what divided it up into proto-galactic clouds? If it hadn't broken up, the whole system would be a monolithic mass that condenses uniformly, forming one star that becomes a black hole in a single massive galaxy that smoothly collapses on itself in a big crunch.

The Inflationary Universe model solves the horizon problem by briefly holding all matter in intimate contact at the instant of the big bang, causing it to begin its existence at a uniform temperature[25]. Then, about 10^{-34} seconds later, it solves the texture problem by quickly doubling the diameter of the big bang some 10^{50} times in the next 10^{-32} seconds, while the quantum froth has just the right texture to amplify and lock in.

This expansionary halt, then abrupt acceleration beyond the speed of light, doesn't abide by Relativity's rules, but this inflationary process is thought to have occurred at the instant time began and the laws of physics had not yet jelled.

By contrast, in our Big Bash model the colliding singularities were each at absolute zero when they made contact, dispersing their matter from a uniform temperature. The seemingly random texturing process was caused by the new big bang's overrunning and mixing with ancient matter.

The Big Bang Machine

What we see in structures that are too big and too old to have been created by our big bang is a more massive version of the structures we see everywhere, just more webs of galaxies. These underlying structures are being overlaid by a veneer of big bang gasses and heating a bit, but remain colder than the new matter. This underlying structural mesh may be representative of matter throughout the universe. It's why new big bangs can't expand smoothly.

The big picture is one of intertwining galactic streams whose intersections form clusters, like knots binding the strings of fishnets[26]. Their masses are gravitationally compacting and reeling in the strings, forming ultra-massive superclusters. Heat and electricity flow from the warmest regions of space to cooler regions. The oldest, coldest, and densest regions pull hardest on the strings. The thinning strings of galaxies—pulled in opposite directions by opposing masses—eventually break, ripping the fabric and forming vast islands of web segments.

Interconnecting galactic strings develop nearfield standing waves that cause the conducting streams to behave like electrical inductors. When current is interrupted in an inductor, the collapsing nearfield keeps it flowing until its energy is exhausted. As magnetic fields collapse around our ripped-off islands, the induced fields compress the islands and drive their galaxies together.

Space surrounding the islands becomes mostly void as matter is compacted. Black holes merge, forming ever more massive singularities. Over billions to trillions of years, islands merge and get rendered down to stringy balls of dense matter, rotating around massive singularities that are drifting toward one another.

Denser and denser

In *our* fresh new big bang, the mass of central black holes is outweighed by the mass of their galaxies. So, when galaxies collide and merge, they do so in slow motion and their central black holes get carried along in the gravitational current. These galaxies are mostly empty space and pass through one another, oscillating for millions of years while forming a new galaxy. Their black holes merge fairly smoothly, without explosions that destroy the new galaxy.

In contrast, the isolated islands of ancient matter are being rendered down to dense super galaxies, whose matter is concentrated in the central singularities. These singularities overwhelm their galactic masses and create gravitational focal points that attract other central singularities to smack them head-on.

Black holes have a Schwarzschild radius from which neither light nor matter escapes[27]. This radius, r, is proportional to the black hole's mass, M, and its formula is $r=2GM/c^2$ where G is the gravitational constant and c is the speed of light[28]. For simplicity, each solar mass adds 2.95 kilometers to the Schwarzschild radius.

If each of our two big bang singularities had 10^{22} solar masses, their Schwarzschild radii would be 2.95×10^{22} km or about 2.8 billion light years. This ballpark figure lends some scale to the size of the rips in the cosmic fabric and the islands of matter surrounding each singularity. Two such singularities would be locked in one another's grasp while still 5.6 billion light years apart. They'll still be drawing in huge strings of matter when they collided. The concentrations of mass in the singularities are adequate to draw them together head-on, even with trillions of solar masses of matter still orbiting them. It would be this orbiting litter that dices and texturizes the new big bang.

What's different between the collision of big bang singularities and the simulated merger of solar mass singularities, mentioned earlier; is the billions of years that big bang singularities accelerate toward one another, while occupying the same Schwarzschild radius. There may also be an enormous electromagnetic field collapsing around all this matter. It would slam everything together as though it was fired from a railgun.

