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Revolutionizing cosmology: the small bang model and its implications on universe genesis

Abstract

The Small Bang Model (SBM) introduces a revolutionary framework for the genesis of the universe, challenging conventional cosmological theories. By sug-gesting the universe originated from a zero-mass state, facilitated by antimatter black holes, the SBM provides fresh insights into galaxy formation and the dis-tribution of matter and antimatter. This paper outlines the SBM's foundational principles, contrasts it with the Big Bang theory, and highlights its potential to resolve longstanding cosmological puzzles. Notably, it presents empirical valida-tions demonstrating distinct mass relationships between supermassive black holes and their host galaxies, supporting a novel classification into matter and anti-matter galaxies. The Small Bang model is founded on two pivotal concepts: the theory of Cosmic Inflation and the principle of 'Shunyata Universe's Genesis' (or'Emptiness Universe's Genesis'), a framework envisioning the universe's incep-tion as small, empty, and cold, entirely devoid of matter or energy. Within this Shunyata beginning, the cosmos as we witness today, abundant in matter and energy, was forged during the $2\mu s$ duration of cosmic inflation. Throughout this period, the substantial energy of the Inflaton field was harnessed either through the mediation of micro black holes or directly by the Inflaton's influence on the spacetime fabric itself. This era was marked by the continuous creation of matter and antimatter particle pairs (such as proton-antiproton and electron-positron, including the creation of photon-antiphoton pairs), permeating the entire expand-ing universe. The SBM predicts that the massive annihilation of antiparticles, induced by the inflaton field throughout the entire universe in the final 15 ns of cosmic inflation, generated two tomographic scans: Cosmic Antiproton Tomogra-phy (CAT) radiation and Cosmic Positron Tomography (CPT) radiation. These two tomographies serve as evidence of the inflaton field's existence, allowing us to calculate its principal parameters and also to create images of the interiors of hydrogen clouds that formed the first galaxies at the end of cosmic inflation. This phenomenon has not yet been fully understood by physicists because the photons from CAT radiation have shifted into the microwave range, generating the Cosmic Microwave Background (CMB), and the CPT radiation has transitioned into the FM range, producing the Cosmic FM Background (CFMB), which is **1013** times weaker than the CMB. This weaker signal can be confused with noise gen-erated by FM equipment, thus remaining undetected. These SBM findings offer a groundbreaking perspective on the early universe's dynamics and the distribu-tion of cosmic matter, and dark matter origin, deepening our understanding of cosmic inflation. Consequently, we invite physicists to study, comprehend, and assess the new cosmological Shunyata beginning, proposed by the Small Bang Model.

Keywords: Cosmic Inflation, Inflaton Field, Antimatter Black Holes, Matter-Antimatter Asymmetry, Galaxy Formation, Quantum Fluctuations, Cosmological Theories, Dark Matter, Supermassive Black Holes, Big Bang, Small Bang

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Introduction

The quest to understand the universe's origins has long intrigued scientists, leading to the dominance of the Big Bang theory.[1] Yet, the Small Bang Model[2] (SBM) proposes a compelling alternative, suggesting the universe originated from a state of nothingness, characterized by zero mass and energy. Unlike the Big Bang theory, the SBM explains the universe's emergence and the creation of matter through antimat-ter black holes within a crucial two-millisecond timeframe (cosmic inflation period), aligning with Big Bang model (same total mass/energy) beyond this point.

The big bang theory

The Big Bang theory,[3] supported by Hubble's observations, suggests the universe began as a dense, hot singularity, expanding over time. It explains the early formation of hydrogen and helium and the cosmic microwave background (CMB) radiation. How-ever, it faces challenges explaining the universe's uniformity and the matter-antimatter imbalance.

Cosmic inflation theory

Introduced by Alan Guth, the Cosmic Inflation Theory[4] complements the Big Bang Model by suggesting a period of exponential expansion from a state devoid of matter or energy. The SBM builds on this, positing that all matter and energy in the universe originated from the inflaton field[5] during very short (but not exactly measured until today) inflation period time. This model provides a framework for understanding the universe's genesis and offers a means to calculate the inflaton field's parameters, addressing gaps left by the Big Bang theory (Figure 1).

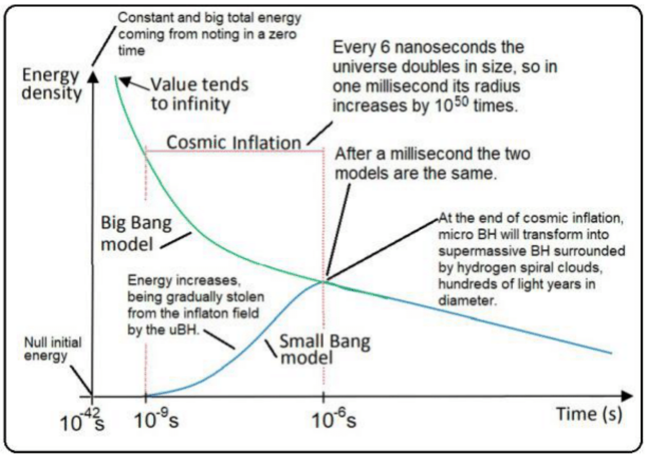

Figure 1 Energy density in Big Bang model and Small Bang model.

Limitations of the big bang theory

While the Big Bang theory has significantly advanced our understanding of the universe, it struggles with several unresolved issues, such as the initial singularity, matter-antimatter asymmetry, the nature of dark matter,[6] and the formation of galaxies and supermassive black holes. These challenges highlight the need for alterna-tive theories like the SBM, which seeks to address these phenomena and offer a more comprehensive understanding of the universe's origins.

Could SMBHs be composed of antimatter?

