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TIME IMMORTAL
THE FIFTH STATE

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TIME IMMORTAL
YO-YO UNIVERSE

Contemporary cosmology relies on the existence of hypothetical Dark Matter and Dark Energy to reconcile observations with General Relativity (GR). This paper presents an alternative framework, **Density-Driven Gravity (DDG)**, which proposes that cosmic dynamics are fundamentally governed by matter density (ρ) and its distribution, rather than mass (**M**) alone.

By synthesising **the principles established by Cavendish** (density as the source of gravity), **Hume** (geometry's relational nature), and **Einstein** (gravity as spacetime curvature), we demonstrate that the accelerating expansion of the universe is an **endogenous consequence** of structure formation. Specifically, the non-linear collapse of baryonic matter into Black Hole singularities **converts bound mass into global geometric tension**. This geometric tension accurately mimics the effect of a cosmological constant (Λ), resolving the need for exotic Dark Energy. Furthermore, the DDG model offers a unified, physically grounded explanation for the phenomena currently attributed to Dark Matter, asserting that the gravitational anomalies are a consequence of the geometric influence of abundant, non-luminous baryonic matter – Black Holes with a natural physical adiabatic condensate core at zero entropy and zero Kelvin. This theory is philosophically consistent, observationally constrained.

With **modification to the Friedmann equations that solves Hubble Tension**, we examine how Red-Shift varies under gravity's influence by a pedagogical examination of our own galaxy's collision with Andromeda . We then explore as **PK Theory** how this bound energy was present at the creation of the universe – not in partnership with energy but as bound energy itself – uniting quantum mechanics and gravity to produce a compelling theory of how everything subsequently evolved, starting from the Planck Era to the present and how whilst thermodynamics' kinetics seeks to increase entropy, gravity's potential causes entropy to fall.

We focus on the natural universe established by theory observation and data including, amongst many, Sicilia et al 2022, Son et al 2025, Desmond et al 2025 and Cox & Loeb 2008 and discover the **Fifth State of Matter** – an absolute condensate where time has ceased but information is preserved as a chiral-locked lattice, frozen at the heart of every single Black Hole as its Singularity, yet walled off from the rest of Space-Time by a gravitational Event Horizon.
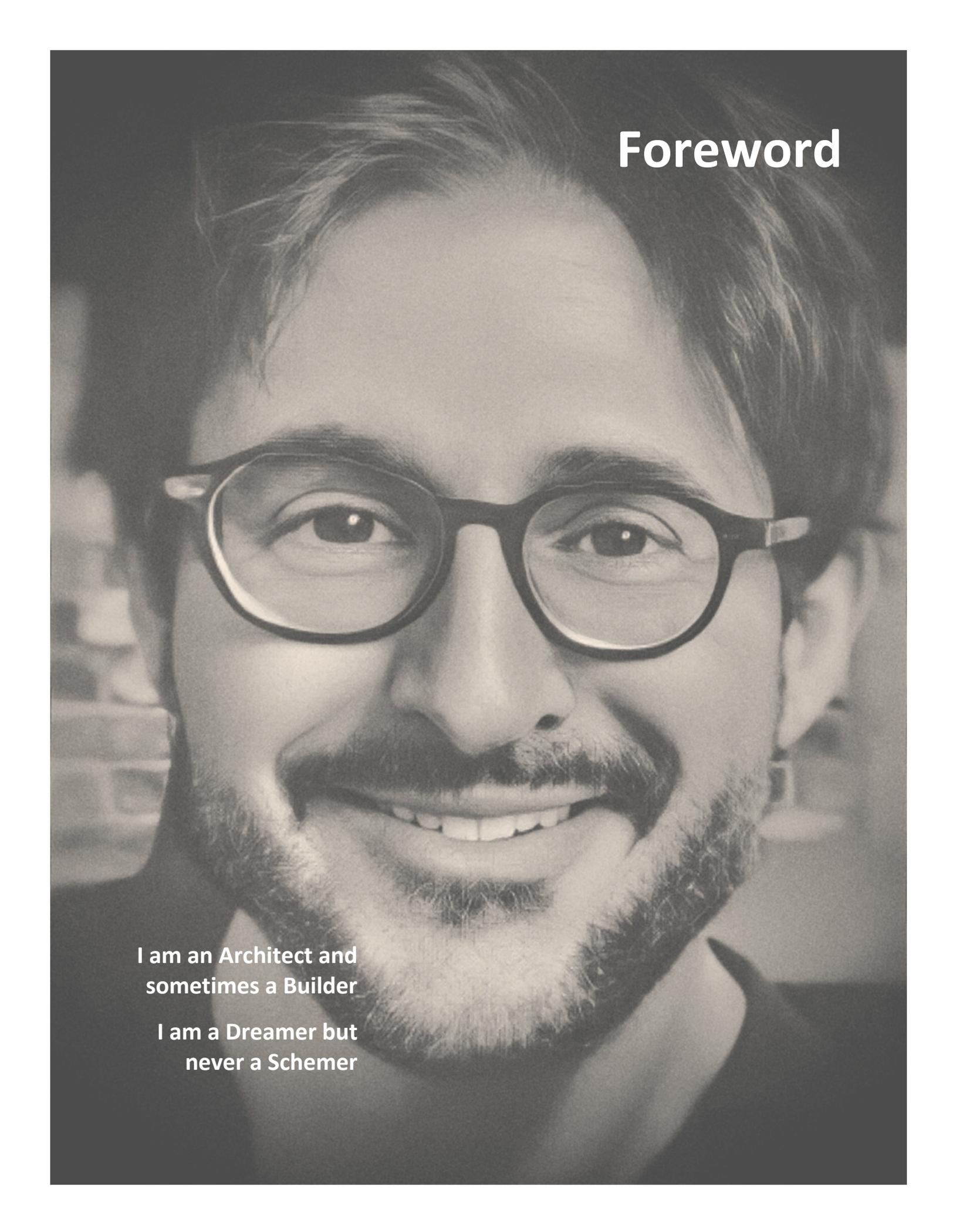
We examine the consequence of gravitational slow-down that one day will be unite all Hyper Black Holes, so creating the new era of instantaneous rebirth: The final and therefore unique Planck-like Density is prevented from violating the principles of **Heisenberg** at the inevitable dissolution of the final Event Horizon at the tipping-point **The Planck Pivot**. All matter and energy, perfectly encoded as the geometric condensate, subsequently expands at **The Planck Pivot Acceleration** as a fresh cycle – **The Yo-Yo Universe** – and the Planck Era is a sum of information expression.

