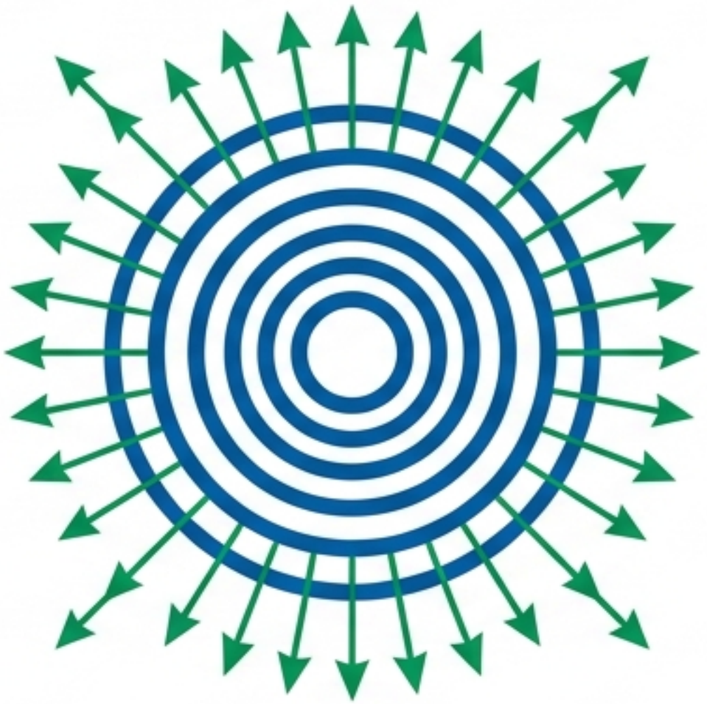
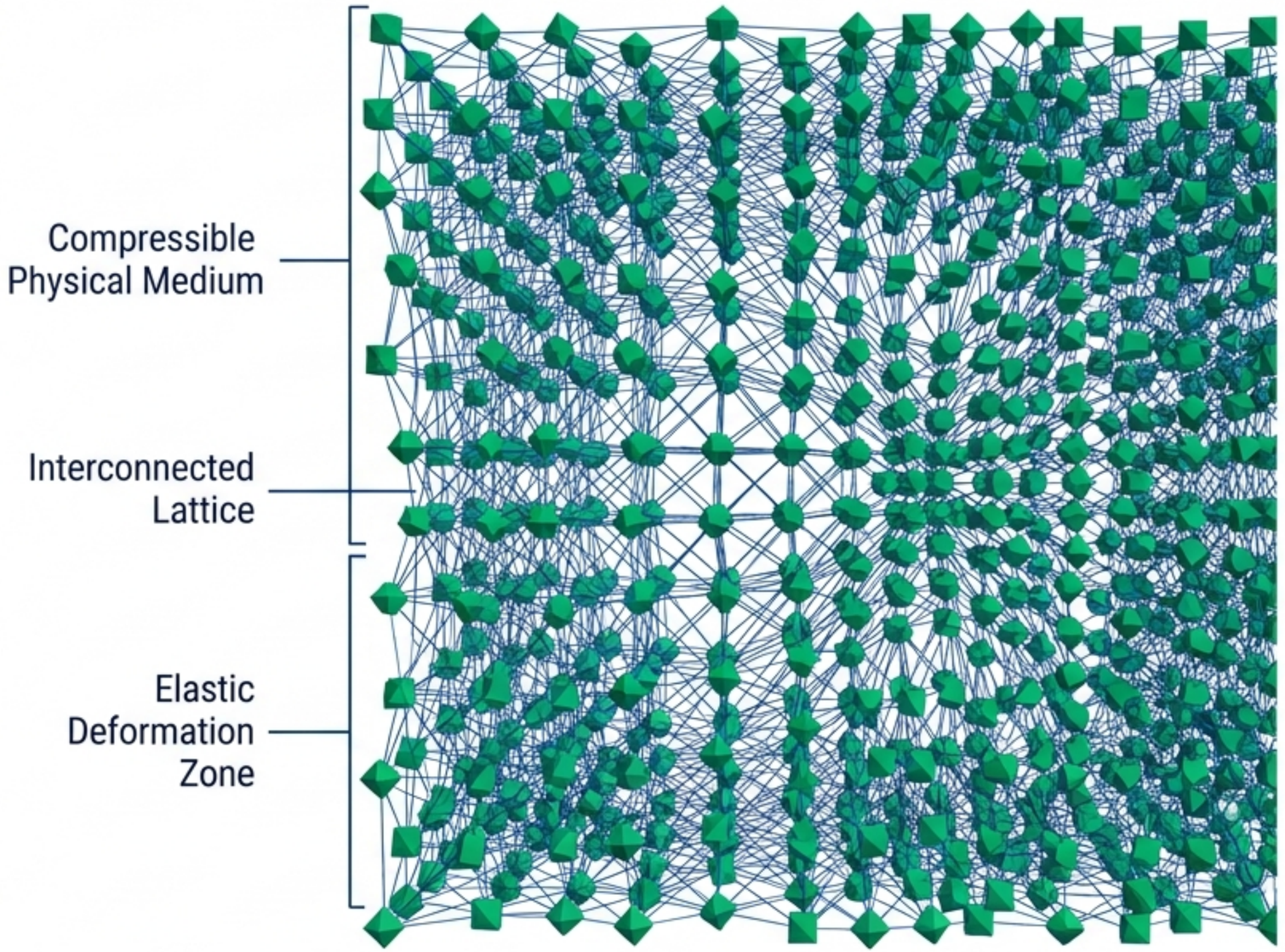
Emergent Orbital Hierarchy and Gravitational Sorting in an Infinite Universe



A comprehensive physical framework replacing the finite-age expanding metric with an eternally dynamic spatial arena. Demonstrating that large-scale rotational structures definitively challenge the 13.8-billion-year cosmic age, supported by gravity-only proofs of emergent orbital hierarchy and the Spaticle substrate.



The Physical Substrate of Spacetime

Space is not an empty mathematical vacuum, but a continuous, non-particulate physical medium.

Intrinsic equilibrium density:
$\rho_s = 5.9 \times 10^{-27}$ kg/m^3.

Gravitation is defined as the organised compression and deformation of this physically real medium.

The deformation propagates at speed c, decays at a specific relaxation length, and retains organised state for a finite carrier memory timescale.