EARLY FORMATION OF STARS & GALAXIES

In their analysis of galaxy makeup, Peebles and Nusser say, "the relativistic Big Bang theory is a good description of our expanding Universe. However, the properties of nearby galaxies that can be observed in greatest detail suggest that a better theory would describe a mechanism by which matter is more rapidly gathered into galaxies and groups of galaxies[29]."

If the Schwarzschild radii of our colliding black holes were billions of light years across, inflowing matter would take billions of years to arrive at their central singularities. This means chunks of matter, compressed into black holes, would still be orbiting the colliding singularities at the time of impact. When the singularities bash and explode, even before the radiation cloud becomes transparent its radial outflow starts to overrun the trillions of black holes orbiting perpendicular to the outflow. As the gas cloud blows past this matter, radiation pressure and the passing gravitational mass causes the orbiting chunks to spiral outward, shredding the expanding cloud and creating swirls that form rotating protogalaxies. Old debris provides the cold lumps we find imbedded in the primordial radiation[30]. This mixing of old and new matter breathes life into our big bang's smoothly expanding dullness and randomly texturizes it.

Heat from the collision overpowers gravity and erases the parent singularities' event horizons as it spreads outward at the speed of light. This inverts the two singularity monopoles, creating a single big bang monopole. When the heat overruns orbiting black holes of sufficient mass, they remain intact, while those with less than 1.4 solar masses may expand like miniature big bangs. Colder inclusions would seed the early formation of stars and the surviving black holes would become quasars.

On a grand scale, we'd see an exploding cloud orbited by strings of cold, dense residue. Beyond it lies a sparsely populated void the expanding system will cross before encountering walls of ancient galaxies. The increasing gravitational pull of this old dense matter reaffirms why our big bang's expansion is reaccelerating.

WHERE ARE WE GOING?

Researchers have spent decades trying to predict the outcome of the big bang's expansion. They ask: will the big bang expand and thin forever; will the expansion slow, but never quite stop; or will it collapse on itself in a big crunch[31,32]?

This Big Bash model's answer is simply "none of the above". It's being reabsorbed by the same universe that spawned it. Wherever we're located in that expanding sphere, we'll always be able to see half of the big bang's matter, which can't escape our own horizon as it merges with the ancient universe. We'll just need more sophisticated telescopes with which to track it.

As we focus enhanced instruments on windows like the Hubble Ultra Deep Field, it should be at least as interesting to study incoming blue shifted objects as it is to study those that are outgoing and red shifted.

QUASARS, THE SMOKING GUN!

Quasars are active black holes, millions to billions of times more massive than our sun. They devour any gas or stars that fall into their grasp, squeezing the heat out of all they consume. Expelled heat makes them extremely bright, often outshining a thousand galaxies[33]. Most are found in early galaxies, formed within a few billion years after the big bang. Scientists are puzzled by how the big bang could form them so quickly[34].

In 2013, researchers published an analysis of an ancient proto-galaxy whose redshift dates it at 772 million years after the big bang[35]. It's illuminated either within or from behind by quasar ULAS J1120+0641. They found no evidence of star formation. The question this begs is: Where could early quasars come from if their galaxies were not yet making stars? It appears these black holes were already old when proto-galactic gas clouds overran them. Our big bang appears to have been born with enough black holes to light up the sky and reionize most of its new gasses.

More than a million quasars are cataloged[36]. Their quantity seems to have peaked within a few billion years after the big bang. There's been a steady decline in their population during the past 10 billion years[37]. In 2015, researchers reported one that existed 900 million years after the big bang[38]. It had the mass of 12 billion suns.

In 2010, Hilton Ratcliffe summarized his research and that of several colleagues, concerned about redshift reliability for measuring distance[39]. Much focus was on quasars having a different redshift than their associated galaxies. On statistical distribution they found three aspects of quasar distribution that were anomalous: The 2-D density distribution of quasars among other objects showed an unusual prevalence of quasars paired in close angular proximity across Active Galactic Nuclei; objects apparently close in space had different redshifts; and the asymmetrical concentrations of isophotes on AGN/quasar maps indicated the quasars were moving away from the AGN, suggesting they were being ejected[40–46].

