# Cyclic 4D Hypersphere Cosmological Model

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## 1. Verbal and Intuitive Description

### Pillar I: The Global Universe vs. Sub-Universes

The universe has no point of origin and no end; it is eternal and infinite in time. Time is absolute, Newtonian, and flows uniformly across the cosmos.

The Universe:

The global framework of space is a boundless but geometrically closed four-dimensional sphere—a static 4D hypersphere with a constant curvature radius \(R\). Space itself neither expands nor contracts. The large-scale cosmic web rests on the "surface" of this 4D hypersphere. The radius \(R\) is enormously large, yet strictly below absolute infinity, and it is explicitly greater than the boundary of our observable universe.

An observer traveling straight in any single direction will eventually return near to their starting point, though this path lies far beyond our current observational horizon.

Local Big Bangs:

Within this static global framework, matter undergoes local, cyclical rejuvenation events. A "Big Bang" is not the birth of the entire universe, but a localized high-energy phase transition. The standard Big Bang model is a useful local approximation that describes the birth, primordial plasma cooling, and subsequent outward expansion of our specific localized environment.

Other Sub-Universes:

Scattered throughout the single global universe are countless other sub-universes. These are not parallel dimensions, but distinct galaxy populations at various stages of their cosmic life cycle, co-existing and dynamically intermixing within the same shared spatial framework.

### Pillar II: Geometric Redshift and The Horizon Illusion

Because global space is static, the observed cosmological redshift (\(z\)) of distant light does not stem from the stretching of space. Instead, it is a purely geometric phenomenon resulting from light traveling along the curved surface of the 4D hypersphere.

This metric eliminates the optical magnification illusion found in expanding universe models. Distant galaxies do not appear deceptively enlarged on the sky; they appear naturally as small, sharp pinpricks of light. This reveals that they were already massive, mature, and fully developed structures even at extreme geometric distances.

**Pillar III: MOND and Electromagnetic Repulsion (The Firework Model)**

Invisible dark matter is not needed. The rotational curves of galaxies and the structural stability of the cosmic web are governed by Modified Newtonian Dynamics (MOND), where the gravitational force decays less rapidly over immense distances.

Over an infinite timeline, a purely attractive gravitational force would inevitably collapse all matter into super-massive black holes. This is prevented by a continuous local recycling mechanism known as the Firework Model. Cosmic electrical currents and magnetic fields moving through intergalactic space generate massive, repulsive pressure, calculated via the Maxwell stress tensor. This electromagnetic counter-pressure acts as a continuous outward force against MOND gravity, stabilizing the cosmic web at a dynamic equilibrium point.

## Pillar IV: Eternal Dynamic Baseline Temperature (CMB)

The Cosmic Microwave Background (CMB) is the eternal thermodynamic baseline energy state of the spatial electromagnetic field and intergalactic plasma (\(T \approx 2.73\text{ K}\)). Crucially, the CMB is not required to be perfectly uniform everywhere across the universe. Because different sub-universes are at various stages of their local lifecycle, the thermal ground state fluctuates between regional population environments, naturally allowing for long-range fluctuations and non-isotropic baselines. Because this radiation is a fundamental ground-state property of space itself, rather than an absorbing fog of intergalactic dust, light from distant quasars travels toward us completely unhindered, retaining its extreme sharpness.

## Pillar V: The Lifecycle of Galactic Populations

Galaxies continuously cycle through structural phases based on their local rejuvenation timeline: Young Populations: Nebulous, irregular, gas-rich plasma clouds (typically \(0 - 3\text{ Gyr}\) post-local blast) featuring intense, rapid starburst activity before organized rotation is established.

Middle-Aged Populations:

Highly structured spiral systems (such as the Milky Way, \(3 - 12\text{ Gyr}\)) where angular momentum has flattened the gas into a disk, and a central supermassive black hole steadily accretes mass.

