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External Gravity Cosmology (EGC)

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Abstract

I herein propose External Gravity Cosmology (EGC), a revised cosmological model in which the observable universe (OU), or Our Universe, is a finite, evolving region embedded within an, infinite, or effectively infinite, anisotropic gravitational landscape, The Universe (TU).

Unlike ΛCDM, (standard model of the Universe) External Gravity Cosmology (EGC) dispenses with dark energy, and a Big Bang singularity. Instead, OU structure and expansion arise from gravitational forces exerted by mass concentrations beyond Our Universal Event Horizon (OUEH), such as deep gravitational wells distributed unevenly across TU. These external gravitational forces induce anisotropic cosmic expansion, directional redshift modulation, and cosmic microwave background (CMB) anomalies, and explain features that align with recent findings, including early galaxies, supermassive black holes at high redshift, and statistically significant quasar dipoles [1]. The CMB, in this model, is not a relic of recombination but a filtered radiative field shaped by intervening curvature, similar to viewing a forest where everywhere you look is tree trunk, looking even until depth perception and density come into effect. EGC reframes cosmic history as a product of classical gravitational interaction and self-organization over indefinite timescales and offers a coherent and testable alternative to speculative early-universe physics. It positions gravity, not exotic fields, as the central agent in cosmological evolution, with observational consequences that extend beyond current horizons.

1. Significant Observational Anomalies in Current Theories

The exploration of our universe has always been of great interest in the history of mankind, and traces can be found from thousands of years ago. We invite the reader to momentarily set aside established cosmological doctrines, such as the Big Bang, cosmic inflation, dark energy, the cosmological principle, the prescribed source of CMB, the Hubble constant, and approach the universe with a fresh perspective. Throughout history, human understanding of Gravity has evolved through paradigm shifts: from Aristotle's notion of natural motion to Newton's law of universal gravitation, and later to Einstein's general relativity. Each transition marked a profound departure from accepted truth. It is in this spirit of open inquiry that we reconsider gravity's role in shaping a boundless, dynamic cosmos and our understanding of the Cosmos and the mechanisms within it. This section is devoted to briefly reviewing significant observational anomalies in current theories.

1.1 The Big Bang Theory: Observational Challenges

Recent observations from the James Webb Space Telescope (JWST) have challenged the ΛCDM model's predictions about early cosmic evolution. Galaxies such as CEERS-93316, seen just ~300 million years after the Big Bang, exhibit high stellar masses, compact morphologies, and elevated star formation rates featuring characteristics of mature systems, not the primitive, small halos expected in hierarchical formation scenarios [2]. Further complicating this picture are quasars at redshifts $z > 6$ hosting supermassive black holes (SMBHs) with masses $\gtrsim 10^9\, M_\odot$, whose rapid formation exceeds standard accretion limits without invoking exotic seeds or fine-tuned conditions [3]. These anomalies have spurred renewed interest in alternative models, including direct-collapse black holes, modified dark matter, or revisions to early universe dynamics. As JWST continues revealing evolved structures at unexpectedly high redshifts, mounting evidence suggests that ΛCDM cannot account for the speed or complexity of early structure formation.

1.2 The Cosmological Principle: Evidence Against Large-Scale Isotropy

The assumption that the universe is homogeneous and isotropic on large scales is central to standard cosmology. However, high-precision observations increasingly challenge this view. Secrest et al. [1], using over 1.3 million quasars from the CatWISE2020 catalog, detected a statistically significant dipole anisotropy in quasar distribution. The observed amplitude exceeds expectations from local motion relative to the CMB by more than a factor of two ($p \approx 5 \times 10^{-7}$), suggesting an intrinsic large-scale asymmetry. Supporting evidence comes from the CMB itself. The "Axis of Evil", an improbable alignment of the quadrupole and octopole temperature modes was first identified by Wilkinson Microwave Anisotropy Probe (WMAP) and later confirmed by Planck [4]. Additionally, Planck detected a hemispherical power asymmetry, with one side of the sky consistently exhibiting stronger temperature fluctuations [5]. These features persist across frequencies and analysis techniques, ruling out artifacts. Collectively, they imply that the observable universe may be embedded in a gravitationally asymmetric region, warranting revisions to the standard model.