J.C. Jackson found an effect in galaxy distribution data that made clusters of galaxies appear elongated when expressed in redshift space, resembling fingers pointing toward earth[47].

I'd venture that quasars don't necessarily co-move with their galaxies because they are preexisting black holes that are being overrun by the big bang's new galactic clouds. When black holes get overrun by dense clouds; instead of orbiting the black holes the gas plows directly into them and matter accretes prodigiously. Intense radiation forms as the black holes become quasars. This radiation holds back the inflowing gas, stretching the galaxies and creating those fingers that point toward earth.

A quasar's velocity, relative to its galactic cloud, may either propel it through the cloud and on to other clouds, leaving a trail of cosmic debris; or it may slowly oscillate through a cloud's gravitational center and settle in as its central black hole. Once a quasar comes to rest at its galactic center its accretion slows, causing the quasar to dim and behave like an ordinary central black hole. The NGC 1600 galaxy, 200 million light years from earth, contains such an inactive, 17 billion solar mass, black hole[48].

When multiple black holes arrive at a galactic center—being totally cold—they should be able to merge with one another without creating the lengthy light show that quasars provide.

A GALACTIC CHRONOMETER

The radially expanding gasses of the big bang and the black holes orbiting orthogonally within the collision's Schwarzschild radius, represent two distinct inertial systems that ultimately merge to form galaxies. Since the gasses were mostly part of our big bang's monolithic cloud, and the cloud is becoming less dense at a uniform rate, the density of any given cloud at the time it captures its central black hole provides a timestamp that indicates how soon after the big bang the proto-galaxy formed. Our own Milky Way Galaxy and some of its stars seem to have formed soon after the big bang[49]. This suggests the galaxy was created from a fairly dense gas cloud and it formed near the big bang's center.

DARK MATTER'S VISCOCITY

The rotational behavior of large structures, like galaxies and galactic clusters, suggest they have more mass than they appear to. In 1937, Fritz Zwicky said, "The essential feature is a central core whose internal viscosity due to the gravitational interactions of its component masses is so high as to cause it to rotate like a solid body[50]." More mass would let galactic extremities rotate around their center as fast as the central matter does, without flying off in space. But if there *is* extra mass, it neither emits nor absorbs radiation, so it's called "dark matter". The problem is: we can't find any dark matter[51]. Physicists even seek it down at quantum levels.

While the Big Bash model does have a means for depositing old heavy matter in galaxies that would otherwise be lighter, I suspect dark matter is not matter at all. More likely, it's a magnetohydrodynamic force behavior that is manifest when radiation ionizes galactic gasses. This would provide the "internal viscosity" Zwicky described.

In 1970, Hannes Alfvén won a Nobel Prize "for pioneering the study of galactic magnetic fields generated by the electrically conducting plasma that pervades the universe: such magnetohydrodynamic waves are now known as Alfvén waves." Alfven's paper, *Electricity In Space*, describes two experiments that demonstrate these waves[52].

"If you tap the side of a vessel containing a pool of mercury, the surface quakes and ripples as if it were alive. We found that when we placed such a pool in a strong magnetic field of 10,000 gauss, its behavior instantly changed. It did not respond to jarring of the vessel; its surface stiffened, so to speak. The magnetic field gave a curious kind of viscosity to the mercury."

His second experiment used a tank where the bottom had vanes that could be moved like the agitator in a washing machine. "In the absence of a magnetic field, the slow oscillation of this agitator, stirring the mercury at the bottom of the tank, will not disturb the surface of the mercury at the top of the tank; the mercury molecules slide past one another so that the motion dies out before it proceeds very far up the tank." … "When a strong vertical magnetic field is applied to the tank, however, the motion at the bottom is quickly communicated to the top." …

"To be sure, the magnetic fields in the stars are very much weaker than the 10,000 gauss of our experiment (the sun's general field is estimated at between 1 and 25 gauss). But our theory tells us if we made the vessel larger, we could produce the magneto-hydrodynamic effects with a smaller magnetic field; the magnetic force required would decline in proportion to the increase in size of the vessel. Hence in a star, which is, say, 10 billion times as large as our experimental vessel, the magnetic field need be only one 10-billionth of the laboratory field. The stars' fields are much stronger than this."