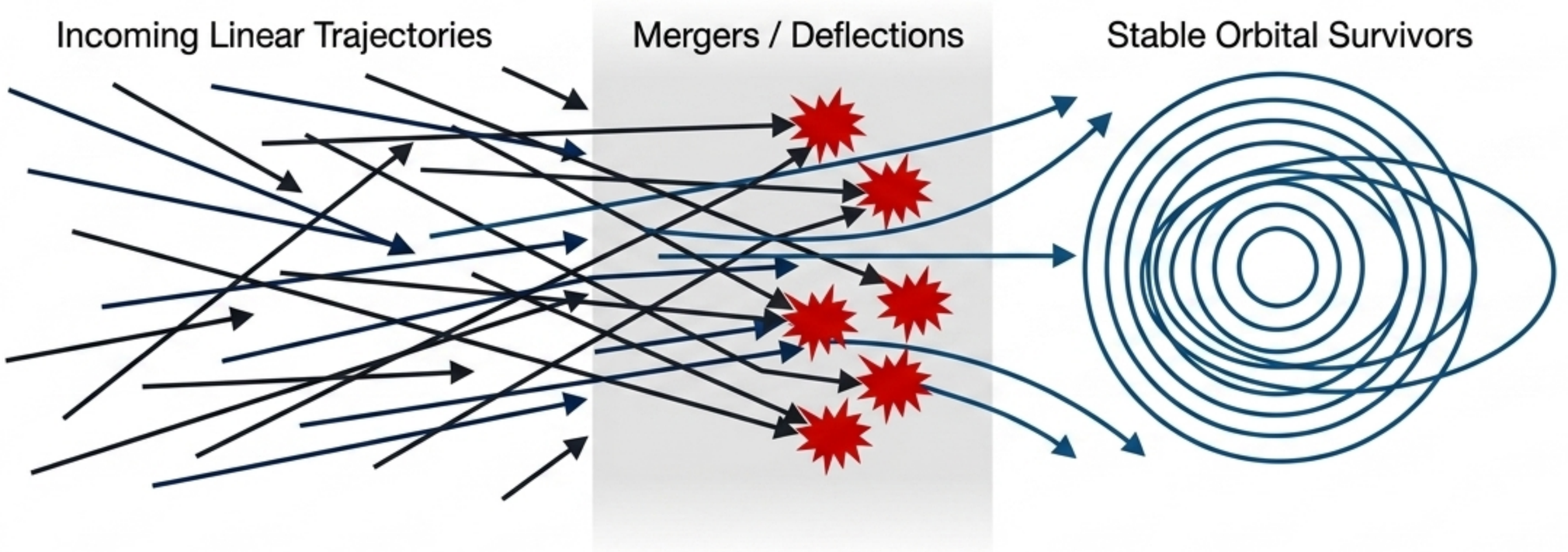
Structural Divergence of Cosmological Frameworks

Parameter	The Standard Model	The Continuous Dynamics Framework
Cosmic Duration	Finite 13.8 Gyr age	Infinite eternal duration
Spatial Metric	Expanding metric space	Static Spaticle substrate
Structure Origin	Singular origin / inflation	Continuous threshold ignition / gravitational sorting
Gravitational Anomalies	Particulate dark matter halos	Rotational substrate entrainment

The unresolved contradictions of the standard model (Hubble tension, S8 tension, mature young galaxies) are not isolated anomalies, but the inevitable mathematical artefacts of applying a finite-age expanding metric to an eternal, dynamically sorted universe.

The Transient Nature of Linear Trajectories

The Gravitational Sorting Filter



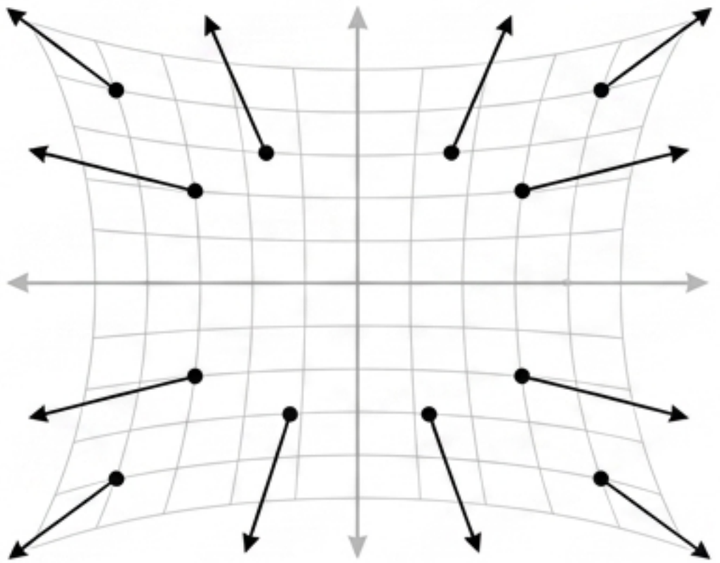
In an infinite, matter-filled universe over infinite time, straight-line motion is the least stable configuration. Bodies on intersecting trajectories will inevitably collide, merge, or deflect. The observable universe is therefore not a pristine original kinematic distribution, but a survivor-selected population. Straight-moving matter is selected against; non-intersecting and divergent paths are selected for.

Dynamical Selection and Angular Momentum Conservation

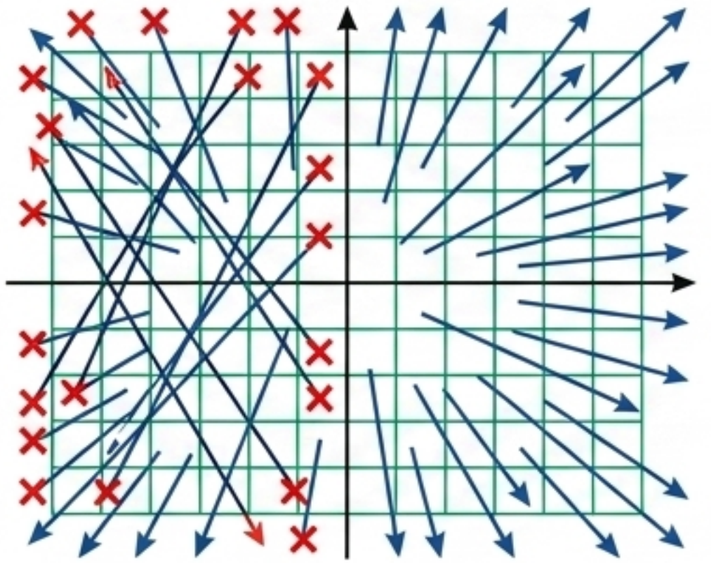
	Linear Trajectories	Orbital Configurations
Encounter Probability	Approaches 100% collision or deflection probability over cosmological timescales.	Minimizes encounter probability via shared gravitational geometries.
Long-term Stability	Fragile and easily disrupted by passing mass.	Endures; incoming perturbations typically alter the existing hierarchy rather than destroying the orbital state.
Angular Momentum	Approach trajectories are never perfectly collinear. Net angular momentum is imparted instantly.	With no boundaries to absorb it and insufficient cosmological friction to dissipate it, rotation, once initiated, is permanent.