1.3 Redshift and Hubble's Law: Discrete Redshifts and Association Anomalies

Cosmological redshift, traditionally interpreted as evidence of universal expansion, is a foundational pillar of ΛCDM. However, multiple observational anomalies now challenge this interpretation. Some studies report cases where high-redshift quasars appear spatially close to low-redshift galaxies, implying possible physical associations inconsistent with their inferred cosmological distances [6]. Additionally, statistical analysis of quasar redshifts suggests a quantized distribution, indicating that redshifts may occur in discrete intervals rather than a smooth continuum [6]. Such patterns could arise from intrinsic quasar properties or alternative redshift mechanisms. Further complexity arises from observed redshift biases tied to galactic rotation: galaxies rotating in the same direction as the Milky Way exhibit higher mean redshifts than those rotating oppositely, with the effect increasing at higher redshifts [7]. These findings suggest that redshift may be influenced by local dynamics or orientation effects, prompting a re-evaluation of its purely cosmological interpretation and raising questions about the completeness of the standard model.

1.4 The Hubble Constant: The "Hubble Tension"

The "Hubble tension", a persistent discrepancy between early and late universe measurements of the Hubble constant (H_0) poses a major challenge to ΛCDM cosmology. The Planck mission derived $H_0 \approx 67.4$ km/s/Mpc from CMB data, while recent high-resolution JWST observations support significantly higher local values. Notably, the lensed supernova SN H0pe yielded $H_0 = 75.4$ km/s/Mpc via time-delay analysis, circumventing traditional calibration issues [8]. JWST has also ruled out crowding effects in Cepheid measurements, rejecting such systematics at >8σ confidence [9]. The tension remains robust across methods, sparking speculation about new physics including early dark energy, time-varying gravitational constants, or exotic neutrino interactions. As more lensed supernovae are observed and JWST probes deeper into cosmic history, the nature of this divergence may be clarified. Whether the tension arises from observational bias or indicates a fundamental flaw in ΛCDM remains a central question in modern cosmology.

1.5 Cosmic Microwave Background Radiation (CMBR): Large- Scale Anomalies

Beyond supporting expansion, the CMB radiation reveals anomalies that challenge statistical isotropy. Among these, the "Axis of Evil", a persistent alignment of low multipole moments and the hemispherical power asymmetry, both observed in WMAP and confirmed by Planck. Planck's PR4 release reaffirms the statistical significance of these features, ruling out foreground contamination and local structure effects such as the Sunyaev-Zeldovich (SZ) contribution from the Virgo cluster [10]. These anomalies appear intrinsic to the CMB itself, casting doubt on the assumption of randomness at large angular scales. Theoretical efforts to explain them include models invoking primordial anisotropies, non-trivial cosmic topology, and inflationary alternatives with directional dependence. EGC proposes correlations between CMB features and the distribution of large-scale structures, potentially revealing deeper gravitational imprints beyond our horizon. Combined with the Hubble tension, these features may signal a need to revise the geometric or physical assumptions of standard cosmology. Larger and uneven gravitational pulls outside OUEH.

1.6 Limitations of Standard Cosmological Constructs: Dark Energy and Cosmic Inflation

The ΛCDM model describes cosmic evolution through two critical but empirically unverified constructs: dark energy and cosmic inflation. These components reconcile theoretical predictions with observed data but lack direct physical identification, raising fundamental concerns.