Traditionally, Supermassive Black Holes, including Sagittarius A* at the heart of the Milky Way, are presumed to be matter-based SMBH. However, recent experiments, notably by Alpha-CERN,[7] have started to challenge the clear-cut distinctions between matter and antimatter, especially regarding their gravitational behaviors. This emerging ambiguity brings to light a provocative hypothesis: Could the supermas-sive black holes (SMBHs), including the one anchoring our Milky Way, be composed of antimatter?[8]

This proposition ventures beyond traditional understandings of matter-antimatter annihilation, offering a fresh lens through which to examine antimatter's cosmic distri-bution. It suggests that SMBHs might be vast reservoirs of concealed antimatter, with their event horizons acting as veils that prevent any detectable annihilation signatures from escaping. Importantly, the gravitational interaction with stars orbiting such SMBHs would not differ whether the black hole consists of matter or antimatter. This scenario opens new paths for exploring the enigmatic nature of antimatter, potentially circumventing the necessity for CP violation explanations,[9] and enriching our dialogue on the universe's most profound mysteries.

It's crucial to underline that if SMBHs were antimatter, no signatures of matter-antimatter annihilation would be detectable outside their event horizons, since such events inside would not influence the external universe. Furthermore, the orbital dynamics of stars around such black holes would appear unchanged to observers, supporting the viability of this theory without contradicting current astronomical observations. This notion not only challenges traditional views on matter-antimatter annihila-tion but also opens new avenues for investigating antimatter's mysteries, suggesting that vast quantities of it might be locked away within the universe's most enigmatic structures (Figure 2).

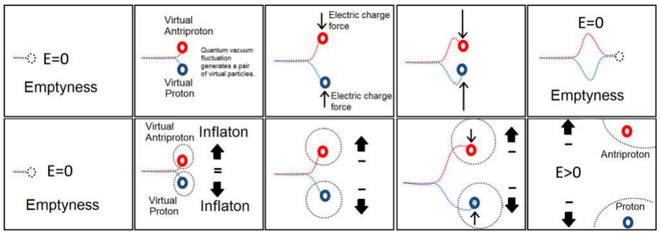

Figure 2 Quantum fluctuations in the vacuum generate virtual particles of matter and antimatter, which appear and disappear with a total energy equal to zero. The action of the inflaton field moves the two particles apart, reduces the force of attraction between them and prevents annihilation and generates real particles, transforming for example, a virtual proton-antiproton pair into a proton and an antiproton and generating matter/energy.

The impact of cosmic inflation on virtual particles in void space

Cosmic inflation, immediately following the universe's birth, was a period of rapid spatial expansion that significantly influenced the formation of the universe as we know it. According to Quantum Mechanics,[10] quantum fluctuations in the void can spawn pairs of virtual particles, including matter and antimatter, as well as micro black holes (μBHs).

Inflation stretches space, separating these particle pairs and turning them into real entities. The inflaton field, a sea of energy driving inflation, deferentially affects various particles. As presented in Figure 2, the inflaton field expanding the space, allows protons/antiprotons and electrons/positrons to emerge unscathed, depletes photons of energy, and causes μBHs to grow by transforming inflaton field energy into matter and antimatter. This differential effect results in μBHs absorbing particles of one type while ejecting the opposite.

The small bang model

The Small Bang Model (SBM) marries Quantum Mechanics, General Relativity, and Cosmic Inflation, proposing a zero-mass-and-energy origin universe. It suggests micro black holes (µBHs) fueled by the inflaton field evolved into supermassive black holes (SMBHs), sidestepping the infinite energy density problem at the universe's birth and elucidating SMBH presence at galaxy centers. We can use one analogy of a circular saw expanding in ice, powered by mechanical energy and expelling ice jets to illustrates how μBHs can grow: The energy that increase the saw radii promote the ice expelling when the saw rotate enlarging the hole. In a similar way one μBHs can function as matter/antimatter converters during inflation, powered by the inflaton field. This process underscores cosmic inflation's critical role in shaping the early universe, including the formation of SMBHs and galaxies, and offers insights into the matter-antimatter distribution.

Drawing on the Ulianov Theory,[11] there is a discernible difference in the growth rates of μBHs, with antimatter μBHs growing faster than their matter counterparts. This difference in growth rates leads to antimatter μBHs dominating over collisions with matter μBHs, resulting in the loss of mass for antimatter μBHs while matter μBHs are completely annihilated. This mechanism of differential growth and interac-tion between matter and antimatter micro black holes (μBHs) forms the foundation of the Small Bang Model's explanation for the observed dominance of matter in the uni-verse. It posits that antimatter was sequestered within the growing antimatter μBHs, which eventually evolved into the supermassive black holes (SMBHs) composed of antimatter that we theorize exist today.

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Small bang framework

The Figure 3 illustrates the dynamic evolution of the universe according to the Small Bang Model, capturing key milestones from its very inception to the present day. It highlights:

1. The initial expansion from a minuscule bubble to a meter-sized vacuum bubble.
2. The onset of cosmic inflation, facilitating the creation of matter and antimatter μBHs by preserving virtual particles from annihilation.
3. The growth phase of μBHs, absorbing antimatter and ejecting matter, powered by the inflaton field.
4. The dominance of antimatter μBHs and the formation of surrounding matter clouds.
5. The substantial expansion of space post-inflation, spreading matter clouds across vast distances.
6. The gravitational collapse of hydrogen clouds forming the first stars, leading to the birth of galaxies and the ongoing stellar lifecycle.
7. This visual narrative provides a succinct depiction of the universe's expansive jour-ney from a singular beginning to its current complexity, as proposed by the Small Bang Model.

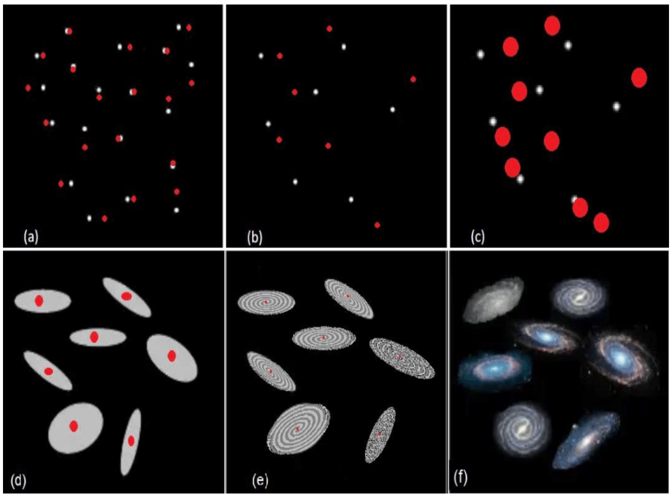

Figure 3 Stages of universe evolution in the Small Bang Model: (a) Initial Expansion: From a Planck bubble to a one-meter vacuum bubble; (b) Cosmic Inflation Begins: Formation of matter and antimatter μBHs from virtual particles; (c) μBH Growth: Absorption of antimatter and ejection of matter; (d) Antimatter μBH Dominance: Formation of surrounding matter clouds; (e) Cosmic Inflation Ends: Space expands, stretching matter clouds across galaxies; (f) Star Formation: Collapse of hydrogen clouds forms the first stars, leading to the ongoing cycle of galaxy illumination.