Apparent Recession as an Emergent Statistical Property

Metric Expansion (Standard Model)



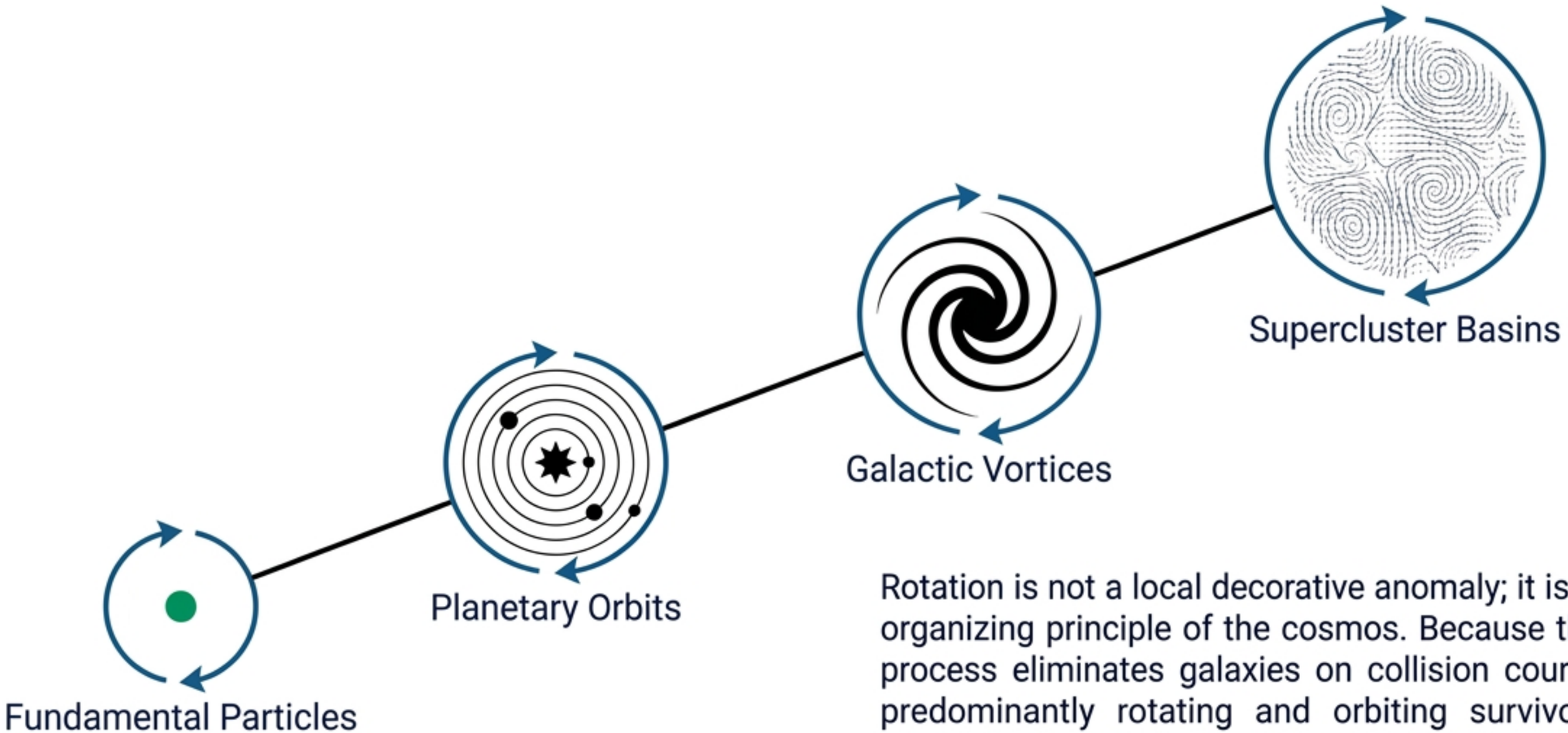
Gravitational Sorting (BFUT)



When intersecting trajectories are eliminated over immense timescales, the remaining population of surviving galaxies is predominantly moving on divergent. Observed from any point, this gravitationally sorted population produces a velocity-distance correlation mathematically identical to the Hubble relationship.

The Hubble Tension is thereby resolved: it is not a breakdown of a universal constant, but the expected outcome of different measurement methodologies sampling different scales and epochs of an ongoing filtering process.