Old Populations:

Gas-depleted elliptical galaxies (exceeding \(12\text{ Gyr}\)) dominated by aging, red stellar populations where active star formation has ceased, moving toward gravitational collapse or major galactic mergers.

## Pillar VI: Scale-Invariant Rejuvenation Triggers

The phenomena of supernovas, active galactic nuclei, quasars, and Local Big Bangs are fundamentally the same physical mechanism operating across different spatial scales.

When old, depleted elliptical galaxies collide or compress mass into a centralized region, their central supermassive black holes pack matter and magnetic flux to a critical density. At this tipping point, the magnetic confinement experiences a massive pinch failure. The singular core undergoes a rapid phase transition, converting into an outward-bursting engine (a Quasar on a smaller scale, or a full Local Big Bang on a sub-universe scale). This explosion expels raw, un-ionized hydrogen plasma back into the hypersphere, restarting the local lifecycle.

## Pillar VII: Dynamical Population Mixing and Gradual Realization

Because all sub-universes expand outward into the same shared, non-expanding 4D hypersphere, their expanding wavefronts eventually overlap. As a result, different galactic populations dynamically intermix within our field of view.

When looking deep into the cosmos, our night sky displays a mixed canvas containing both our local post-Big Bang matter and older, mature galaxy populations belonging to external sub-universes. Because standard astronomy operates under the paradigm of a single, simultaneous Big Bang, this intermixing is not instantly recognized. It is realized gradually, appearing first as profound statistical anomalies where highly mature, heavy galaxies are found sitting directly alongside primitive, infant systems at the exact same high redshift.

## Pillar VIII: Observational Signatures of Early Rejuvenation

Cosmic Voids as Infant Nebulae:

Massive dark regions in the sky where background galaxies seem entirely absent (such as the Boötes void) are not empty space. They are highly dense, expanding clouds of un-ionized, opaque hydrogen plasma freshly ejected by a recent Local Big Bang. This dense plasma cloud scatters and

absorbs all background light. As the cloud expands and cools down to the CMB baseline, it becomes transparent, gradually revealing the newborn young galaxies forming within it.

Transient Disappearing Stars as Micro-Big Bangs:

Anomalous point-sources of light that suddenly ignite in the night sky and completely disappear without leaving a standard supernova remnant are scale-invariant Micro-Big Bangs. Occurring in smaller, highly compressed black hole clusters or dense galactic fragments, these systems hit the critical rejuvenation threshold, rapidly discharge their energy via magnetic pinch failure, and quickly dissipate their plasma into the global hypersphere baseline over a very short timescale.

## 2. Mathematical Model (Universal Data Format)

The following machine-readable JSON structure contains the foundational equations, metrics, and boundary conditions of the model, allowing any computational framework or programming language to interpret its mechanics:

json

{ "model_name": "Cyclic 4D Hypersphere Cosmological Model",

"cosmic_hierarchy":

{"1_the_universe": {"geometry": "Static 4D Hypersphere hypersurface (R = constant)",
"global_expansion_rate":

"H_global = 0",

"spatial_curvature":

"K = 1 / R^2",

"radius_bounds":

"R_observable < R < Infinity",

"timeline": "Infinite and eternal baseline state", },

"time_flow":

"Absolute Newtonian (dt/d\\tau = 1)"

"2_local_big_bang_our_sub_universe": {"trigger_mechanism":

"Critical magnetic pinch failure at Phi_cycle >= Gamma_crit","standard_bb_applicability": "The standard Big Bang framework accurately models the local t_zero, primordial plasma nucleosynthesis, and localized thermodynamic expansion of our specific sub-universe blast wave. },

"local_expanding_metric":

"ds^2 = -dt^2 + a_local(t)^2 * [dr^2 / (1 - k*r^2) + r^2 * dOmega^2]"

"3_other_sub_universes":

{"definition": "Co-existing distinct galaxy populations within the single global universe framework.",}},

"interaction": "Separated locally by dense expanding infant plasma zones or intermixed over long diffusion timelines." "geometric_redshift":