Dark energy, modeled as a cosmological constant (Λ), was introduced to explain the observed acceleration of cosmic expansion. Yet, its physical origin, energy scale, and constancy remain unresolved. Results from the Dark Energy Spectroscopic Instrument (DESI) suggest that dark energy may vary over time, showing departures from a true cosmological constant [11]. This has renewed interest in dynamic dark energy models and modified gravity. Additionally, alternatives like Wiltshire's "timescape cosmology" argue that cosmic acceleration may be an apparent effect of gravitational energy differences between voids and clusters, thereby eliminating the need for dark energy [12]. Compounding this issue is the cosmological constant problem: Λ's value is 120 orders of magnitude smaller than predicted by quantum field theory, considered one of the greatest unsolved puzzles in theoretical physics.

Inflation, introduced to resolve the flatness, horizon, and monopole problems, relies on a hypothetical scalar field with carefully tuned potential parameters. While it accounts for the near scale-invariance of the CMB's primordial fluctuations, critics argue that inflation lacks predictive power and is too flexible to be falsifiable. Recent work by Ijjas, Steinhardt, and Loeb [13, 14] questions its explanatory value, suggesting that it naturally leads to a multiverse framework where anything is possible and thus scientifically untestable. Emerging alternatives include bouncing cosmologies, quantum gravity-inspired pre-inflationary phases, and non-local gravity models.

Taken together, these limitations suggest that ΛCDM may be an effective approximation rather than a fundamental theory. As precision data from JWST, DESI, and CMB-S4 accumulates, cosmology may revise to EGC grounded in gravitational anisotropy and consistent with large-scale structure anomalies and the existing and emerging data.

2. External Gravity Cosmology (EGC)

The standard ΛCDM model explained that universe is homogeneous and isotropic on large scales and that it originated from a singularity, a primordial state of infinite density and temperature commonly referred to as Big Bang. While this model has demonstrated considerable success in describing the broad strokes of cosmic evolution, such as nucleosynthesis, large-scale structure formation, and CMB, a number of persistent anomalies increasingly challenge its sufficiency. There are apparent directional asymmetries observed in the CMB, a statistically significant dipole in the distribution of distant quasars, unresolved tension in measurements of the Hubble constant, and discovery of massive, evolved galaxies within a few hundred million years of the supposed beginning of time.

EGC offers a conceptually simpler, observation-driven alternative. It removes the need for dark energy, inflation and an initial singularity by attributing cosmic expansion and structure to gravitational influences from unobservable mass distributions beyond OUEH. These sources reside in a vast, anisotropic universe, which lacks global homogeneity or bounded size. In this framework, OU is shaped by external gravitational gradients. Anisotropies in redshift and the CMB arise not from early-universe relics but from real-time interactions with deeper curvature structures in TU. EGC thus reframes cosmic acceleration and large-scale alignment as emergent phenomena rooted in classical gravitational dynamics beyond our universal event horizon.

2.1 Reframing the Cosmic Landscape

EGC redefines the role of gravitation in cosmic evolution by placing OU within a broader, dynamic, and anisotropic environment TU. Rather than assuming internal causality and uniform initial conditions, EGC posits that the evolution of OU is shaped significantly by gravitational forces exerted by masses and structures beyond OUEH. In this model, cosmic expansion is not a passive continuation of primordial inflation but an active, directionally biased response to external gravitational gradients. These gradients originate from an uneven distribution of masses in TU, which lacks large-scale homogeneity and isotropy. OU is therefore not a privileged or isolated region, but part of a vast cosmic patchwork shaped by its position within this gravitational landscape. By grounding expansion and structure in general relativity rather than speculative scalar fields or dark energy, EGC offers a continuous, interaction-based cosmology. Observed anisotropies in redshift and the CMB are interpreted not as relics of early-universe conditions but as real-time signatures of gravitational differentials across the horizon. This directional framework implies that space itself, through its curvature and topology, encodes information about structures beyond our current observational reach, offering a physically consistent explanation for persistent cosmological anomalies.