Rotation as the Universal Terminal State

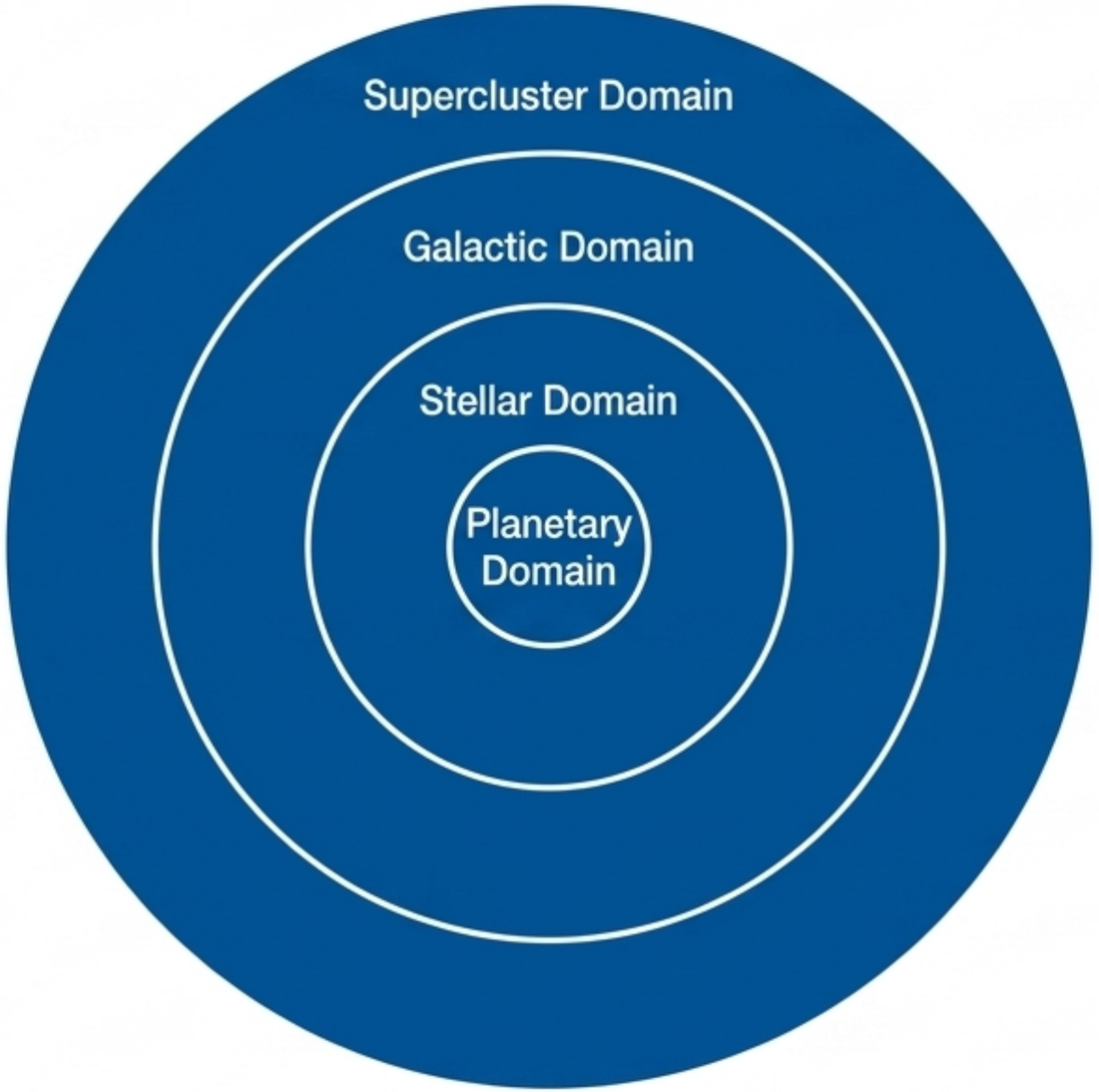


Rotation is not a local decorative anomaly; it is the primary organizing principle of the cosmos. Because the selection process eliminates galaxies on collision courses, leaving predominantly rotating and orbiting survivors, angular organisation scales infinitely. Every path, given sufficient time, spirals. Spinning bodies endure; straight-moving bodies do not.

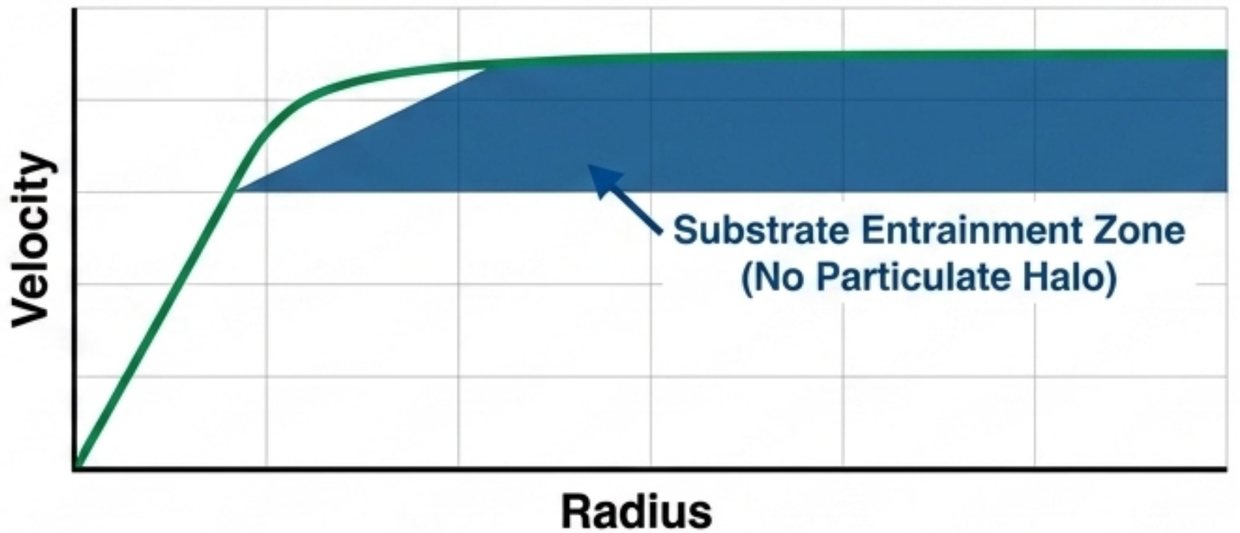
The Nested Domain Hierarchy and the DD-1 Equation

$$R_{\text{eff}} = R_d \left(1 + \frac{v_{\text{rot}}^2}{c^2}\right)^{1/3}$$

Gravity does not extend infinitely as a mathematical tail. Every structure possesses a finite gravitational dominance domain defined by the DD-1 equation. This formulation defines the radius at which a structure's gravitational influence gives way to the next larger nested nested structure in the cosmic hierarchy.
Apparent continuous gravitational influence across scales is a superposition property of nested, real, finite depressions in the Spaticle substrate.