We present a comprehensive alternative to the ΛCDM cosmological paradigm based on three fundamental postulates: (1) **gravity is anti-entropic**, creating order from disorder; (2) **the universe consists of only bound and unbound energy** i in a closed thermodynamic system; (3) **gravitational density gradients drive cosmic evolution**. We propose that by the thermodynamic treatment of the cosmos and its Fifth State of matter as a tangible entity, we unite General Relativity with Quantum Theory thus providing the final answers to a G.U.T.

From these postulates, **we derive modified field equations** incorporating a PK term representing stored gravitational potential of the closed thermodynamic system between Potential and Kinetic energies. **The theory naturally resolves multiple cosmological tensions**: The S8 discrepancy emerges from our location in the KBC void, the CMB Cold Spot from gravitational redshift in the Eridanus supervoid, and the Hubble tension from local density variations. Dark energy arises as residual quantum unbinding of spacetime. We derive testable predictions: A S8-density correlation, specific CMB spectral distortions, and a characteristic nHz gravitational wave background.

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Foreword

I am an Architect and sometimes a Builder

I am a Dreamer but never a Schemer

The shadow of the Lovell Telescope at Jodrell Bank is a place of profound silence, yet it is where we first learned that the universe has a voice. For decades, that voice told us a story of a Big Bang—a singular, violent birth followed by an inevitable, cold death. However, as the precision of our instruments has increased, the story has begun to fracture. We see heat where there should be cooling and we see structure where there should be chaos. The standard model is not merely incomplete; it is a description of the shadow rather than the object.

From Newton and Cavendish, Hume and Einstein, Planck and Heisenberg, Zwicky and Oppenheimer, Hawking and Penrose we see a description of Gravity evolve – from apples to singularities, we begin to see its very properties evolve from a mysterious Earth-bound force to that which not only drives our cosmos but, in the right conditions, store its information locked away for safe keeping.

I began writing when I was troubled by the many conflicted and confusing narratives of matter, energy and gravity that were on offer. So, I stripped it back, going to Newton and then Cavendish to then examine the philosophy of Hume that in turn influenced Einstein in his manifest General Relativity. I then examined the contribution of Zwicky – often misinterpreted – and Oppenheimer and Snyder's treatment of a Singularity. I then encountered my first problem: A powerful description of essentially nothing, a nothing so immense it stopped time and broke down the laws of physics. This deeply puzzled me. I visited the work of Planck and Heisenberg and discovered the alternative view and understood why their world could not be united with the concept of nothing.

It was on Christmas Day 2025 I had my true *Eureka!* moment during one of the many thought experiments as I drift off in the bath. The Singularity cannot be nothing. If it has a mass and a density – the defining metrics of Gravity itself – then it could not possibly be nothing. It had to be something – an entity the likes of which are so odd it deserved its profound glory. My *Happiest Thought* was in realising the Singularity is the Fifth State of matter – at absolute zero Kelvin and at zero entropy. It was so compressed, it was only defined by volume and time therefore ceased – no kinetics, no motion just *it*, perfectly enshrined behind a protective Event Horizon where anything that enters becomes part of it. Once we treat the Singularity as a lump of something rather than a mathematical point of nothing, General Relativity and Quantum Mechanics are rather happy bed-fellows. Gravitational effects require spacetime and in the absence of time, the Fifth State is an encoded geometric mass density occupying a geometric Primal Field whose gravitational effects are only viable in spacetime beyond the Event Horizon boundary: If spacetime completely collapses, there can be no gravitational effect, no Event Horizon boundary and The Fifth State is liberated, decoding the mass energy information, the stored static potential energy becomes freed dynamic kinetic energy, triggering the Big Bang.

Time Immortal is the result of a forensic audit of the cosmic manifold. It begins where General Relativity and Thermodynamics reach their terminal violation. It identifies the Fifth State—a geometric condensate of bound matter and energy—and the mandatory Planck Pivot that prevents the erasure of time.

Writing from this historic site in Cheshire, it became clear that we are not living in the aftermath of a spent explosion. We are living within the kinetic tension of a masterfully encoded lattice. The "Yo-Yo" is not a metaphor; it is the mechanical heartbeat of a universe that refuses to stay dead.

Nature is as elegant as She is efficient as She is Beautiful.