2.2 Gravitational Wells and Asymmetric Expansion

A central tenet of EGC is that the expansion and structural evolution of OU are significantly shaped by gravitational influences originating beyond OUEH. These external influences arise from mass asymmetries and unseen structures embedded in the broader, anisotropic gravitational landscape of TU. Unlike ΛCDM, which assumes statistically isotropic expansion driven by internal initial conditions and dark energy, EGC attributes direction dependent expansion to real-time curvature effects induced by external gravitational wells.

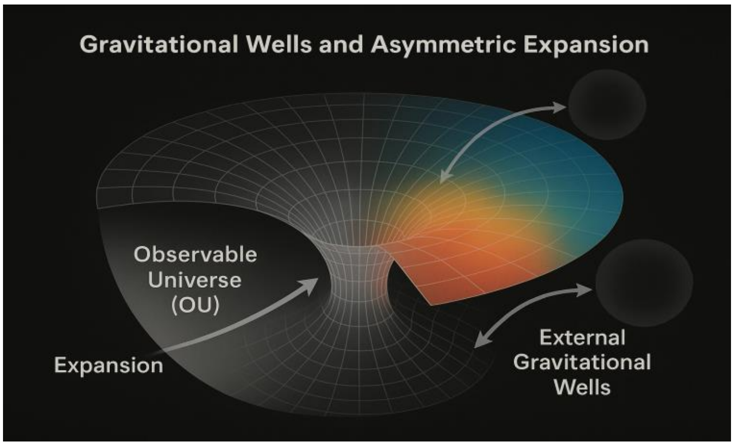

Figure 1: This figure visualizes how external masses and structures could generate anisotropic curvature, potentially explaining observed asymmetries in cosmic expansion or redshift, be they expansionary or gravitational.

These gradients manifest observationally as anisotropic redshift patterns, galaxy distribution imbalances, and CMB temperature asymmetries. Secrest et al. [1] detected a significant quasar dipole in mid-infrared surveys, exceeding kinematic expectations by over a factor of two suggesting a cosmological, not local, origin. Similarly, von Hausegger and Sarkar [19] identified consistent directional alignments across multiple datasets. Additional studies show how local gravitational basins affect large-scale motion, implying that even more distant mass concentrations beyond OUEH could exert similar influence [20]. Within EGC, such anisotropies are not anomalies but expected features gravitational imprints from TU’s large-scale geometry. This framework offers a physically coherent, testable alternative to isotropic models, potentially resolving several persistent cosmological asymmetries.