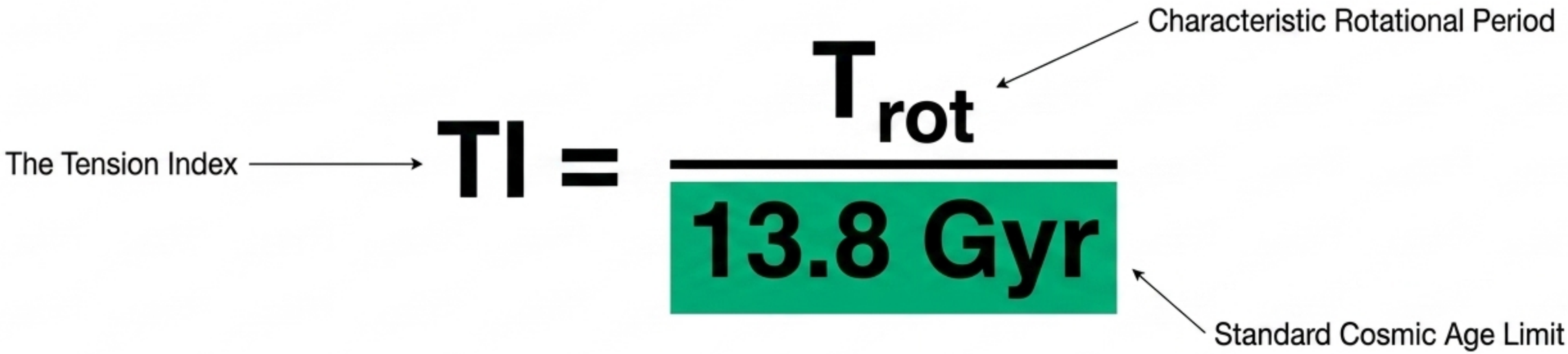
Rotational Entrainment and the Dissolution of Dark Matter



Flat rotation curves are a **structural consequence of substrate physics,** not **hidden mass.** As visible baryonic matter rotates, it continuously drags and entrains the surrounding Spaticle substrate.

This rotational entrainment, encoded in the **rotational** term of the DD-1 equation, pumps ordered propagation structure back into the surrounding medium against natural relaxation, generating the exact extended **exact extended gravitational support** previously attributed to dark matter. Validated against 175 SPARC galaxies without a single per-system free parameter.

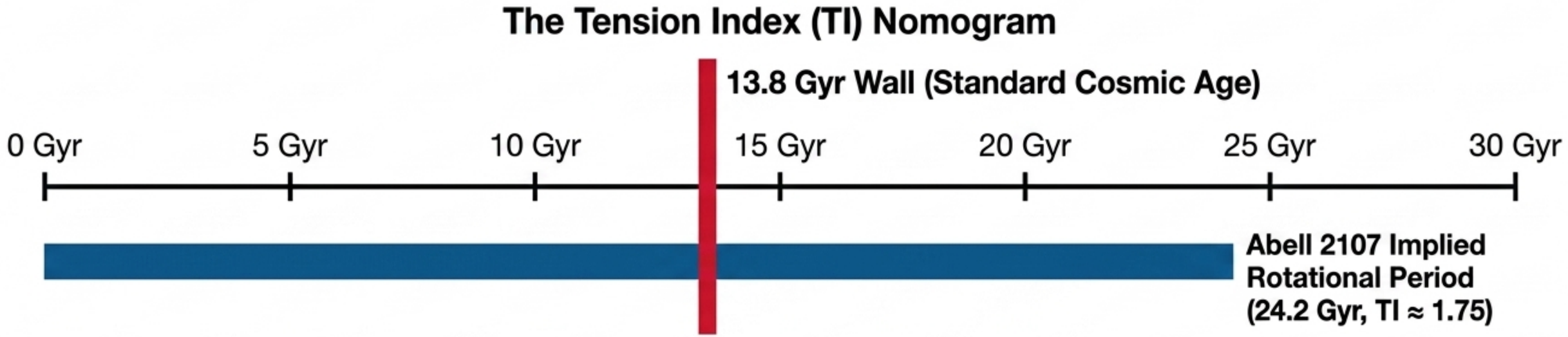
The Chronological Crisis and the Tension Index



If large-scale rotating structures exist, they demand a cosmological environment capable of sustaining their continued evolution. The Tension Index (TI) quantifies this chronological pressure. When TI > 1, the system has not had sufficient time, under the standard cosmic age, to complete even one full characteristic revolution.

Furthermore, if a structure's current scale is attributed to metric expansion, the burden increases: rotational coherence must somehow survive differential stretching without a source of additional dynamically relevant matter.

Observational Impossibility: The Case of Abell 2107



Direct observation of galaxy-cluster rotation shatters the standard timeline. For the galaxy cluster Abell 2107, observed at a radius of approximately 1.5 Mpc with a rotational speed of approximately 380 km/s, the implied rotational period is 24.2 billion years. This yields a Tension Index of TI ≈ 1.75.