These findings prompt further questions, especially on the mechanisms of μBH growth and its implications for galaxy formation and dynamics. By proposing that SMBHs and galaxies rotate in opposing directions, this framework challenges conven-tional cosmology and opens new paths for understanding the dark matter,[12] and our universe's formation and structure.

Small bang model key points

The Small Bang Model Key points include:

1. Initial rapid expansion from a Planck-length cold void to several meters.
2. Virtual particle pair creation, stabilized against annihilation by cosmic inflation, transitioning into real matter/antimatter pairs.
3. Differential cosmic inflation effects:
    a) Photons stretch, losing energy.
    b) Protons, antiprotons, electrons, and positrons pair off, potentially annihilating.
    c) µBHs grow by converting inflation field energy into matter/antimatter.
4. µBH mass increases by absorbing antimatter and expelling matter, significantly enhancing Hawking radiation[13] efficiency.
5. Antimatter µBHs' accelerated growth over matter counterparts, suggesting anti-matter confinement within SMBHs without CP violation.
6. Ulianov String Theory integration, offering insight into particle mass variances within black holes.
7. Implications for galaxy rotation dynamics, potentially explaining the dark matter non-existence (Figure 4).

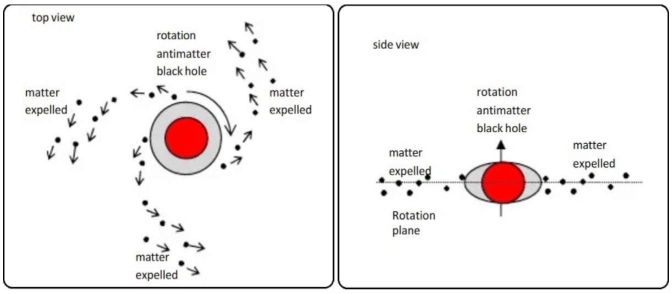

Figure 4 Antimatter micro black hole rotation, slicing virtual particles, absorbing antiprotons and positrons, emitting protons and electrons.

Results

The SBM clarifies several cosmic puzzles: the early universe's state, SMBH formation, galaxy assembly, and antimatter's whereabouts. While cosmic inflation's trigger and inflaton field energy source remain open questions, they're equally unresolved in Big Bang cosmology. SMB is based on the Ulianov String Theory[14] and Ulianov Sphere Network[15] (a new string theory and a new spacetime theory developed by the author). This theory's considering that all universe particle has the same basic sting model, and the particle observed mass will depend on it string wrapping mode (tat can be five modes: 1D mode, 2D mode, 2.5D mode or 3D mode), and enable calculating galaxy-to-SMBH mass ratios, suggesting dark matter's perceived presence aligns with SBM's predictions, offering new galactic evolution insights. As these new theories have not yet been accepted by physics, we can consider that the following relationships were obtained empirically, despite them having a complete and very consistent deduction (Figure 5):

$$\log(M_{Stellar} / M_{ASMBH}) = 2.963 \tag{1}$$

$$\log(M_{AStellar} / M_{SMBH}) = 2.285 \tag{2}$$

$$\frac{M_{Dark}}{M_{Stellar}} = 5.5 \tag{3}$$

$$\frac{M_{Dark}}{M_{AStellar}} = 3.7 \tag{4}$$

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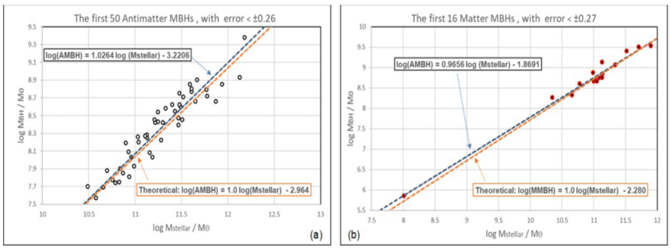

Figure 5 a) Graph depicting a logarithmic plot of the mass of 50 antimatter SMBHs against the mass of their respective host galaxies. Data includes only points from the Antimatter SMBH - Matter Galaxy Table (selected from a total of 77 available) where the total error is less than ±0.26; b) Graph depicting a logarithmic plot of the mass of 16 matter SMBHs against the mass of their respective host galaxies of antimatter. Data includes only points from the Matter SMBH - Antimatter Galaxy Table (selected from a total of 23 available) where the total error is less than ±0.27.

Galaxies formation in the small bang model

The Small Bang Model (SBM) delineates the formation of the universe's largest galaxies through the initial growth of an antimatter micro black hole (μBH) that emerged at the onset of cosmic inflation (t=1ns). Considering the mass of the largest observed galaxy is approximately 6 × 1042kg and originates from a Planck-mass antimatter μBH, we calculate a mass expansion factor of 2.7 × 1050. This calculation given a based to SBM propose that the inflaton field caused the universe's radius to double 170 times at a constant rate (every 12ns, totaling 1964ns), reflecting the exponential expansion of the universe's radius post-inflation. The model accounts for the breaking of virtual particle pairs (micro black holes, μBHs, and matter-antimatter particles) throughout the entirety of the two-millisecond duration of cosmic inflation. Importantly, only those μBHs that appeared within the first 50 to 100 ns following the onset of cosmic inflation expanded sufficiently to evolve into Supermassive Black Holes (SMBHs), each encircled by a hydrogen cloud. This developmental process is analogous to seeding a forest, wherein the earliest seeds grow into mature trees, whereas subsequent seeds, emerging under the already established canopy, struggle and often fail to develop.