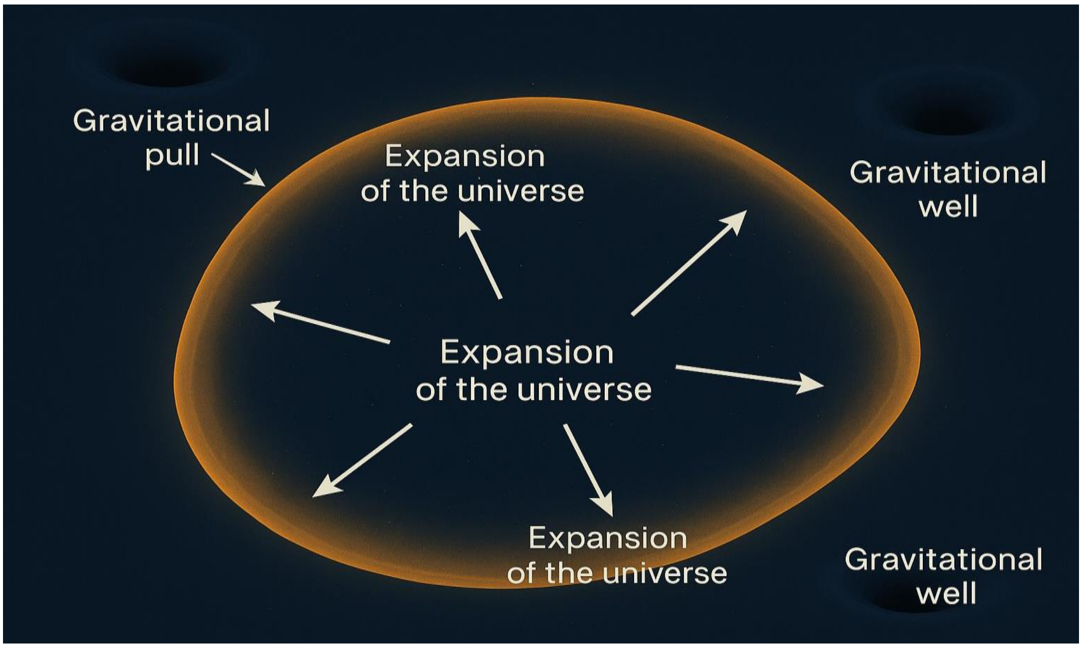

Figure 2: Conceptual illustration of the potential influence of external gravitational wells on the observable universe. The central region represents OU, where arrows indicate the isotropic expansion predicted by standard cosmology.

2.3 A Universe Without Dark Energy

EGC challenges the foundational assumptions of the standard cosmological model by proposing a universe that is inhomogeneous and anisotropic. In this framework, the observed acceleration of cosmic expansion traditionally attributed to cosmological constant or dark energy is instead a manifestation of gravitational influences from masses beyond OUEH. This perspective eliminates the need for both an initial singularity and exotic energy components, offering a purely gravitational interpretation of cosmic evolution. Recent observational data lends credence to this approach. The DESI collaboration has released findings suggesting that dark energy may not be a constant force. By analyzing data from over 15 million galaxies and quasars, DESI researchers observed that the influence of dark energy appears to have evolved over time, potentially weakening in the last 4 to 5 billion years. This challenges the long-held assumption of a constant cosmological constant and opens the door to alternative explanations for cosmic acceleration [21].

Complementing this, David Wiltshire's timescape cosmology offers a model where apparent cosmic acceleration arises from the differential aging of regions in an inhomogeneous universe. In this model, voids and denser regions expand at different rates, leading to variations in the passage of time. Observers in gravitationally bound systems perceive an apparent acceleration due to these time differentials, negating the need for dark energy. Wiltshire's model has been tested against supernova data and found to be consistent with observations [22]. In summary, EGC, supported by recent observational and theoretical developments, provides a compelling framework for understanding cosmic acceleration and the large- scale structure of the universe without invoking dark energy or an initial singularity.

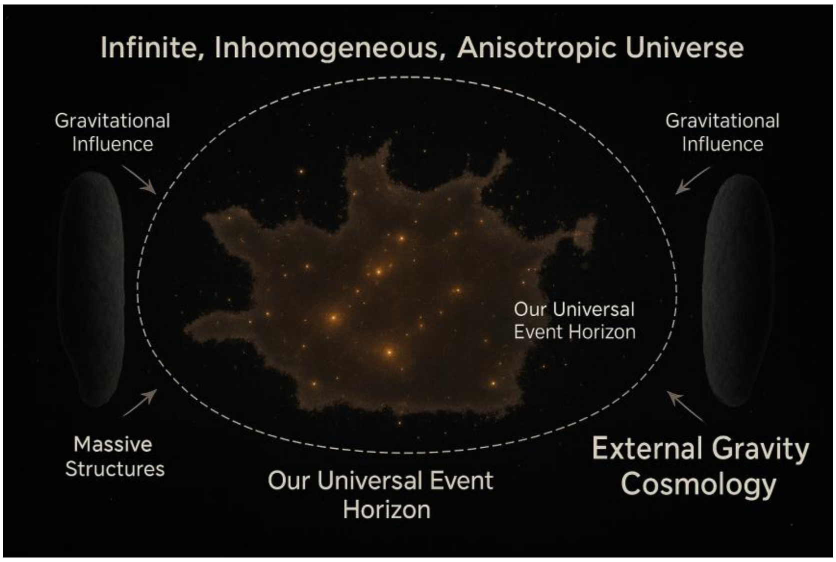

Figure 3: This figure is a conceptual illustration of the EGC framework, a model that challenges the assumption that our universe evolves in isolation. It proposes that masses beyond OUEH can exert a gravitational influence on OU.