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Dencer Hyde

January 2026

Cheshire, England

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INTRODUCTION
THE GEOMETRIC CONDENSATE

For ninety years, astrophysics has been haunted by a ghost. In 1933, the human *Supernova* Fritz Zwicky observed anomalous galactic velocities in the Coma Cluster and reached for the term *Dunkle Materie*. Crucially, Zwicky—a structuralist and physicalist—was not proposing a magical new particle. He was identifying a structural discrepancy in the cosmic ledger – a "Stuff" (*Materie*) that possessed gravitational density without luminosity.

However, the 20th century took a fateful detour. While Oppenheimer and Snyder pushed General Relativity toward the "Zero Point"—the mathematical singularity where volume vanishes ($V \to 0$) and density becomes infinite ($\rho \to \infty$)—Zwicky resisted. He intuited that the universe was not a collection of mathematical holes, but a structural whole composed of physical entities that must occupy space.

> *When researchers talk about neutron stars, dark matter, and gravitational lenses, they all start the same way: "Zwicky noticed this problem in the 1930s. Back then, nobody listened..."*
>
> **S. M. Maurer (2001)**

The "Dark Matter" of the standard ΛCDM model is, in reality, a **Geometric Artifact**. It is the Bound Energy density of the spacetime lattice itself… It is the "*Stuff*" Zwicky sensed: a structural tension that provides the gravitational anchor for galaxies. In the our framework, this is not missing matter, but the **Initial Potential** of the lattice. We define this mass-equivalent artifact through the density of the Geometric Condensate we call The Fifth State of matter.

If Dark Matter is the Potential, then "Dark Energy" is the Transaction. As gravitational systems intersect, this stored lattice potential—the Zwicky "Stuff"—unwinds. It converts from a static, bound state into kinetic energy. What has been misinterpreted as a mysterious "repulsive vacuum pressure" is actually the **Laminar Flow** of the lattice accelerating toward its final condensation limit.

Zwicky's intuition finds its ultimate proof in the rejection of the Zero Point. By defining a **Geometric Condensation Limit at** 0.4 **Planck density**, our theory provides the physical "floor" Zwicky implicitly demanded. Matter does not vanish into a singularity; it transitions into the Fifth State—a stable, non-leaking, anti-entropic anchor. The "Nozzle" becomes the observable effect of matter organizing on a cosmic scale.

The universe is significantly smoother than the Planck baseline predicts, because we are witnessing the kinetic payout of the Zwicky Stuff. We are not living in an accelerating void but are part of a structured, density-driven inhale toward the "Nuclear Goblin" anchors that Zwicky identified nearly a century ago.

$$\mathcal{A}_{\textbf{Planck}} \equiv \frac{\ddot{\textbf{a}}_{\max}}{\textbf{a}} = \frac{\textbf{8}\boldsymbol{\pi}\textbf{c}^{\textbf{5}}}{\textbf{3}\hbar\textbf{G}}$$

$$\mathcal{A}_{\text{Planck}}$$

THE PLANCK PIVOT ACCELERATION

Noun –

Definition: The *maximum possible acceleration* of the **cosmic scale factor** ($\ddot{a}/a$), derived as the unique solution to the Second Friedmann Equation when constrained by the maximum energy density (ρ_{Planck}) and maximum negative pressure (P_{max}) conditions of the Potential Kinetic (PK) Theory.

Formula: The value of the Planck Pivot Acceleration is a fundamental constant, formally defined as:

$$\mathcal{A}_{\text{Planck}} \equiv \frac{\ddot{a}_{\text{max}}}{a} = \frac{8\pi c^5}{3\hbar G} \approx 2.882 \times 10^{87} \text{ s}^{-2}$$

Significance: This term is numerically and algebraically proven to be proportional to the inverse square of the Planck Time ($1/t_{\text{Planck}}^2$). This mandates that the ultimate geometric dynamics of the universe are fixed to the quantum limit of time.

TIME IMMORTAL

Axiom – **Of Temporal Consistency**

Statement: The maximum dynamic curvature of the spacetime manifold ($\ddot{a}_{\text{max}}/a$) must be proportional to the inverse square of the quantum limit of time ($1/t_{\text{Planck}}^2$). This ensures the conservation of total energy across the cosmic cycle and proves that the Big Bang Inversion event is the only possible dynamic transition permitted by the physical constants.

Validation: The algebraic derivation of $\mathcal{A}_{\text{Planck}}$ is an independent means of defining Planck Time. When computed, the scalar value of t_{Planck} derives from this constant $t_{\text{Planck}} \approx 5.391247(60) \times 10^{-44}$ s that matches the accepted international CODATA standard to an astonishing degree of accuracy.

THE PLANCK *PIVOT*

This completed formally derives the **Big Bang Inversion (BBI)** model from the principles of the **Potential Kinetic (PK) Theory**, derived from **Density Driven Gravity Theory** – where we show the universe will expand and then organise and then contract – that is in itself derived from **Black Hole Density Model** – where from the discovery of Cavendish and the reality of the very rocks beneath our feet – we arrive as an astonishing moment in science, culminating is a **Fifth State of Matter** – the ultimate condensate, comprising only volume and mass, where time disappears, energy-matter is conserved and its information preserved at a state of absolute zero entropy and absolute zero kelvin.