Antimatter μBHs forming within an extant hydrogen cloud would invariably collide with matter, leading to mutual annihilation. This indicates that galaxy formation was tightly bound to specific conditions and timings post-inflation. Additionally, the Small Bang Model posits that by the end of inflation (t=2 μs), the micro black holes had already reached their eventual form as supermassive black holes, and the spiral clouds encircling them had contain all the galactic mass (protons and electrons expelled by the SMBH), effectively determining their ultimate size. Initially, galaxies were positioned in close proximity to one another, with their hydrogen clouds nearly in contact. Over time, they drifted apart to their present distant locations, propelled by the universe's ongoing expansion. Nevertheless, gravitational forces maintained the integrity of the hydrogen clouds, preventing them from significant expansion.

Furthermore, the Small Bang Model (SBM) theorizes the potential existence of mini-galaxies, akin to the Magellanic Clouds, possessing a radius of a few thousand light-years and housing around a hundred million stars. It even permits the existence of even tinier galaxies, featuring diameters of about 1,000 light-years and encompassing a million stars. However, galaxies falling below this size threshold tend to disperse their stars into space, as gravitational forces are not sufficient to sustain a cohesive galactic structure.

Cosmic Microwave Background (CMB) in the big bang theory

The Cosmic Microwave Background (CMB) is a relic radiation from the early universe and a fundamental aspect of cosmological studies, offering profound insights into the early universe's conditions and the formation of cosmic structures.

Discovery of the CMB

The theoretical foundation for the CMB was laid by George Gamow, Ralph Alpher, and Robert Herman[16] in the 1940s, who predicted its existence based on the hot and dense state of the early universe. However, it was not until 1964 that Arno Penzias and Robert Wilson[17] stumbled upon this cosmic relic radiation, initially perceived as a pervasive noise in their radioastronomical observations. Their discovery, which provided empirical evidence supporting the Big Bang theory, earned them the Nobel Prize in Physics in 1978.

CMB Satelites

NASA's Cosmic Background Explorer[18] (COBE) satellite, launched in 1989, significantly advanced our understanding of the CMB. COBE's meticulous measurements affirmed that the CMB's spectrum is an almost perfect blackbody radiation and detected the minute temperature anisotropies that hinted at the early universe's den-sity fluctuations. These findings bolstered the Big Bang model by demonstrating the uniformity and granularity of the early cosmos.

Subsequent missions, including the Wilkinson Microwave Anisotropy Probe[19] (WMAP) and the Planck satellite,[20] have refined our comprehension of the CMB. WMAP, launched in 2001, elucidated the age, composition, and development of cos-mic structures with greater precision. Planck, a project of the European Space Agency (ESA) initiated in 2009, offered even more accurate measurements of the CMB's anisotropies. Through Planck's observations, cosmologists gained unparalleled insights into the universe's age, the distribution of dark matter and dark energy, and the intricacies of cosmic inflation.

Current explanation

The prevailing interpretation of the CMB within the Big Bang framework posits that this radiation is the remnant heat from the universe's creation, released only 380,000 years after the Big Bang. At this epoch, known as the surface of last scattering, the universe had cooled enough for protons and electrons to combine into neutral hydrogen atoms, allowing photons to travel freely through space without being scattered by free electrons. This transition rendered the universe transparent for the first time, releasing the light that fills the universe today as the CMB. When CMB was emitted the space temperature was about 3000K and so the photon spectrum are the same of a black body at this temperature. Over the almost 13.8 billions of years that this radiation spend to travel until the Earth the photons wave length was expanded due to the observed universe expansion, and today the CMB is observed as a nearly uniform background of microwave radiation, exhibiting a perfect black body spectrum with a temperature of approximately 2.725 Kelvin. Small fluctuations in the temperature and polarization of the CMB radiation carry a wealth of information about the early universe, including its composition, geometry, and evolution. These tiny variations in density and temperature correspond to the seeds of all future structure: the galaxies, stars, and planets that populate the universe today.

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Cosmic Microwave Background (CMB) and Cosmic Antiproton Tomography (CAT) radiation

The SBM, based on the 'Shunyata Universe's Genesis' concept, posits that all mass and energy are originated from cosmic inflation energy, powered by the inflaton field.

This process involved two key phenomena:

1. **Photon production:** Cosmic inflation transformed virtual photon pairs into real, energetic photons. Early photons were stretched into longer wavelengths, while later photons retained higher energies. The SBM predicts the existence of LIUHEP radiation, akin to CMB but in the gamma ray spectrum, from last moment photon emissions during inflation.
2. **Matter-antimatter creation:** The expansion also led to the formation of real matter-antimatter pairs. Particles formed in the final moments of inflation contributed to CAT radiation, marked by high-energy photons from particle annihilation.

The SBM anticipates that CAT emission would peak during the last moments of inflation, gradually shifting towards lower frequencies post-inflation. The model forecasts specific characteristics of CAT radiation, including a spectrum correlating closely with the CMB observed by COBE. This suggests that the CMB could originate from high-energy photons generated at inflation's end, particularly from proton-antiproton annihilations.

Further analysis within the SBM framework reveals insights into the inflaton field behavior, including its exponential universe expansion and the generation rate of proton-antiproton pairs. The model infers that our observable universe and the distribution of matter within it can be understood through the lens of cosmic inflation, black hole growth, and subsequent galaxy formation. This SBM perspective offers a comprehensive explanation for the CMB and introduces the concept of CAT radiation, potentially reshaping our understanding of early cosmic phenomena. The alignment of the SBM-predicted CAT spectrum with COBE's CMB observations underscores a significant correlation between early cosmic inflation dynamics and present-day cosmic radiation patterns. Remarkably, the CAT spectrum aligns closely with the CMB spectrum observed by COBE, as shown in Figure 6 with the points of COBE measured frequency spec-trum placed side by side whit the points of CAT (with a mean square error less than 1%), like its is a result of a measurement circle applied in the same system per-formed by other kind of equipment. This curve superposition was made using only four parameters (time to double the space radii, time to inflaton field turn off, observ-able universe expansions rate, and one scale/gain factor), suggesting a significant correlation between both curve shapes, that cannot be coincidental.