2.4 Reinterpreting Redshift and the CMB

Traditionally, cosmological redshift is attributed to metric expansion, and the CMB is interpreted as relic radiation from the early universe. EGC offers an alternative view: redshift is also influenced by gravitational differentials caused by mass distributions beyond OUEH. In this framework, the CMB is not a primordial snapshot, but a superposition of ancient, redshifted radiation shaped by gravitational wells within TU. This concept builds on the established phenomenon of gravitational redshift confirmed by the Pound-Rebka experiment and observations of white dwarfs [23], where photons lose energy escaping gravitational potentials.

The “forest analogy” helps visualize this: as all sightlines in a forest end at tree trunks, every line of sight in the sky terminates at a gravitationally filtered radiative surface. This reinterpretation aligns with persistent CMB anomalies. The “Axis of Evil”, an alignment of low multipoles with the Solar System's plane, challenges isotropy [24], while a notable lack of large-angle correlations remains inconsistent with ΛCDM predictions [25]. EGC explains these features as real-time gravitational imprints from structures beyond OUEH, offering a physically grounded alternative to relic-based models of redshift and CMB origin.

3. Conclusion and Discussion

EGC offers a coherent and observationally responsive alternative to the ΛCDM framework by redefining the origin of cosmic structure and expansion. Rather than invoking speculative components like inflation, dark energy, or a singularity, EGC attributes cosmological evolution to real-time gravitational interactions with mass distributions beyond OUEH. In this model, OU is not a self-contained or statistically typical region, but a dynamically evolving patch embedded in a much larger, anisotropic gravitational domain: TU.

The central premise of EGC theory is that directional gravitational gradients originating from unobservable external mass concentrations modulate expansion rates, induce anisotropies, and distort redshift-distance relations within OU. Observed phenomena such as the quasar dipole anisotropy [1], the CMB's “Axis of Evil” [24], early massive galaxies and black holes [2,3], and the Hubble constant tension [8,9] are reframed not as outliers, but as natural signatures of an open, gravity-driven system.

It replaces inflation and dark energy with classical gravitational curvature as the primary driver of cosmic structure. Rather than attributing the CMB to a recombination surface, EGC interprets it as a superposition of redshifted radiation filtered through the gravitational topology of TU [23–25]. Redshift becomes a hybrid phenomenon partly metric, partly gravitational explaining discreteness and directionality in high-redshift surveys.

What distinguishes EGC is its minimal theoretical overhead and direct falsifiability. It makes several testable predictions:

- Direction-dependent variations in redshift-magnitude relations;
- Angular correlations between CMB anomalies and large-scale structure;
- Alignment between quasar dipoles and gravitational hot/cold spots [1,19,20].
- Overlap in CMB and Redshift Variations, exposing large masses outside OUEH
- Eventually, the curve of Gravity waves showing diameter beyond OUEH

These predictions are accessible to current and upcoming missions including JWST, DESI, Euclid, CMB-S4, and LISA. EGC thus bridges conceptual economy with empirical reach.

Philosophically, EGC challenges the cosmological principle by suggesting that isotropy and homogeneity are emergent, not fundamental. If gravitational influences from TU shape OU, then cosmology can transcend its horizon via gravitational tomography. The universe becomes not a relic of a singular origin but a living, gravitationally evolving system.

In sum, EGC positions gravity, not speculation but as the architect of cosmic evolution, offering a parsimonious, testable framework to reinterpret cosmological data and probe the structure beyond our horizon.

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