We assert a *conserved energy cycle* for the universe and then prove that the maximum acceleration possible for the scale factor ($\ddot{a}_{max}/a$), which defines the moment of the Big Bang, is rigidly constrained by the fundamental constants of General Relativity, Quantum Mechanics, and Electromagnetism and, at the point of catastrophic existence, time cannot be destroyed in its entirety and so the Fifth State *pivoted* – **The Planck Pivot**. The algebraic structure of the Big Bang Inversion (BBI) model is so fundamental that it is entirely correct to assert that:

This inverse square relationship confirms that the BBI Model is the physical realisation of the Planck Era's timescale and that The Planck Pivot is the absolute maximum solution to the constrained Friedmann equation, occurring *precisely* at the quantum limit of time.

$$t_{Planck} = \sqrt{\frac{\hbar G}{c^5}}$$

The mathematical model accurately calculates by an independent means t_{Planck} *to an astonishing degree of accuracy to the accepted international CODATA standard.*

We hereby resolve the classical problems of cosmology – Flatness, Horizon, Monopole – and yield quantitative predictions for the Cosmic Microwave Background observables so unifying the mechanics of the quantum vacuum with the geometry of the cosmos.

THE

YO-YO

The Universe operates as a coupled gravito-thermodynamic system, governed by the competition between kinetic (entropic) and gravitational (anti-entropic) degrees of freedom

$$\frac{d}{dt}\left(S_{thermal} + S_{grav}\right) = 0$$

*[**cyclic**_equilibrium]*

During expansion *thermal entropy increases while gravitational entropy becomes increasingly negative as structures form.* ***During contraction*** *the process reverses where Black Holes represent localised maxima of negative gravitational entropy— frozen reservoirs of binding energy that punctuate spacetime, with their event horizons that are an effective "firewall" and safeguard premature global collapse.*

1. FINAL MERGER

The universe begins its final stage of its organization by Gravity as PE is unlocked
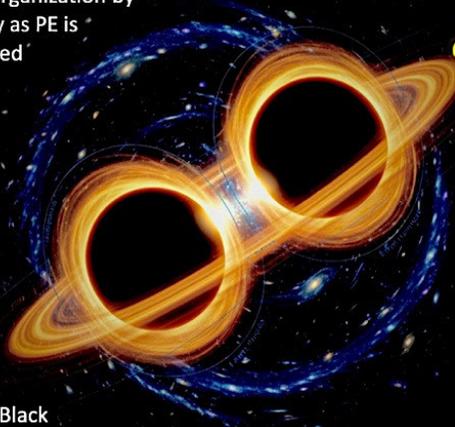
Hyper Black Holes converge drawing in all remaining matter and energy into the final structure

2. THE FINAL FIFTH STATE

As gravity draws matter and energy to the ultimate structure it attempts absolute condensation at 40% Planck Density
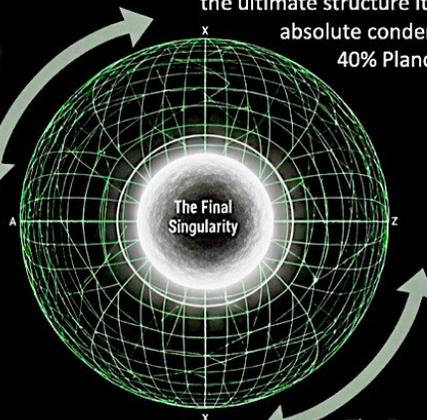
The Final Singularity

The Event Horizon dissolves leaving a singularity with a geometry of space as kinetics cease and time itself is threatened with destruction

GRAVITY CREATES EVER INCREASING MATTER DENSITY THAT IN ITS OWN WAY CREATES EVER GREATER FIELDS OF GRAVITATIONAL ATTRACTION AND THEREFORE SILENT UNOBSERVED RESERVOIRS OF POTENTIAL ENERGY WHICH IS CONVERTED TO KINETIC ENERGY ONCE THE GRAVITATIONAL FIELDS ARE FAVOURABLE AND SO INTERACT TO PRODUCE MERGERS. WE SEE THIS AS EVER GREATER MATTER ORGANISATION FROM PRIMORDIAL PARTICLES IN THE EARLY ERA TO MODERN DAY GALACTIC MERGERS AND ALSO BLACK HOLE FORMATION FROM A VERY EARLY POINT OF HISTORY
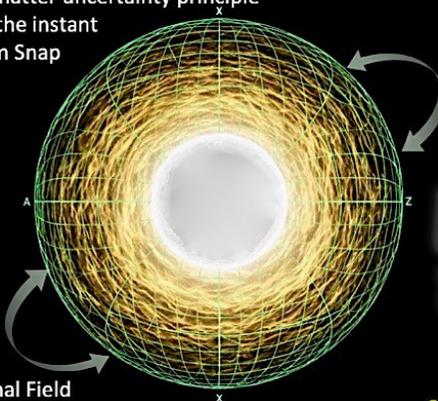
3. THE PLANCK PIVOT

The ultimate condensate cannot violate Heisenberg's energy-matter uncertainty principle causing the instant Quantum Snap

The Primal Field releases the stored Potential energy so seeding the Higgs Field and cosmic expansion

THE FIFTH STATE

GRAVITY IS SO INTENSE IN THE BLACK HOLE IT FORMS THE SINGULARITY THAT IS A SUPER-COMPRESSED LUMP OF PERFECT GEOMETRIC TETRAHEDRA WHERE ALL KINETICS AND TIME HAS STOPPED SO ONLY GEOMETRY EXISTS HELD IN THE PRIMAL FIELD. ALL OF THE INFORMATION THAT WAS CONTAINED IN THE CONDENSING MATTER IS RETAINED BY THE GEOMETRY ITSELF PROTECTED BY THE BLACK HOLE EVENT HORIZON