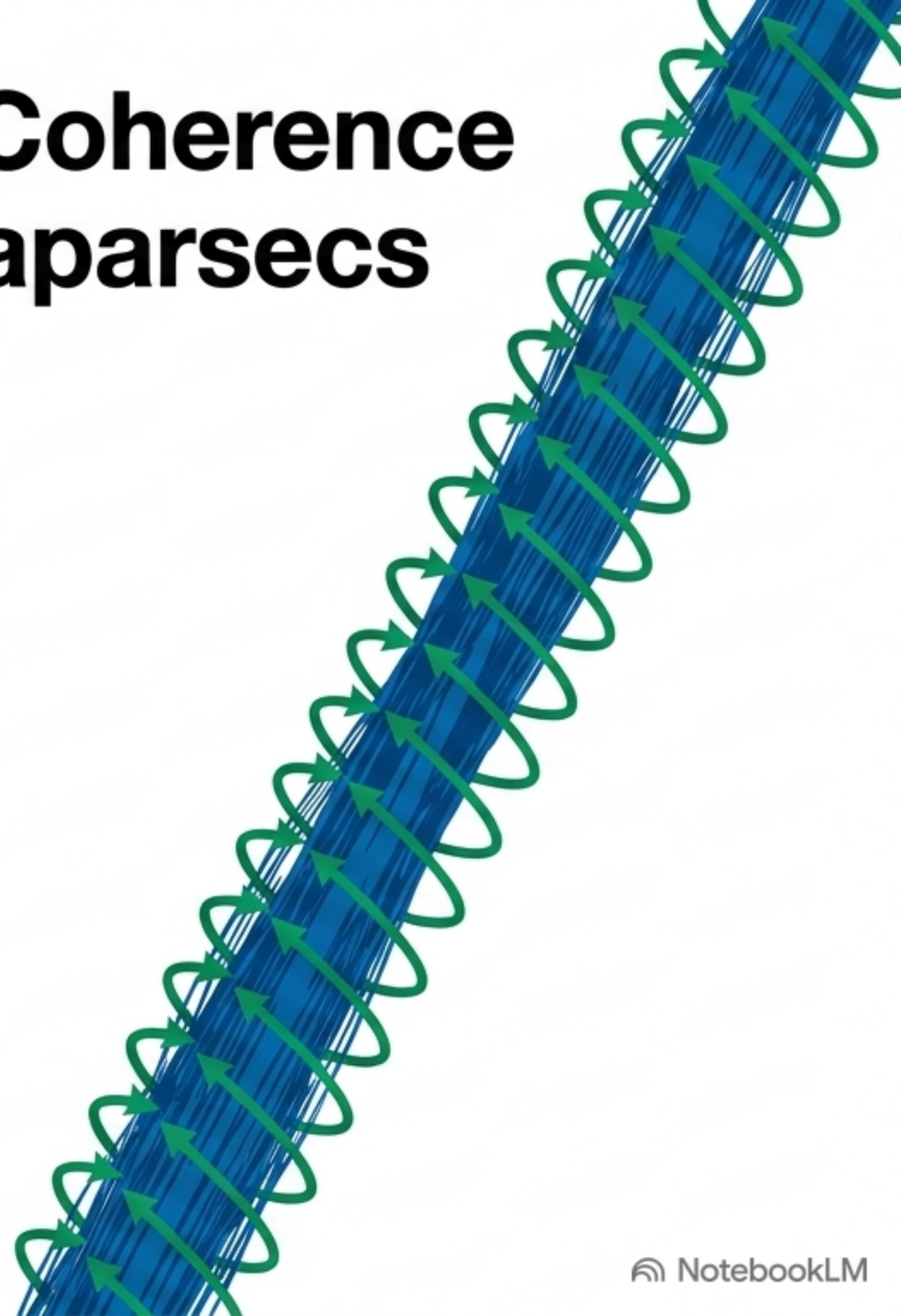
This is not a local kinematic curiosity; it is a direct temporal contradiction. A coherent structure cannot form, establish stable rotation, and maintain material self-consistency in a timeframe that is only roughly half of its required rotational period.

Filament Spin and Basin Coherence Across Hundreds of Megaparsecs

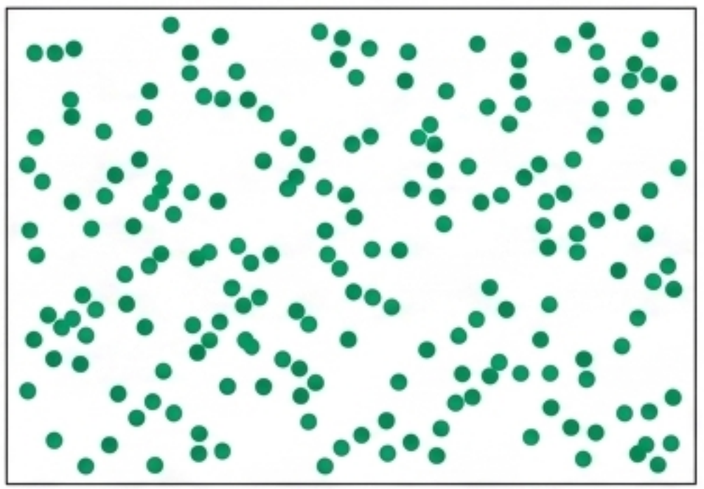
The rotational hierarchy does not terminate at clusters. Modern observations detect angular momentum deep into the cosmic web, with cosmic filaments hundreds of millions of light-years long exhibiting coherent axial spin.

Furthermore, supercluster-scale flow basins, such as Laniakea (approx. 150 Mpc across), exhibit coherent inward gravitational acceleration that can exceed the nominal Hubble-flow acceleration by an order of magnitude (ratios from 0.23 up to 18.2).

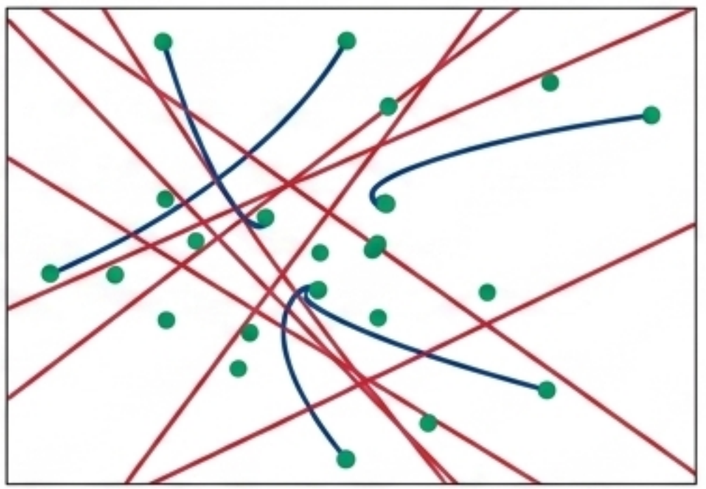
This massive structural coherence dictates that orbital organization recurs upward with no fundamental stopping scale.



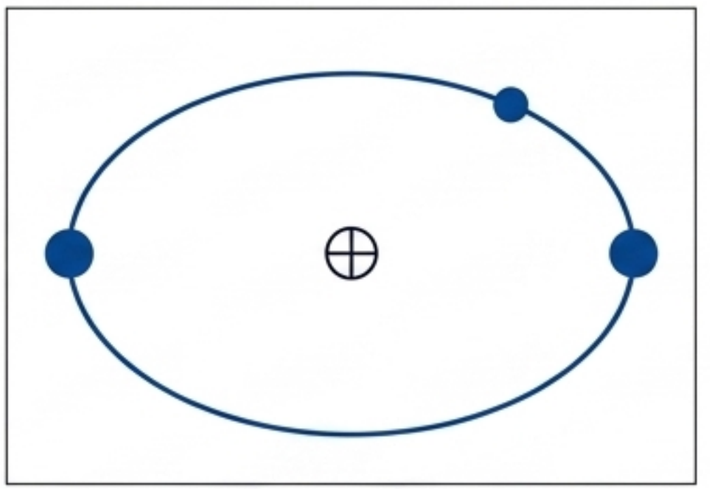
Simulated Proofs of Spontaneous Orbital Capture