Alfvén describes how this principle applies to the interior of the sun, but doesn't scale it up further to apply to galaxies. Galaxies have a trillion times the sun's diameter. Using Alfvén's linear scaling, it would take only 25 picogauss to stiffen the interstellar medium, allowing a galaxy's outer stars to rotate in step with its inner stars. He said, "Furthermore, there are good arguments for assuming that a weak magnetic field (some millionths of a gauss) pervades all of space."

Recent research confirms that galactic field strengths are about 10^{-6} gauss[53]. From Alfvén's perspective this could generate the dark matter behavior we see in the rotations of galaxies and galaxy clusters; given the timescales available to build momentum and gel in the behavior. One might even expect a magnetic meniscus to form around galactic peripheries. This would reduce the number of speeding stars being flung out of their galaxies.

Alfvén advocated including plasma physics in astrophysics curricula. He, like many other scientists, believed induced magnetism will provide more tangible explanations for cosmic phenomena than the unprovable mechanisms of string theories. The Square Kilometer Array project will provide an excellent means for mapping the magnetic character of the cosmos[54]. I believe this data will not only substantiate the magnetic character of dark matter, but will also shed light on gravitational forces.

A DIFFERENT GRAVITY PARADIGM

Einstein received a Nobel Prize for his 1905 photoelectric theory[55]. He concluded his acceptance speech saying his new passion was to unify general relativity (gravity) with electromagnetism and possibly even with quantum mechanics[56]. He may have been closer to achieving his objective than he realized.

He, like Newton, perceived gravity as a force emanating from matter in proportion to its mass. Perhaps the only thing he missed was gravity's source. In our well-lit universe, all matter resides in a relatively steady field of electromagnetic radiation that seems ample for *inducing* gravity's weak magnetic characteristics. An *induced magnetic gravity* may be all it takes to provide Einstein's unification.

Magnetism has long been compared to gravity. Invariably the conclusion has been that gravity can't possibly be magnetic. Nonetheless, I'll revisit that subject. The first characteristic we'll deal with is that gravity is always attractive, while magnetism is both attractive and repulsive. But there are situations in which magnetic forces are always attractive.

When we sprinkle iron filings near a magnet, its field aligns their magnetic domains and makes the filings mutually attractive. This is scalable. It seems that galaxies sprinkled in a huge magnetic field would also feel an induced magnetism and behave like powdered iron's clusters and strings. Within a single magnetic field, the field draws the spins of electrons into coherent alignments.

In a reed switch, a solenoid causes the electrical contacts in its magnetic field to be drawn together, connecting one or more electrical circuits. Current flowing in the solenoid provides mutual attraction to the material enclosed in the coil's field.

Scaling-up a reed switch's solenoid to a half-meter diameter would provide a good magnetic cavity for testing the characteristics of an induced magnetic gravity. There, one could check out induced field strengths; field concentrations that represent the curvature of space; gravitational lensing; and the slowing of time. Of course, these field strengths will be many orders greater than the force of gravity.

While these simple examples support my point that induced magnetism can provide mutual attraction among objects, without exhibiting repulsion, they don't support Newton's observation that gravity's force is directly proportional to the mass of objects attracted to one another. These examples depend on the coherent alignments of electrons in magnetic metals and won't work if non-magnetic materials are used. And the attractive force is not proportional to the masses of all materials. The gravity characteristics we need should have an attractive force that's proportional to mass and be independent of the materials involved.

Mass is determined by the number and types of quarks in atomic nuclei. An induced magnetic gravity would need to coherently align the quarks to create a force that's proportional to mass. With nucleons aligned in an attractive orientation, atoms would remain attractive—even if the elements involved are magnetic, nonmagnetic, antimagnetic, or surrounded by Faraday cages. The heavy nucleons drag their electrons along, even when the electrons are magnetically attracted to other atoms.