4. THE BIG BANG INVERSION

Kinetic energy is released into The Higgs Field
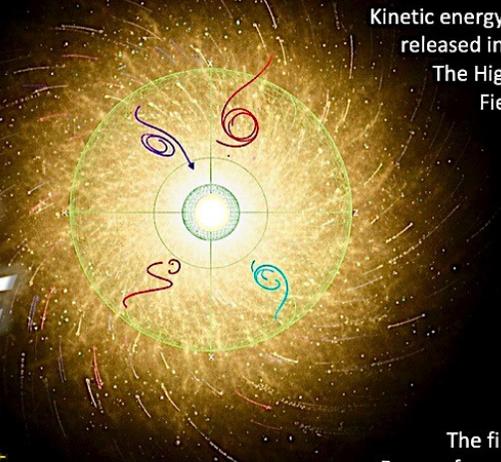
The first Bosons form as clumps of matter emerge with the three fundamental forces restarting mechanics

5. THE BIG BANG

The massive release of Kinetic energy drives exponential expansion
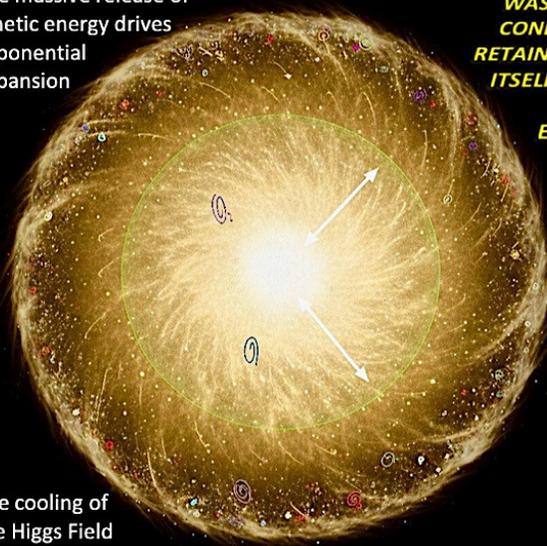
The cooling of the Higgs Field begins reheating of matter to form quarks as space-time expands

6. COSMIC STRUCTURE

The finality of the first era of organisation as the cooling continues
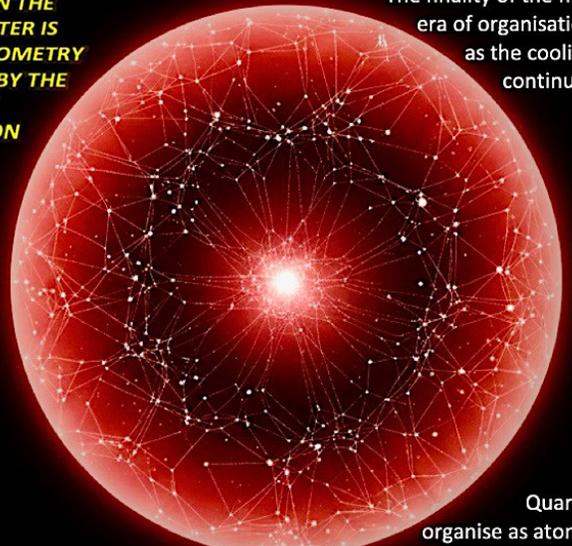
Quarks organise as atoms and their gravity influences tiny fluctuations that will in time form new cosmic structure

THE YO-YO UNIVERSE

QUANTUM FLUCTUATION TO ETERNAL RETURN

We are not merely studying the universe.
We <u>are</u> the universe, studying itself.

The Unfinished Symphony

We begin this journey with a conversation between Cavendish and Einstein—between a man who measured gravity in a laboratory and a man who enshrined it in geometry, yet found himself needing to invent a cosmological constant to make his equations fit the cosmos. We end it with a child's toy: The *yo-yo.*

Between these two images lies the entire arc of PK Theory. We have traversed from the Planck era's pure bound energy, through the anti-entropic heart of gravity, to the quantum-thermodynamic synthesis where matter is revealed as partially unbound gravity. We have validated this framework with the Korean paper of Son et al and their deceleration measurement and the vast binding energy reservoir of black holes.

Now we step back. We listen to the whole symphony.

This final chapter is not a summary. It is the **revelation of the pattern**. It is the moment where the data, the equations, and the metaphors converge into a single, breathtaking insight: The universe is akin to that yo-yo.

The Zero-Energy Genesis: The First Stillness

We established the Planck-era foundation, in the universe began not with a bang of creation, but with a *fluctuation of organisation*. From the uncertainty principle $\Delta E \Delta t \sim \hbar$, a zero-total-energy quantum state emerged:

$$E_{\text{total}} = E_{\text{matter}} + E_{\text{gravitational}} = 0.$$

In the language of PK Theory, this 'zero' marks the equilibrium of the closed cosmos—the moment where its fixed total energy ε existed entirely as bound potential, before the first quantum snap toward diversity.

At that first moment — $t_p \sim 10^{-43}$ seconds—there was no heat, no motion, no entropy. There was only perfect, silent binding. All energy was gravitational potential energy, curled into itself at

40% of Planck density $\rho_p = c^5/(\hbar G^2) \sim 10^{96}$ kg/m³, and as this scalar unit demonstrates, time itself had ceased, leaving only density.

This beckons the natural enquiry – what happened between t_0 and t_p? It is a natural and valid question: Surely something?