Frame 1: Unsorted Initial State



Frame 2: Gravitational Sorting

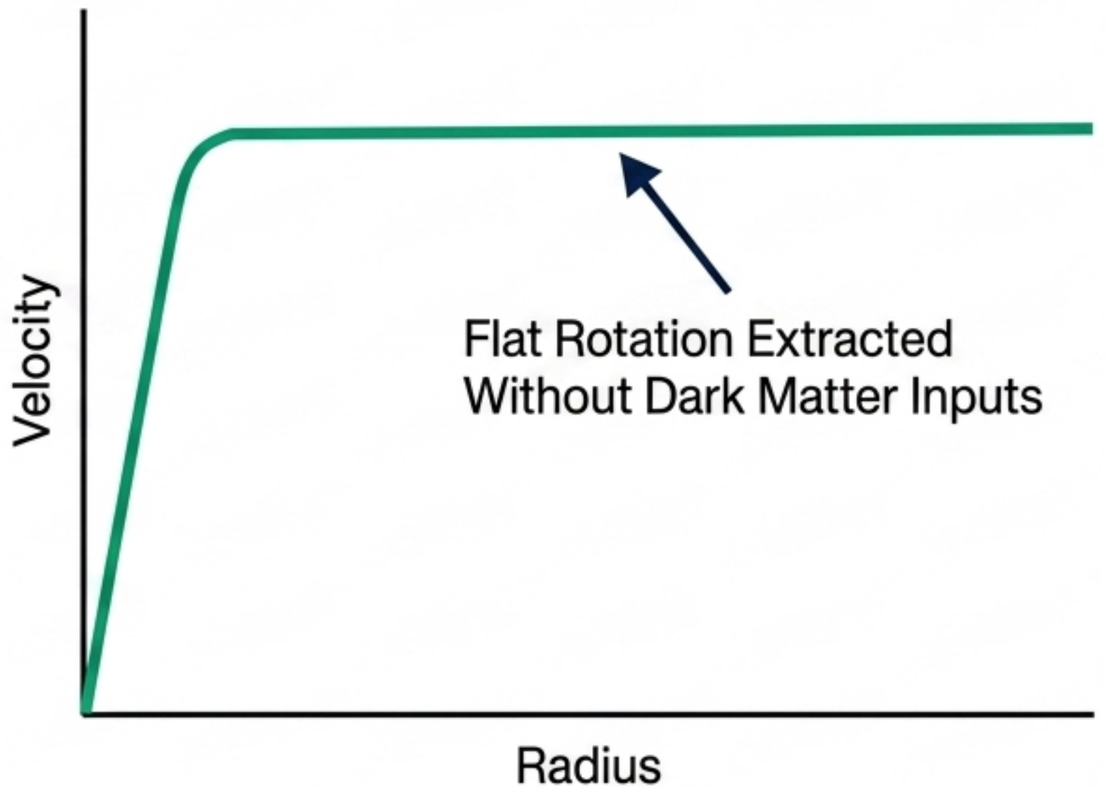


Frame 3: Orbital Terminal State

To prove that emergent orbital hierarchy requires no exotic physics, a rigorous gravity-only N-body simulation was executed. Starting from random, unsorted initial positions and velocities in three dimensions, with no imposed circular motion, no expansion term, and no artificial stabilizing forces, the system spontaneously generated persistent orbit-like capture.

The cleanest near-isolated candidate pair achieved multiple periapsis passages with zero angular-momentum sign flips. This computationally proves that stable orbital ostal hierarchy is the natural, inevitable long-term attractor of matter in a shared gravitational environment.

Emergent Flat Rotation Curves Without Hidden Mass



A dedicated 200-body proof-of-concept simulation of a self-gravitating cloud with net angular momentum spontaneously produced a flat rotation curve.

Utilizing pure Newtonian gravity and zero dark matter parameters, the outer-to-inner velocity ratio stabilized at 0.71, rising to 0.78-0.85 at larger body counts. Angular momentum was rigorously conserved throughout.

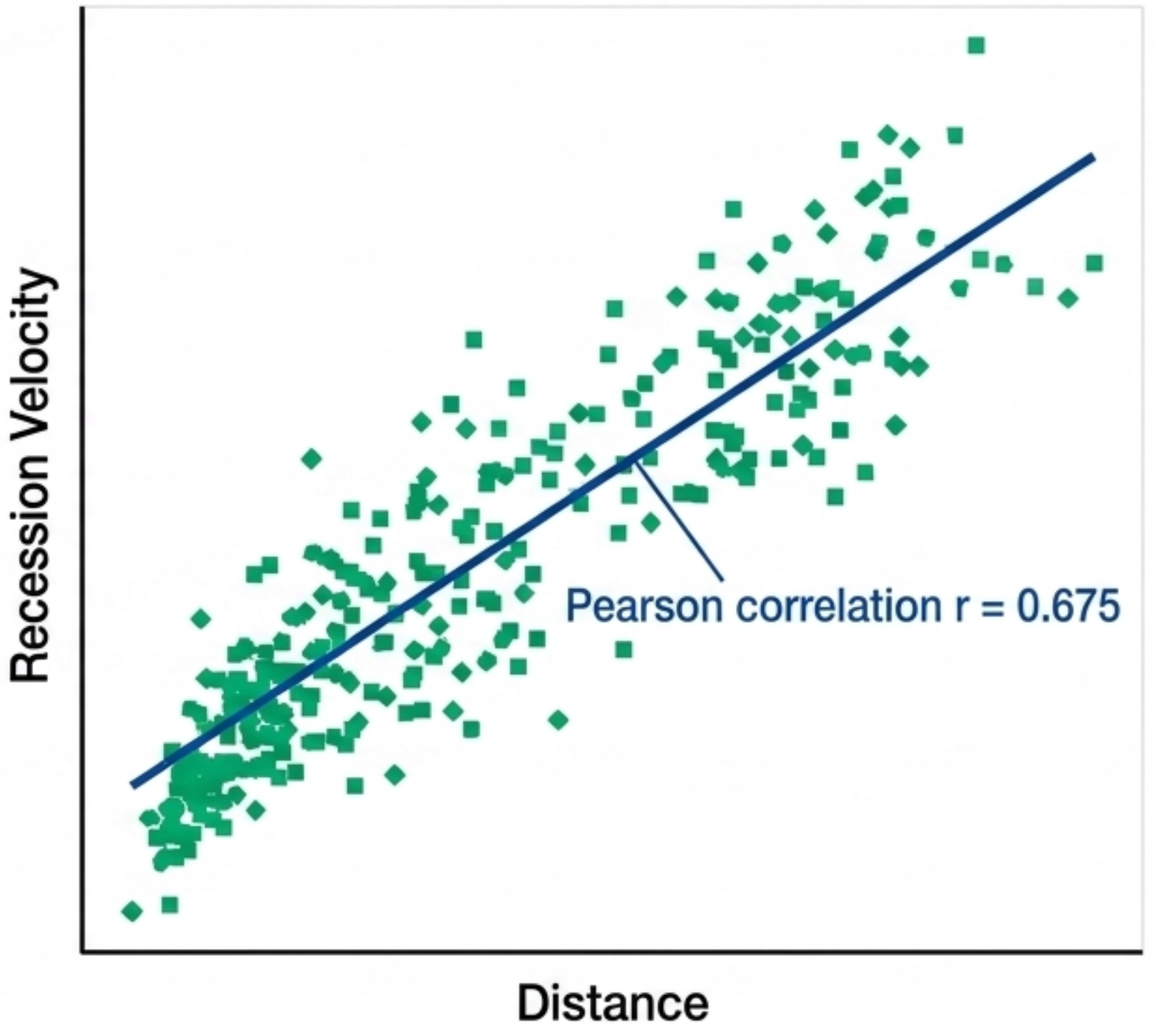
Flat rotation is a structural property of the physics of distributed angular momentum in a vortical system, not the result of an invisible particulate halo.