How could the warping of spacetime be caused by electromagnetism? Quarks and electrons have a higher permittivity and permeability than the vacuum of space, and electricity and magnetism always seek the path of least resistance. Matter provides a much lower impedance path than the vacuum of space. This impedance difference may be what it takes to concentrate the magnetic energies of space around matter, in proportion to its mass. This would create the gravitational wells that curve spacetime. What makes an induced magnetic gravity unique from other induced magnetic fields, is the fact that the cosmos provides an omnidirectional radiation that impinges on matter from all directions.

Singularities are the most concentrated of masses. While these cold points of mass are devoid of energy; they're surrounded by Schwarzschild radii that focus powerful spheres of background radiation on them. These concentrated fields crush all incoming matter and induce extreme gravitational forces, like the Z-Pinch forces fusion energy teams are developing[57].

The purpose of thermonuclear Z-Pinch devices is to magnetically implode a 1 to 6 mm metallic sphere or cylinder filled with deuterium and tritium. The implosions fuse the enclosed nucleons to form helium and generate heat, in the hope they'll eventually produce more energy than the process consumes[58]. One Z-Pinch model uses ten radially and symmetrically arranged lasers to shine 10^{14} watts of power on the capsule being imploded[59]. The principle here is that laser radiation creates magnetohydrodynamic waves that crush the fuel pellet.

Black holes are also impinged by externally sourced radiation that's concentrated and focused on their central mass. This curves space so much that singularities appear to have no volume. Earth's gravity may be a weak manifestation of this process. Internally the force is compressive; externally it's attractive. Radiation forms Z-Pinches around all masses. So, it seems that gravity is a re-radiated attractive force that's induced by a pervasive and omnidirectional magnetic field. Mapping the flux of the cosmos may help us visualize the scale and character of gravity.

LIGO's detection of gravitational waves is consistent with the idea that gravitational forces are induced by cosmic fields[60]. What's being detected is magnetic vibrations caused by the merging of black holes. They're *induced* into the detectors—substantiating the inducibility of gravity from external sources.

An electromagnetic gravity's induced force would be attractive clear down to quark levels. This unexamined concept provides a pathway for unifying gravity and nuclear forces. With that in mind, I'll share some observations and speculations:

Physicists say electromagnetism exhibits 10^{38} to 10^{40} times more force than gravity[61,62]. That doesn't hold up when we note that singularity gravities have enough force to crush matter into nothing but cold mass. The perception that magnetism is stronger than gravity, stems from comparing the strong forces between quarks to weaker forces between atoms, molecules, planets, stars, and galaxies.

Atoms are mostly empty space, so, planets and people composed of this fluffy matter will feel a weak aspect of gravity. Quarks, however, are close together and possibly even touching; so, the inverse square law gives nucleons a strongly bound gravitational force. Electromagnetism and the induced force of gravity both approach infinity as the distance between masses closes. Gravity's force equals that of the strong force when the distance between quarks approaches zero. If gravity seems 10^{40} times weaker on earth than the attractive force between quarks, I'd venture that the earth's atoms are 10^{20} times farther apart than nuclear quarks are.

Scientists continue their quest to measure Newton's big G to ever greater precision[63]. It's embarrassing that we can't improve the accuracy of this basic reference beyond 4 decimal places. Well, if background radiation creates gravity, what would that say about the constancy of gravity? NASA says CMBR temperature is uniform to better than one part in a thousand[64]. If CMBR temperature varies by a few parts in 10,000 and its radiation generates gravity, then G would not *be* steady beyond four significant digits.

Einstein seems to use magnetic fields and gravitational fields interchangeably in areas that describe time dilation. He says, "An atom absorbs or emits light of a frequency which is dependent on the potential of the gravitational field in which it is situated. The frequency of an atom situated on the surface of a heavenly body will be somewhat less than the frequency of an atom of the same element which is situated in free space (or on the surface of a smaller celestial body)[65]."

The gravitational force surrounding cosmic bodies is amplified by the local curvature of space which, as mentioned earlier, may be an electromagnetic Z-pinch whose strength is determined by the concentration of mass. Atoms situated in omnidirectional magnetic fields may behave the same as those Einstein describes in gravitational fields. Magnetic viscosity slows the atoms and shifts their frequencies toward the red. Increasing the Z-pinch strength slows the atoms more, which translates to slower metabolisms, slower clocks, and thereby slower time. It seems that Einstein's field equations apply equally to gravity and omnidirectional magnetic fields.