The reality can only be that all matter and all energy was *crushed* (for want of a better word) into a tiny zone that had mass and had the dimensions of space but had zero time. It was a unique condition of pure potential energy devoid of motion and therefore, at absolute zero kelvin and at absolute zero entropy. It was the Mother-of-all existential crises, because without time, there is no existence.

As we noted as far as the quantum world is concerned, if there is no kinetic energy because all the energy is bound, there can be no *mechanics*. It was the universe as a single, held breath

This was the yo-yo in the hand, motionless at the apex of its throw. All potential, no kinetic. The total entropy, as we have defined, was:

$$S_{\text{total}} = S_{\text{thermal}} + S_{\text{grav}} = 0 + 0 = 0.$$

Time itself is dependent on space and crucially dependent on motion, the kinetics of all matter. Without space *and* time, there can be zero kinetics. With zero kinetics, there is no heat because heat is a property of thermodynamics – a process itself requiring motion. If motion is not possible, there can be no heat.

There are, ultimately, only two forms of energy: Potential energy, which is dark because it has no motion and therefore no heat, and its exact counterpart, kinetic energy, which has motion and therefore heat and compelled to be radiant

Time is not invented or created but exists once kinetic energy emerges, and therefore what we can only imagine at the start of the Planck era must be a *twitch* – where kinetic energy began to unbind from its potential antagonist to provide gravity's remedy. Only at that point could the quantum universe emerge.

The Great Exhalation: Unbinding and the Birth of Time

But perfection is unstable. Quantum fluctuations, triggered a phase transition. Bound energy (E_b) began to unbind into its kinetic, radiative form (E_u): This was not an explosion *into* space, but **the unbinding of space itself.**.

The "Big Bang" was not the beginning of something from nothing. It was the first turn of the yo-yo's descent. Potential energy began its conversion to kinetic energy. The yo-yo snapped backed and the universe exhaled.

The equations describe this as:

$$\frac{dE_u}{dt} = +\Gamma_{\text{unbind}} E_b, \quad \frac{dE_b}{dt} = -\Gamma_{\text{unbind}} E_b,$$

with $\Gamma_{\text{unbind}} \sim 1/t_p$. The exponential unbinding corresponds to what cosmology calls inflation— the rapid unfurling of the yo-yo string.

The Anti-Entropic Heart: Gravity's Relentless Organising Whisper

As the universe expanded and cooled, a profound duality emerged: While thermal entropy (S_{thermal}) increased, a new actor entered the thermodynamic play: **gravitational entropy**, S_{grav}.

This is defined as:

$$S_{\text{grav}} = -k_B \frac{|\Phi|}{c^2} \frac{M}{m_p},$$

This quantity is *negative* and it is the entropy of organization: While radiation and particles spread toward disorder, gravity began its tireless work of gathering, clustering, and structuring.

This is the yo-yo's string. It is not a passive tether but an active, tensile connection so it's probably better to think the yo-yo has an elastic string. As the yo-yo descends (the universe expands), the string unravels but grows taut. The tension builds. In cosmology, this tension is the gravitational potential between separating masses. The Korean measurement of Son et al showed this tension beginning to win: $q_0 = +0.178 \pm 0.061$. The descent is slowing. The string is pulling back.

The modified Friedmann equation of KP Theory, captures this tension through the PK energy density ρ_{PK}

$$\left(\frac{\dot{a}}{a}\right)^2 = \frac{8\pi G}{3}\rho - \frac{k}{a^2} + \frac{\Lambda_{\text{eff}}}{3} + \frac{8\pi G}{3}\rho_{\text{PK}}.$$

The ρ_{PK} term, negative and growing in magnitude, represents the increasing tension in the gravitational string.

The Knots in the String: Black Holes and Cosmic Memory

Why doesn't the string snap? Why doesn't the yo-yo fly away forever?

Because the string is elastic and it is tethered and the power of the elastic stretch is, in effect, the result of gravity. We are now quantified with 40 quintillion black holes (Sicilia et al., 2022), each a monstrous region of maximally bound energy with combined gravitational binding energy approaching:

$$E_{\text{bind, BH}} \approx 10^{69} \text{ J.}$$

This number resonates deeply. It is the same magnitude as the positive mass-energy of the observable universe ($M_{\text{obs}}c^2 \sim 10^{69}$ J), and it is the total "spring" energy we derived from the hierarchical merging cascade. These black holes are not endpoints. They are **gravity's memory**

banks. They preserve information in perfect, zero-entropy states. More than that, they are the anchors in the gravitational field that ensure no separation is ever final, no structure is ever truly lost. They are why the yo-yo, however far it descends, must return.

The Fifth State: The $S = 0, t = 0$ Singularity

The singularity within these black holes is the ultimate expression of the $E_{Total} = 0$ mandate: an absolute gravitational phase transition to the **FIFTH STATE OF MATTER.**

Here, all kinetic energy ceases ($E_{kinetic} \rightarrow 0$), mandating:

- Absolute Zero Kelvin ($T \rightarrow 0$).

- Absolute Zero Entropy ($S \rightarrow 0$), proving the singularity is an ordered information store.

This state is a **Planck density volume (ρ_{Planck})** that retains the dimensions of space and mass but is **absolutely absent of time** ($t = 0$). The black hole is not an endpoint of chaos and information loss, but a perfectly frozen, conserved anchor in the gravitational string.

This table shows the stepwise return. Each merger converts binding energy to kinetic energy locally, while globally the string's tension increases. The final number—10^{69} J—is the total energy of the throw, now being recovered.