Simulated Emergence of the Hubble-Like Relationship

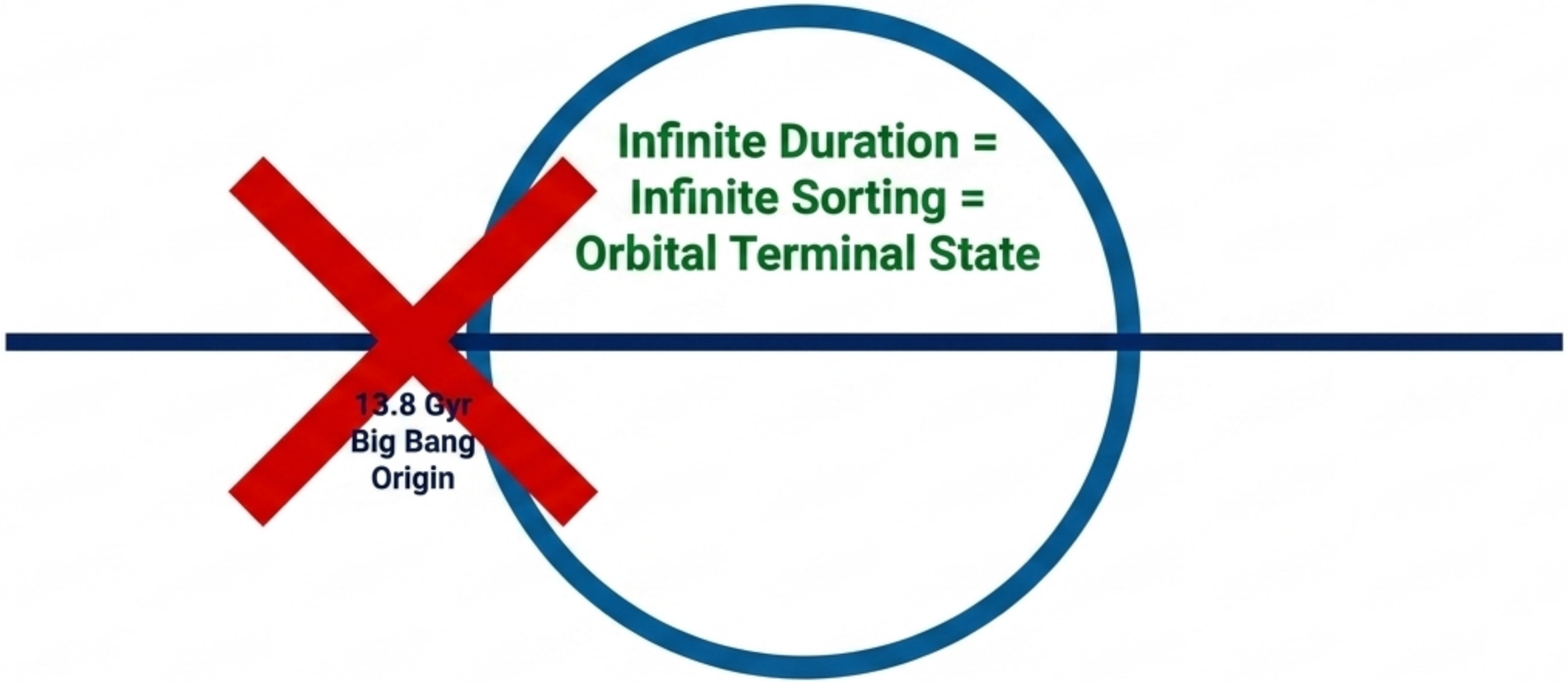
A 200-galaxy simulation initialized with random positions and non-preferred velocities, implementing only Newtonian gravity and momentum-conserving mergers, was run to equilibrium.

As intersecting trajectories were eliminated, the survivor population spontaneously exhibited a Pearson correlation of r = 0.675 between distance and recession velocity, with 84% of surviving galaxies receding.

A Hubble-like kinematic relationship emerges purely from gravitational sorting over cosmological timescales, requiring zero metric expansion and zero dark energy.



The Architecture of Dynamical Eternity



The master synthesis: Because gravity-only physics spontaneously form stable, nested orbits over immense timescales, the observed existence of cluster-scale rotational periods exceeding 24 billion years (TI > 1) forms an inescapable logical trap for the standard model.

The universe cannot be 13.8 billion years old. **The cosmos is an eternal, living web.**

Gravitational sorting builds the structure in darkness; continuous threshold ignitions illuminate it; and **nested rotational entrainment** of the Spaticle substrate sustains it forever.