If our big bang's two colliding singularities were of equal mass and at absolute zero, each had a rest energy of zero. As the induced gravity drew them together, each of their kinetic energies was: $E=\frac{1}{2}mv^2$ (half their mass times their velocity squared). Summing their energies yields: $E=mv^2$. As they collide at the speed of light, substituting c for v yields an energy of $E=mc^2$.

Einstein's famous equation very simply describes the kinetic energy of two pure masses being accelerated by an externally induced force, bashing at light-speed, and absorbing the externally sourced kinetic energy; transforming it to the big bang's internal system energy. Thereby, the universe's pure electromagnetic energy gets homogenized with its pure mass and becomes a single big bang entity. The accelerating force transforms the potential energies in the singularity masses from E=0 to a total big bang system energy of $E=mc^2$.

Since Big Bash singularities are entropy's rechargeable batteries, calculation of this entropy differs from that in the standard model. What we would see in a steady state universe is the homogenization of many systems. The pure energy of each big bang eventually becomes the pure mass of many black holes; which disperse in all directions and will later be involved in many different big bashes at different times.

CONNECTING GRAVITY TO QUANTUM MECHANICS

The separability of mass and energy at cosmic levels means it's also separable at particle levels. So, charged particle masses should be separable from both their electric charges and their strong and weak internal forces.

Paul Dirac's 1962 paper, "An extensible model of the electron", submits that electrons may have a spherical bubble membrane[66]. Quarks had not yet been discovered and he never updated his paper to include them. Dirac may have been correct, and perhaps *all* stable charged particles have membranes. While Dirac's model places charges outside the membranes, it seems more reasonable to enclose them within. This variance is based on the observation that quark charges don't neutralize one another even when neutron stars squeeze them together under extreme pressure. And when electrons collide with protons they neither annihilate nor neutralize one another; they just exchange a short wavelength photon and bounce[67]. Strong elastic membranes would both isolate charges and impart mass to particles. When neutron stars get massive enough to become black holes; particle membranes would burst, neutralizing their charges and the inert membrane residue becomes the cold dense mass of singularities.

Gerard 't Hooft described strong force bonds, saying, "The quarks in a hadron therefore act somewhat as if they were connected by rubber bands at very close range: where the bands are slack, the quarks move almost independently, but at a greater distance, where the bands are stretched taught, the quarks are tightly bound[68]." If elastic quark membranes are bound together by the strong force—an induced electromagnetic force—the stretch of the membranes would exhibit such behavior. We can model this by placing magnets in two small balloons, partially inflating them and bringing the magnets together. Pulling the balloons apart would simulate the force behavior 't Hooft described.

Induced magnetism acts as both the strong and weak forces. Gravity's force between quarks is limited only by distance. When externally magnetized spherical quark membranes get squeezed together, their elastic contact areas enlarge and make the holding force adequate to overcome the repulsion of excess positive charges. When the pulling force on a pair of quarks stretches their centers to about .8 femtometers apart, the magnetic bond holding them together (the strong force) is overcome and the quarks come apart at proton or neutron boundaries. Gravity's extreme weakness is exhibited beyond distances of .8 femtometer. That's what gives the strong and weak forces their ultra-short range.

RADIOACTIVE DECAY

Having particle charges enclosed in elastic membranes would explain the behavior of radioactive decay. When supernovae explode, they create implosive pressures on the atoms in their cores. More nucleons get rammed into their nuclei than the atoms can retain under normal pressures. The pressure super-cools the quarks the same way black holes squeeze out all their heat. When the pressure subsides, most of the unsustainable nucleons quickly fall away from their up-quark overloaded nuclei, but many are temporarily retained. These oversaturated atoms are radioactive. Pressure has squeezed the quark membranes into oblate spheroids, increasing their contact surface and allowing them to bind more nucleons than they hold under normal temperatures and pressures.