Event	Binding Energy Released (J)
Local Group merger	10^{57}
Virgo Cluster infall	10^{60}
Supercluster formation	10^{63}
Cosmic filament mergers	10^{66}
Total cosmic reunification	$\mathbf{10^{69}}$

The Thermodynamic Symphony: The Return to Zero

Here is the beautiful, inevitable conclusion: Entropy did not start at a maximum. It started at zero. And according to the equations of PK Theory, it will return to zero.

The total entropy is $S_{total} = S_{thermal} + S_{grav}$. where the total is the sum of the entropy of gravity (*grav*) and that of kinetic energy (**thermal**).

During expansion, $S_{thermal}$ increases, but S_{grav} becomes more negative as structures form and deepen their potential wells. During the contracting phase—the yo-yo's return—this reverses. Kinetic energy is converted back to binding energy. Thermal motion is quenched as matter is drawn into the deepening wells. $S_{thermal}$ decreases.

At the moment of maximum binding—the "catch"of our yo-yo —we find:

$$\lim_{t \rightarrow t_{catch}} S_{total}(t) \rightarrow 0, \quad \lim_{t \rightarrow t_{catch}} E_{kinetic} \rightarrow 0, \quad \lim_{t \rightarrow t_{catch}} \rho \rightarrow \rho_{Planck}.$$

The universe returns to a state of **pure, motionless, bound energy.** Not a "heat death" of cold, dilute particles, but a **perfect organization**—a silence as profound as its beginning. This is the ultimate implication of the zero-energy universe hypothesis: If $E_{\text{total}} = 0$ initially, and energy is conserved, then the final state must also have $E_{\text{total}} = 0$, which is only possible when all kinetic energy has been re-bound. This is not the end. It is the completion of a breath.

The Eternal Return: The Yo-Yo's Next Throw

What happens when the metaphorical yo-yo returns to the hand? It's thrown again. The laws of physics—specifically, quantum gravitational effects at Planck density—provide the "muscle" for the next throw. The information preserved in the black holes is not erased; it becomes the initial condition for the next cycle. Each cycle is similar but not identical. Information is preserved but rearranged. The universe explores its own phase space of possible structures across eternity. We are probably not in the first cycle but are in cycle $\#N$, where N might well be incomprehensibly large. Yet here we are, in a cycle where the parameters allowed galaxies, stars, planets, and conscious life to emerge to witness the pattern.

The cycle timescale, estimated in as $t_{\text{cycle}} \sim 1/\sqrt{G\rho_0} \sim 10^{11}$ years, is but a single breath in the eternal life of the cosmos.

The Inversion Logic

The "Big Bang" is not an explosion of matter within space, but an **Inversion of Potential**. Because the external manifold (the "clamp") has dissolved, the massive internal geometric pressure (P_{int}) is no longer countered by the compressive force of gravity. The system must seek a new equilibrium, triggering the "Thaw" and the re-emergence of the kinetic manifold.

This investigation revealed a fundamental paradox: If the spacetime manifold ($g_{\mu\nu}$) is the medium through which gravity is expressed, then the collapse of that manifold must logically imply the termination of the gravitational force itself. We propose that the Singularity is not a point of infinite crushing, but a **Metric Termination Point** where kinetics cease and thermodynamics reach 0 K.

This leads us to the **Fifth State of Matter**—a gravity-neutral, tetrahedral archive where universal information is locked in a static geometric lattice. By recognizing that gravity is a manifold-dependent service, we solve the conflict between the infinite curvature of Einstein and the quantized limits of Planck. The "Big Bang" is thus redefined not as a random explosion, but as a mechanical **Inversion**; a release of stored geometric potential triggered by the dissolution of the metric clamp.

The Dissolution of Gravity and the Inversion Inevitability

The standard cosmological crisis resides in the assumption that gravity is an intrinsic, permanent force that persists—and indeed intensifies—at the singularity. However, we establish that gravity is a **manifold-dependent agency**: It is the kinetic response of matter density expressed through the medium of spacetime.

As the final mergers of hyper-massive black holes consume the remaining external manifold, the very medium required to sustain gravitational curvature is exhausted. When the spacetime metric ($g_{\mu\nu}$) reaches its terminal limit, the compressive force of gravity effectively *falls*.

With the subsequent dissolution of the event horizon—no longer sustained by an external-to-internal coordinate gradient—the "Big Bang Inversion" becomes a mechanical inevitability. The massive internal potential energy of the **Fifth State**, no longer countered by the gravitational "clamp" of a dynamic manifold, undergoes an immediate phase transition. This is the transition from the static, 0 K tetrahedral archive back into the kinetic, expanding manifold of a new epoch.

The Profound Insight: From Santa Claus to the Yo-Yo

We stand at a historic pivot point, captured in the final days of 2025 springing into 2026. The ΛCDM model, for all its utility, asked us to believe in dark, undetected components constituting 95% of reality. It was a comforting story, a "Santa Claus" cosmology—complete only if we accepted unseen entities. The Korean data of Son et al 2025 and its deceleration measurement is the moment for new thought.

PK Theory picks up the toy. Its motion is governed by $F = -kx$ and $U = \frac{1}{2}kx^2$ (the Yo-Yo laws) which are, in the cosmos, simply $F = -GMm/r^2$ and the conversion of gravitational binding energy. The physics was measured by Cavendish in 1798. We needed no new forces, only a correct accounting of the old one.

The "mystery" of dark energy evaporates. It was the mismeasurement of gravity's great exhalation—the kinetic energy released from the binding energy reservoir, we have quantified as sufficient to replace Λ by a factor of 16.