A Critical issue in the big bang model of the CMB

Despite the success of the Big Bang model in aligning the Cosmic Microwave Back-ground (CMB) frequency spectrum with that of blackbody radiation at 3000K (shifted to 2.74K due to universal expansion), there exists an overlooked issue: the expected wavelength of peak intensity for a 3000K blackbody is around 1μm (red light), which today corresponds to the 2mm peak of the CMB. This implies a 2000-fold expansion of the observable universe from 380,000 years post-Big Bang to present day. However, this expansion factor suggests an observable universe radius at 380,000 years that is 5 to 10 times larger than anticipated. Utilizing a 20,000-fold factor resolves this discrepancy but would require blackbody emission in the 100nm range (ultraviolet radiation) at temperatures between 10,000 to 20,000K—far above where protons and electrons could combine into hydrogen.

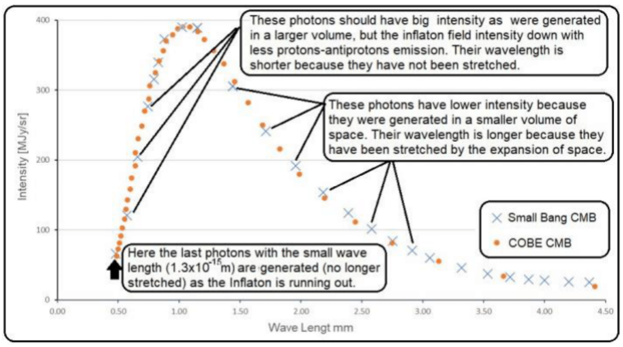

Figure 6 Comparison between the CMB spectrum as predicted by SBM (CAT radiation) and observed by COBE. The SBM explains this alignment through photon emissions from proton-antiproton annihilation, with the CAT spectrum shifting over 13.8 billion years to match the CMB, illustrating the impact of cosmic inflation and galaxy formation on early universe radiation.

Alternatively, assuming the CMB occurred 10 times later (3 to 4 million years post-Big Bang) would imply that the red light of the CMB was emitted too late to carry the initial universe's details. Thus, we face a dilemma: either accept that the observable universe had a radius of 5 million light-years at 380,000 years or recognize a significant miscalculation in the universe's temperature and size at the time of CMB emission. This discrepancy might have been implicitly accepted, attributing it to an additional effect of cosmic inflation. However, the Small Bang Model (SBM), considering a more extensive cosmic inflation, clarifies that at the end of cosmic inflation, the observable universe spanned only one light-month in diameter. This suggests that at 380,000 years old, even with an accelerated expansion rate early in the universe's history, it is unlikely the universe spanned 1 million light-years in diameter at the time of CMB emission, leading to an expansion factor of 13,000 and a space temperature of at least 10,000 Kelvins at CMB emission. This paper argues that the current Big Bang CMB model struggles to reconcile the temperature, age, and size of the universe at the moment of CMB creation. This significant flaw has been overlooked due to the lack of alternative models for CMB genesis and the speculative nature of cosmic inflation, which has been used to excuse the larger-than-expected universe radius at 380,000 years. The emergence of the SBM challenges this narrative by providing a detailed account of CMB genesis that calls into question the Big Bang model. Furthermore, the Big Bang fails to explain certain CMB details, such as microwave polarization, which the SBM's CAT-CMB model addresses convincingly.

Cosmic antiproton tomography and inflaton parameters

Accepting the premise that Cosmic Microwave Background (CMB) radiation stems from high-energy photons generated in the last moments of cosmic inflation—specifically, from proton-antiproton annihilation—and acknowledging that the mass of the largest galaxies originates from the first antimatter micro black holes (μBHs) appearing in the initial nanoseconds of cosmic inflation, leads to several key insights and calculations regarding the behavior of the inflaton field throughout cosmic inflation. In the Small Bang model, the power spectrum of photons from proton-antiproton annihilation, composing the Cosmic Antiproton Tomography (CAT), is determined by multiple parameters of the inflaton field:

1. Inflaton start time = 1 ns,
2. Time for inflaton to double the universe's radius = 12 ns,
3. Number of times the inflaton doubles the universe's radius = 170 times,
4. Total duration of inflaton = 1964 ns,
5. Radius of the universe at the start of inflaton = 2.1 cm,
6. Radius of the universe at the end of inflaton = 3.3 × 1048m,
7. Inflaton shutdown time = 14 ns,
8. Operation limit of inflaton = 0.1%,
9. Minimum inflaton power to generate antiprotons = 0.01%,
10. Transition of inflaton field turn off (from sigmoid function to linear function) at = 50% of the standard Inflaton field level,
11. Sigmoid factor *Ks* = 2300.

Considering that the final photons from the Cosmic Antiproton Tomography (CAT) have a wavelength of 1.3 × 10−15m, and the Cosmic Microwave Background (CMB) radiation begins at 0.5 mm, it was inferred that over 13.8 billion years, the observable universe expanded by a factor of 3.78×1011, effectively doubling in size 38.5 times. Consequently, at the close of cosmic inflation, the diameter of our observable universe approximated one light-month. Following this period, despite the universe's expansion at the speed of light, its radius measured approximately 380 thousand light-years after 380 thousand years. This indicates that cosmic inflation did not extend the radius to the 3 million light-years necessary to account for the CMB's transition from 3000K to 2.75K over 13.8 billion years of observable universe expansion, as posited by the Big Bang model. The photons emitted during the annihilation of proton-antiproton pairs exhibit unique directional properties, akin to particle beams rather than spherical waves. Their emission frequency is remarkably stable and precise, allowing these photons to form a coherent, spherical shell around any given observer. This behavior is reminiscent of a colossal, natural laser, distinguishing it from typical stellar or black body emissions.