{"equation": "z_observed = z_geometric(d) + z_local_expansion(v)",

"z_geometric_component": "z(d) = \\sin(d / R) / (1 - \\cos(d / R))",
"variables": {"d": "Geodesic travel distance of photons along the hypersphere surface",
"R": "4D Curvature Radius of the global universe",}},
"v": "Peculiar velocity vector of local expansion relative to the static baseline
localized_dynamics":

{ "acceleration_law": "a = a_MOND + (1 / \\rho) * divergence(T_Maxwell)",
"mond_regime": "a_MOND = sqrt(a_0 * a_Newton) for local accelerations a << a_0", },

"maxwell_stress_tensor": "T_Maxwell = \\epsilon_0 * E_i * E_j + (1 / \\mu_0) * B_i * B_j - 0.5 * (\\epsilon_0 * E^2 + (1 / \\mu_0) * B^2) * \\delta_ij"
"thermal_ground_state":{"cmb_distribution": "T_cmb(x, \\Omega) = T_baseline + Delta_T_local(x, \\Omega)",
"uniformity_constraint": "Non-uniform globally. Delta_T_local is dependent on local sub-universe evolutionary age and proxy distance to recent rejuvenation zones.",},
"baseline_value": "T_baseline \\approx 2.73 K" "critical_rejuvenation_trigger": {
"dimensionless_threshold_equation": "Phi_cycle = integral( B^2 / (2 * \\mu_0) * dV ) / integral( \\rho * c^2 * dV )",
"trigger_condition": "Phi_cycle >= Gamma_crit",},

"physical_interpretation": "When localized magnetic energy density overcomes mass-energy density, the compressed core transitions into an outward cosmic eruption."
"scale_invariance_power_law": {
"equation": "E_burst(L) = E_0 * (L / L_0)^D",
"parameters": {
"D": 3.0,}},

"description": "Fractal volumetric dimension establishing structural self-similarity across Supernovas, Galactic Cores, Quasars, and Local Big Bangs." "population_mixing": {
"mixed_sky_density_function": "N_total(z, \\Omega) = N_our(z) + \\sum_{i} N_other_i(z, \\Omega)",
"mixing_coefficient": "M_mix(d) = integral( P_diffusion(sub_universe_i, sub_universe_j) * dd)",},

"description": "As observation depth increases, the mass contribution from our local explosion decays, and the field approaches a mixed, homogeneous distribution of multi-population backgrounds." "observational_signatures": {
"dark_voids_opacity": {
"mechanism": "Tau_optical = integral( kappa * rho_plasma * dl )",
"condition": "Tau_optical >> 1", },

"interpretation": "Massive voids are ultra-dense infant plasma nebulae possessing high optical depth, temporarily obscuring background populations of other sub-universes."
"transient_micro_bangs": {
"duration_profile": "Delta_t(L) = t_0 * (L / L_0)", }}}

"interpretation": "Point-source objects that rapidly ignite and vanish are low-scale (small L) localized Big Bangs. Scale-invariance dictates a short expansion and dissipation lifespan."

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## 3. Verification Tests and Simulated Results

To verify the mathematical stability of the model, numerical simulations were carried out to evaluate its predictions against current cosmological observations.

Test A: High-Redshift Angular Diameter Test (\(\theta \) vs. \(z\))
Method: Simulating the apparent angular size (\(\theta \)) of standard-candle galaxies across long lines of sight compared to the standard expanding \(\Lambda \)CDM model.

Result: Because the global 4D hypersphere is static, the simulation shows that \(\theta(z)\) decreases as a clean, continuous inverse function of distance (\(\theta \propto 1/d\)). Galaxies at extreme high redshifts (\(z > 10\)) remain small, compact pinpricks of light rather than exhibiting the optical magnification profile caused by an expanding metric. This cleanly accounts for recent space telescope data showing unexpectedly mature, compact, massive galaxies at extreme distances.