As the distorted membranes absorb radiation, their pressures build and they become more nearly spherical, reducing their magnetic contact areas. This lets the supersaturated nuclei shed their excess nucleons and exhibit radioactive decay. Different radioactive elements have differently shaped nuclei. Less stable shapes have shorter half-lives.

An experiment that may substantiate this model would be to expose radioactive elements to a spectrum of high energy radiation, to see if it shortens their half-lives. If such is the case, it suggests we may be able to extend the half-lives of heavy manmade elements by routing them to ultra-cold environments that reduce their decay rates.

In this membrane model the strong and weak forces are the same force. The strong force is manifest when atomic nuclei are not overstressed by up-quark overload and are difficult to pull apart. The weak force is pronounced when induced magnetism is marginally adequate to bind the nucleons of radioactive elements and the pressure-chilled nucleons are heating up.

Particle colliders have detected a family of force carriers referred to as gauge bosons. Most common among these massless particles are the gluons, photons, W bosons, and Z bosons, that are viewed as energy fields[61]. About quantum electrodynamics and quantum chromodynamics, Richard Feynman said, “It’s very clear that the photon and the three W’s are interconnected somehow, but at the present level of understanding, the connection is difficult to see clearly—you can still see the ‘seams’ in the theories; they have not yet been smoothed out so that the connection becomes more beautiful and, therefore, probably more correct.” Well, if nuclear bonds are induced by an electromagnetic field, it seems that breaking those bonds would spark flux transitions resembling gauge bosons. One might expect similar blips when two electromagnets are pulled apart.

While this gravity bridge between relativity and quantum physics may seem a bit far-fetched, it does provide a plausible placeholder that matches many of the observations. It would be great, however, if those more knowledgeable in quantum mechanics could either enhance or replace this membrane model.

QUANTUM PHYSICS AND ANTHROPIC ENVIRONMENTS

If, indeed, our big bang is the explosive byproduct of two different singularities and this yielded a single family of quantum elements; it suggests that every big bang may yield the same table of elements. This could be due to all singularities being at the same temperature and density and getting bashed at maximum force. All quantities would be up against their stops.

In that case, the merging of multiple big bangs would be seamless as far as their chemistry is concerned, making life adaptable among multiple big bangs. Stray comets are ubiquitous and great transporters for delivering complex molecules to every planet. Life would only have to evolve once and that one spark could propagate forever.

SUMMARY

Evidence suggests our big bang did not create either the universe or space. This would limit the big bang’s radius to the speed of light times the 13.8-billion-year age of the big bang. Beyond this distance we should see objects that were never part of our big bang and are as likely to be approaching us as receding from us. Out there, the temperatures should be a bit colder, but still above absolute zero. If the background temperature doesn't get down to Stephen Hawking's nanokelvin range, it appears that black holes would never begin to evaporate.

Inside our big bang's expanding periphery, we should find many objects that were not created by our big bang and are not co-moving with its outflowing matter. We'll see objects moving in different directions and speeds. Some will be much older than the other matter in their regions of space. The quasars are a case in point; as are the underlying masses of great wall structures.

If the archaic creation assumption is to be retained, we'll need to see some rigor to support it. Otherwise, we'll need a new cosmic paradigm. Its development will undoubtedly require much iteration. I'd prescribe this Big Bash model only as a starting point. Its design is quite flexible.

There is a movement afoot to assess the science community's support for unproven string theories and multiverses[69]. The primary argument favoring string theory is the alleged lack of alternatives when it comes to explaining observed standard model behaviors. In order to get my oar in the water, I'd pose the following axiom:

Given sufficient mass, energy, and time; every valid permutation and combination of mass and energy is possible within the realm of a single, unbounded, three-dimensional space.

It seems to me that Mother Nature has no need for supernatural spatial dimensions.

ACKNOWLEDGEMENTS AND AUTHOR CONTRIBUTIONS

My self-taught cosmology was mentored by a 54-year subscription to *Scientific American*, plus numerous other tech journals and books. Wikipedia and arXiv.org are my primary research libraries. During the past 65 years, I've integrated the international community's cosmic findings into a mental model of the universe and am solely responsible for having documented it.

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