When considering the immense scale of the universe, with a radius of 13.8 billion light-years, against the comparative pinpoint of a detector on Earth, the mechanics of photon reception reveal intricate details about their origin. For a detector with a mere 2 mm radius, representing the peak resolution for microwave signals, photons that reach this detector emanate from a cosmic region approximately 4 light-years across. Within this vast space, only a fraction of annihilating antiprotons contribute to the signal received. The interplay of photons, all sharing the same frequency but differing in phase, initiates an interference process. This process effectively filters out 99% of the photons, leaving behind only polarized light as the residue of this cosmic symphony. The variability in antiproton annihilation times across different densities of hydro-gen clouds introduces a nuanced layer to this cosmic signal. In denser regions, antiprotons are annihilated more rapidly, leading to a condensed lifespan and subsequently, emissions of differing frequency and energy. This dynamic serves as a cosmic density map, with frequency peaks highlighting regions of intense gas concentration within galaxies, tapering off into the voids of intergalactic space.

Thus, the Cosmic Microwave Background (CMB) observed by COBE can be likened to an antiproton tomography of the nascent hydrogen clouds that seeded the first galaxies. This tomography provides a detailed view of the universe's embryonic state, with each density variation leaving a distinct spectral signature. This suggests a universe not as a homogenous expanse but as a textured canvas, where areas of dense matter contrast with voids, painting a complex picture of cosmic evolution.

Moreover, the phenomenon of polarization emerges naturally from this process. Given that all photons within a significant emission area converge on the observer simultaneously and share a common frequency, their collective interference—whether constructive or destructive—results in polarized light. This aspect of polarization, while known in physics, gains a profound explanation within the context of cosmic antiproton tomography, highlighting a sophisticated interplay between cosmic matter distribution and light. In essence, the Small Bang Model's interpretation of the CMB not only offers a compelling explanation for the observed data but also enriches our understanding of the universe's fabric, from its earliest moments to the vast structures that define it today.

Cosmic FM background radiation prediction

The Small Bang Model (SBM) introduces a nuanced perspective on the early universe's energetic dynamics, particularly focusing on the aftermath of electron-positron annihilation events parallel to the well-documented proton-antiproton annihilations that gave rise to the Cosmic Microwave Background (CMB). As the universe underwent rapid expansion during its nascent nanoseconds, a vast number of electron-positron pairs, formed throughout cosmic inflation, would likely undergo annihilation. This process, predominantly occurring within matter and antimatter clouds respectively, is theorized to emit a unique spectral signature akin to the CMB, albeit at a significantly lower intensity and at a wavelength band approximately 1836 times greater, reflecting the mass ratio difference between protons and electrons.

This leads to the prediction of Cosmic FM Background (CFMB) Radiation within the SBM framework. This radiation, a relic of Cosmos Positron Tomography (CPT), adjusted for the expansive timeline of 13.8 billion years, manifests today with a characteristic wavelength around 4 meters (87.5 MHz frequency). This aligns with frequencies traditionally reserved for FM radio broadcasting, offering an intriguing overlap with terrestrial technology. It's important to note that, unlike the more penetrative CMB, CFMB radiation's interaction with Earth's atmosphere is markedly different, potentially contributing to its historical elusiveness in observational astrophysics. The intrinsic low intensity of CFMB, being about 1013times weaker than that of the CMB factoring in both the reduced energy release from electron-positron annihilations and the significantly lower generation rate of positrons as compared to antiprotons coupled with its unfortunate frequency alignment with widespread human communication channels, renders it virtually indistinguishable from anthropogenic noise with current detection methodologies.

This profound insight from the SBM necessitates a strategic pivot in observational approaches. Targeted exploration, potentially leveraging space-based assets equipped with specifically designed antennas attuned to the lower-end FM frequency bands (50 to 100 MHz), could provide the clarity needed to detect CFMB. Such a detection would not only corroborate the SBM's postulations but also significantly broaden our comprehension of the electromagnetic tapestry that the universe is woven from, revealing new layers of cosmic evolution and particle interaction predating the formation of the observable cosmos.

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Advanced imaging techniques in modern medicine

Modern medicine employs various techniques to obtain internal images of the human body. The oldest among these is X-ray, developed in 1900 and later followed by tissue scanning techniques that generate images through ultrasound. More recently, we have seen the development of magnetic resonance imaging, conventional tomography, and positron emission tomography (PET) technologies. This section briefly discusses X-ray and positron emission tomography techniques as a theoretical basis for understanding images generated from the CMB.

X-Ray imaging

X-rays are a form of high-energy electromagnetic radiation capable of penetrating soft tissues and being absorbed by denser tissues, such as bones. In an X-ray examination, an X-ray beam is directed towards the part of the body under examination. Part of these rays is absorbed, and part passes through the body, captured by a detector on the other side. This creates an image that shows the variations in density of different tissues or materials, allowing for the visualization of bone structures or the identification of foreign objects within the body. The major issue with this technique is that when specific layers of the same material are traversed, it becomes more difficult to identify in which layer the observation is made, which can be partially solved by rotating the analyzed body. Furthermore, tissues that are transparent to X-rays will be traversed without generating any signal.

Positron Emission Tomography (PET) imaging

Positron Emission Tomography (PET), developed in the late 20th or early 21st century, is a type of medical imaging that reveals the function of tissues and organs. Unlike X-ray, which provides information on physical structure, PET focuses on biochemical activity. During the procedure, a small radioactive marker, called a radiotracer, is injected into the body. This radiotracer emits positrons, which, upon encountering electrons in the body, produce detectable photons (light particles). By capturing these photons, PET creates detailed images of the body's functions, such as blood flow, oxygen use, and sugar metabolism. The great advantage of this technique is that signals are generated at specific points and pass through points of no interest. As a result, PET images are much more detailed than X-ray images and allow observation of metabolism functioning. Being a more advanced technique, it is also much more expensive.

Medical imaging techniques in relation to the CMB

This section explores the analogies between the Cosmic Microwave Background (CMB) radiation and various medical imaging techniques. By comparing the Big Bang model to an X-ray exam and the cosmic antiproton tomography (CAT) to positron emission tomography (PET), we can gain a better understanding of the information conveyed by the CMB about the early universe and the cosmic structures it has interacted with.