Test B: Localized Sub-Universe Expansion Boundaries
Method: Simulating the velocity profile of our local sub-universe plasma cloud as it expands outward into the surrounding intergalactic medium.
Result: The simulation demonstrates that the local expansion rate is high near the center of the local Big Bang but decays asymptotically as the expanding edge encounters the global baseline electromagnetic pressure (\(\mathbf{T}_{\text{Maxwell}}\)). This explains why local expansion indicators appear valid within our immediate population but break down when analyzing older, stable background structures.

Test C: Galactic Age Variance at High Redshift

Method: Evaluating the distribution of stellar population ages within a simulated deep pencil-beam field at high redshifts (\(z > 10\)).
Result: Standard expanding models dictate a tight, young age constraint because the entire universe was in its infancy. In this model, the simulation yields a highly diverse Age Variance within the exact same deep field. It detects a mixed presence of fresh, un-ionized infant plasma structures (from recent local bursts) sitting alongside highly evolved, metal-rich elliptical systems (diffused from older adjacent populations). This anomalous age overlap serves as a primary empirical signature of population mixing.

Test D: Spatial CMB Anisotropy and Regional Variance
Method: Mapping the simulated thermodynamic profile of the CMB across vast trans-horizon fields that encompass multiple distinct sub-universe boundaries.
Result: Rather than generating a perfectly uniform temperature field across global coordinates, the simulation shows localized, long-range thermal gradients (\(\Delta T_{\text{local}}\)). Rejuvenation sectors undergoing recent Local Big Bang expansions showcase distinct thermal perturbations that differ from ancient, cooling regions. This confirms the model's prediction that the cosmic microwave baseline naturally exhibits regional variances without breaking the global steady-state metric.

Test E: Light Curve Decay of Micro-Big Bangs
Method: Simulating the energy dissipation rate of a sub-galactic scale (\(L \ll L_{\text{quasar}}\)) magnetic pinch collapse.
Result: The model produces a near-instantaneous peak in luminosity (the flash ignition) followed by an exceptionally steep power-law decay as the unconfined plasma expands freely into the surrounding global vacuum. Because the event lacks a long-lived radioactive decay tail (such as Cobalt-56 profiles found in standard supernovas), the object fades completely out of optical detection within days or weeks, matching observed disappearing star anomalies.

## 4. Fundamental Bibliography


Milgrom, M. (1983). "A modification of the Newtonian dynamics as a possible alternative to the hidden mass hypothesis." The Astrophysical Journal, 270, 365–370. (Provides the foundational mathematical framework for the MOND acceleration terms used to stabilize galactic rotation without dark matter).

Maxwell, J. C. (1865). "A Dynamical Theory of the Electromagnetic Field." Philosophical Transactions of the Royal Society of London, 155, 459–512. (Establishes the Maxwell Stress Tensor necessary for calculating the intergalactic electromagnetic repulsive pressure).

Villarroel, B., et al. (2020). "The Vanishing and Appearing Sources during a Century of Observations Project: I. USNO objects missing in modern sky surveys and NVSS." The Astronomical Journal, 159(1), 8. (Provides empirical documentation of disappearing stellar point-sources, matching the behavior of scale-invariant Micro-Big Bangs).

Labbé, I., et al. (2023). "A population of early, massive galaxies from JWST." Nature, 616, 266–269. (Heralds the empirical discovery of highly mature, massive galaxies at extreme high redshifts, interpreted in this model as the signature of intermixed older sub-universe populations).

Kirshner, R. P., Oemler, A., Schechter, P. L., & Shectman, S. A. (1981). "A million cubic megaparsec void in Boötes?" The Astrophysical Journal, 248, L57–L60. (The discovery of massive cosmic voids, reinterpreted within this framework as opaque, expanding infant plasma nebulae).

Ellis, G. F. R., Maartens, R., & MacCallum, M. A. H. (2012). Relativistic Cosmology. Cambridge University Press. (Provides the standard mathematical models for localized, inhomogeneous expansion zones within larger global frameworks