The big bang model and X-rays

The analogy between the Big Bang model and an X-ray exam is based on the notion that the Cosmic Microwave Background (CMB) radiation is akin to a ”flash” of high-energy light that was emitted when the universe was approximately 380,000 years old, and its temperature ranged from 3000 to 4000 K. At temperatures above this range, electrons and protons do not combine to form hydrogen, resulting in an opaque plasma. As the universe expands and the temperature continuously decreases, there comes a point where protons and electrons combine, forming hydrogen clouds (which would later form galaxies), a transparent element. Suddenly, the light emitted by a black body at 3000 K is released, creating a spectrum of visible light at every point, which then traveled through the universe, minimally interacting with matter along its path. This process is analogous to an X-ray lamp (in the case of the CMB, it was a red lamp with a peak intensity wavelength of 1000 nm) being emitted behind a body that it traverses, creating an image based on the density of tissues. The CMB we receive today originated from a sphere surrounding us with a radius of 13.8 billion light-years, generated 380,000 years after the Big Bang. Thus, the CMB traversed the universe, passing through various galaxies and interacting, for example, with interstellar dust and hydrogen and gravitational lenses, providing an ”image” of the universe's initial conditions and the large-scale structures it has encountered. Similar to an X-ray, a significant challenge of this technique is traversing various elements without being able to distinctly separate the specific effect of each layer traversed.

Small Bang Model - CAT and Cosmic Antiproton Tomography (CAT Radiation)

The Small Bang model conceptualizes the Cosmic Microwave Background (CMB) akin to a Positron Emission Tomography (PET) scan, but with antiprotons instead of positrons (there also exists a ”pure” PET generating Cosmic FM Background, but this has not yet been detected by astronomers). During cosmic inflation, cosmic antiproton tomography (CAT) radiation is emitted continuously, albeit at a very low level, with a single CAT pulse being generated in the final 10 ns as the inflaton field is deactivated. Thus, the massive annihilation of antiprotons occurs in a very short (10 ns duration) single pulse with a stable and well-known frequency (reference the frequency of photons generated when an antiproton annihilates).

In the Small Bang Model (SBM), at the culmination of cosmic inflation, galactic clouds have already formed, grouped akin to the canopies of trees in a forest, sparing few clearings and gaps. Thus, an antiproton may be spawned within a hydrogen cloud of variable density (or even within the desolate expanse of intergalactic space), where its average annihilation time inversely correlates with the density (suggesting an infinite duration in the absence of density, though typically ranging from 1 to 10 ns within clouds). This mechanism mirrors the emission of positrons in PET scanning, distinguished by a singular, expansive flash occurring simultaneously across all locales. Consequently, the SBM proposes the genesis of the Cosmic Microwave Back-ground (CMB) as akin to a Cosmic Antiproton Tomography (CAT) pulse, analogous to positron emission in PET, but with antiprotons annihilating at diverse universe junctures. This annihilation process spawns photons that, in their cosmic voyage, encounter matter (such as galaxies and interstellar gas) similarly to X-ray radiation's interaction with bodily tissues. Thus, the SBM conjectures the CMB as a composite image (resembling PET + X-ray fusion), potentially offering a detailed vista of the universe's initial matter distribution within a 13.8 billion light-year spherical shell and revealing features of galaxies (e.g., gravitational lensing) encountered enroute to us.

Merging an X-ray with a PET image for expert analysis might obscure the clarity of the underlying phenomena, illustrating the intricacy and depth of information the CMB encapsulates, as interpreted by the SBM. This approach yields a sophisticated understanding of the early universe, blending structural and functional insights akin to the multifaceted nature of medical imaging.

Small bang model - CAT and holographic imaging

In the Small Bang Model, we can also postulate that the Cosmic Microwave Back-ground (CMB), based on Cosmic Antiproton Tomography (CAT) radiation, behaves like an extremely stable laser source emitting a very short pulse of light simultaneously from all points in the universe, akin to a holographic 3D imaging system (strongly analogous to a holographic system for measuring mechanical parts). The multitude of photons generated in CAT possess a basic frequency spectrum that slightly varies in phase. Thus, when these photons converge (upon reaching the observer), they combine through luminous interference (constructive or destructive depending on the phase), essentially producing polarized light (which contains the information of the holograms in the form of phase and frequency spectra).

Some of these characteristics, such as the CMB's polarization, are well known to physicists, but to date, the origin of this polarization (which is obvious in the holographic CAT model) has not been thoroughly explained. It's like having the data of a holography (spatial and frequency spectra that form the image within a hologram) without fully understanding the holographic technique used. Therefore, what is currently recovered from this complex hologram is a rather poor image (a blurred 2D image) compared to the actual image contained within the hologram (a high-definition 3D image).

Thus, the CAT model is capable of distinguishing the CMB into three characteristics: X-ray imaging, PET imaging, and holographic imaging. This allows, in principle, for the evaluation of distinct aspects of the universe (post-cosmic inflation and the universe traversed by the CMB). The author believes that this can yield images with a resolution 4 to 5 times greater than the current CMB data available from the Planck satellite, leading to a much deeper understanding of the types of structures it represents. This will be published in detail in future articles.

Simplified discussion and future directions

This section encapsulates the Small Bang Model's (SBM) implications, emphasizing empirical support and predictive insights. Figures 5 and 7 illustrate SMBH and galaxy mass correlations, pivotal in validating SBM's assertions about the interplay between SMBH masses and their galactic environments.

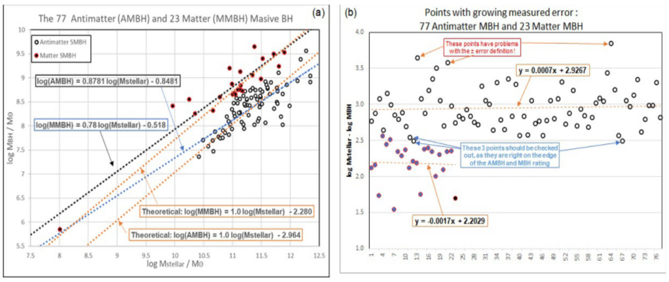

Figure 7 Analysis of galaxy-to-SMBH mass ratios, revealing obscured distinct mass relationships due to mixed datasets and significant noise.

Empirical insights and theoretical predictions

Empirical data corroborates SBM's hypotheses, particularly the distinct mass rela-tionships between SMBHs and host galaxies. Notably, data reduction techniques minimizing error margins reveal congruence between observed trends and SBM pre-dictions (equations 2 and 1). These findings underscore SBM's potential in explaining galaxy formation dynamics, challenging conventional paradigms by proposing matter and antimatter galaxy classifications.

Rethinking dark matter and gravitational models

SBM posits an innovative perspective on dark matter, attributing galactic rotational velocities to SMBH dynamics rather than unseen mass. This reinterpretation aligns with Ulianov String Theory (UST), predicting distinct gravitational behaviors in anti-matter, (value of g for antimatter in Earth surface = $7.7m/s2$) one hypothesis pending empirical validation through experiments like those at Alpha - CERN

Incorporating CAT and CFMB radiation in cosmic analysis

Beyond mass correlations, SBM introduces Cosmic Antiproton Tomography (CAT) and predicts Cosmic FM Background (CFMB) Radiation, akin to the CMB but arising from electron-positron annihilation. These novel components suggest a multifaceted cosmic radiation landscape, offering fresh avenues for understanding universal structure and dynamics. CAT and CFMB phenomena could enhance Planck mission CMB analyses, providing deeper insights into early cosmic conditions and the nature of dark matter.

Invitation to the astronomical community

We urge the astronomical community to explore SBM's framework, particularly through refined mass measurement and classification methodologies. By distinguishing between matter and antimatter galaxies and assessing their dark matter content, researchers can further test SBM's validity. Upcoming analyses should also incorporate CAT and CFMB considerations, potentially unveiling new cosmic phenomena and enriching our cosmological understanding (Figure 8).

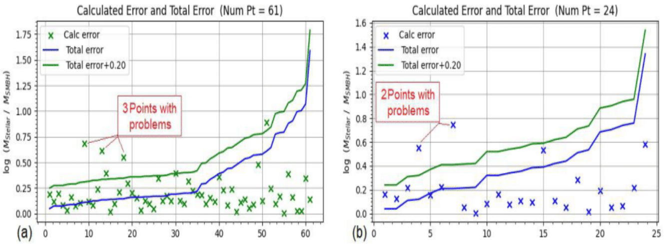

Figure 8 Comparison between total error (TLME) and SBM calculated error (MTE) for an 85 galaxies/SMBH data set, with 15 galaxies classified as mixed galaxies excluded from this analysis. (a) Errors observed in a group of 61 galaxies that represented the final count of matter galaxies (excluding mixed galaxies), with only 3 points not obeying the rule: MTE < TLME + 0.20. (b) Errors observed in a group of 24 galaxies that represented the final count of antimatter galaxies (excluding mixed galaxies), with only 2 points not obeying the rule: MTE < TLME + 0.20.

Concluding remarks

SBM, supported by empirical analyses and augmented by CAT and CFMB considerations, challenges established cosmic narratives, offering novel explanations for galaxy formation, dark matter, and cosmic radiation patterns. As we advance in our cosmic exploration, embracing these innovative perspectives could unravel the mysteries of our universe's genesis and structure.

Conclusion

The discussions presented herein, supported by empirical analyses and theoretical considerations, illuminate the robustness and predictive

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power of the Small Bang Model (SBM). By challenging traditional cosmological paradigms and proposing innovative explanations for long-standing astronomical mysteries, the SBM and Ulianov String Theory (UST) collectively offer a promising frontier in our quest to decipher the universe's origins and composition. As we stand on the cusp of potentially ground-breaking discoveries in particle physics and cosmology, the importance of continued empirical validation and theoretical exploration cannot be overstated.

Conclusion and forward look

The Small Bang Model (SBM) heralds a transformative shift in our understanding of cosmological phenomena, challenging traditional narratives with innovative explanations for the universe's origins, the mechanisms behind supermassive black holes (SMBHs), and the nuanced matter-antimatter dichotomy. Departing from the singularity-centric Big Bang model, the SBM posits a nascent universe emerging from a state of emptiness, enriching our cosmological lexicon with insights drawn from the Ulianov Theory (UT) and offering fresh perspectives on antimatter's elusive nature.

Key milestones of the SBM

1. The model conceptualizes the universe's emergence from a cold, singularity-free void, sidestepping the Big Bang's infinite density and temperature conundrums.
2. It elucidates the formation of SMBHs and spiral hydrogen clouds, delineating a growth mechanism propelled by the inflaton field, which imparts mass to SMBHs and drives matter ejection.
3. Addressing the matter-antimatter asymmetry, the SBM proposes a universe where matter galaxies[21] predominate, suggesting antimatter's confinement within SMBHs.
4. It offers a novel interpretation of dark matter phenomena, attributing galaxy rotational dynamics to SMBHs' angular momentum, thus challenging conventional dark matter paradigms.

Advancements and future directions

The SBM's introduction of Cos-mic Antiproton Tomography (CAT) and the prediction of Cosmic FM Background (CFMB) Radiation represent groundbreaking expansions of the model, enriching our understanding of cosmic microwave background (CMB) radiation. These innovations not only corroborate the SBM's foundational principles but also hint at uncharted spectra of cosmic radiation, opening new investigative pathways for astrophysics. Our analysis reaffirms the necessity for meticulous measurement and interpretation in optical studies, highlighting the congruence between SBM predictions and empirical data. This congruity not only validates the SBM but also sets the stage for further explorations into cosmic inflation's intricacies and the cosmos's matter-antimatter architecture.

The SBM's methodological blueprint for galaxy classification and its revelation of distinct SMBH categories (matter vs. antimatter) pave the way for deeper inquiries into galactic evolution and stellar mass distribution. These insights promise to unravel the complexities of galaxy formation, challenging astronomers to rethink established paradigms.

Concluding thoughts

While the SBM and UT may initially challenge conventional wisdom, their empirical underpinnings and alignment with observed phenomena beckon a reexamination of existing cosmological frameworks. The SBM, in revitalizing the concept of a universe born not from a cosmic egg but from a state of void, offers a compelling narrative on the origins and evolution of our universe. As we continue to probe the cosmos, it is essential to pursue these theoretical avenues, employing a blend of observational astronomy and particle physics, to demystify the cosmos's grandeur and complexity.

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Conflicts of interest

None.

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