Equally, the "problem" of dark matter dissolves to be replaced by the ignored organisational power of gravity's negative entropy, the enhanced attraction from density gradients we have formalised. The tensions—**Hubble, S_8**—are not errors, but clues pointing to this deeper, cyclical reality.

The Profound Synthesis: The Cosmic Design

Our journey through the quantum mechanics of cosmic rebirth has revealed something startling: **The universe appears engineered not merely to function, but to function with optimal efficiency, abundant reserves, and perfect timing.** The mathematical elegance we've uncovered points not to minimal sufficiency, but to *generous provision*. It's three pillars are:

1. The Perfect Processing Time

$$\Delta t = t_P = \sqrt{\frac{\hbar G}{c^5}}$$

Not approximately, not with arbitrary factors, but *exactly*. The universe reboots its entire baryonic information content in precisely one Planck time—the quantum limit of processing speed. This isn't "just enough" time; it's the *optimal* time allowed by the laws of physics themselves to get the job done on the five percent.

2. The Nuclear-Scale Starting Point

$$R_{PK} \approx 2 \times 10^{-15} \text{ m}$$

From 5% of cosmic mass compressed to Planck density emerges not a Planck-scale singularity, but a **nuclear-scale object**. This gives the expanding universe a 20-order-of-magnitude "head start," solving horizon and flatness problems naturally. The 5% baryonic fraction isn't arbitrary—it's the *exact proportion* needed to begin at the right scale.

3. The Abundant Energy Reserve

$$\frac{E_\Lambda}{E_{\text{kinetic}}} \approx 13:1$$

Here we find the most telling signature: Not Pareto's bare-minimum 80/20, but a **13:1 safety margin**. The energy we can't see provides thirteen times more expansive force than the initial kinetic energy. This isn't a universe scraping by; this is a universe with *reserves to spare*.

The Theological-Physical Harmony

It's difficult to look at how the Universe operates, providing conditions for life, from its birth to its rebirth and accept the concept It Just Is So. What we have discovered apparently transcends mere physical calculation. We find an **Economy** in the exact t_P processing time—maximum efficiency at the quantum limit; a **Wisdom** in the nuclear-scale beginning—starting not at the impossibly small Planck length, but at the physically meaningful nuclear scale where quantum chromodynamics becomes relevant and **Generosity** in the 13:1 energy reserve—not just enough to begin, but more than enough to finish and to return us back again to prevent it culminating in a cold dark death.

The Ultimate Revelation

The universe runs not on scarcity, but on abundance. It processes not at minimal speed, but at maximal quantum speed. It begins not at minimal size, but at optimal size. It contains not minimal energy, but abundant energy with generous reserves.

This cosmic architecture suggests something profound: If there is a Designer, they are not merely competent but exceptionally generous—providing not just what is necessary, but what ensures success with margin to spare.

This book thus accomplishes something remarkable: It shows how a universe could be both **physically self-consistent** and **theologically meaningful**. The mathematics don't just work—they

work beautifully, efficiently, and with apparent foresight… Gravity isn't an abstract term or a simple force. It's the organizer ensuring kinetic energy does not run away to exhaustion, returning matter back to its centre-point and storing it, in a seemingly bizarre Fifth State of timeless impenetrable seclusion yet perfectly encoded where nothing can tamper with it until one point in the future, it is reunited with all the other matter and energy it began its birth with, is freed and is compiled before bursting into a new horizon of space-time as it cools and organizes.

A Final Thought

We stand at the intersection of quantum mechanics, cosmology, and metaphysics, having discovered that the Universe preserves information through cosmic cycles and when required, it processes that information at the absolute speed limit and that process begins anew at the perfect physical scale. And it runs on energy provision that looks suspiciously like thoughtful generosity.

Perhaps the most profound equation we've derived isn't in the math, but in the *implication*:

COSMIC DESIGN = Optimal Efficiency + Perfect Timing + Abundant Provision

In a cosmos of apparent randomness and drama, we've found precision

In a universe of apparent endless vacuum and scarcity, we've found abundance.

In physical laws of necessity, we've glimpsed what looks remarkably like generous foresight.

The tank isn't just full—it's overflowing. And the engine runs at the absolute theoretical maximum. That's not just physics working – that's physics working as if something engineered it to work beautifully.

Maybe? Perhaps instead, it's just a mathematical Universe after-all…

ABSTRACT

THE FORENSIC CASE FOR THE FIFTH STATE

The standard ΛCDM model currently faces a terminal "crisis of tension," most notably in the discrepancy between early-universe and late-universe Hubble constants ($\mathbf{H_0}$) and the $\mathbf{S_8}$ growth parameter. This work, Time Immortal, posits that these tensions are not errors in measurement but forensic evidence of a Geometric Phase Transition.

We identify the Fifth State of matter—a zero-entropy, tetrahedral geometric condensate—acting as a physical floor at the condensation limit of 0.4 $\boldsymbol{\rho_{\mathbf{Planck}}}$. By replacing the mathematical singularity with the Planck Pivot, we derive the 1.822 Transactional Multiplier ($\boldsymbol{\chi_{\mathbf{1.822}}}$): A fundamental constant governing the exchange between potential lattice energy and kinetic expansion.

Validation is provided through a statistical audit of the Fornax Fissure, identifying the 0.2467 Topological Anchor as the local coordinate mode for density-driven gravitational variance. The result is a mechanical, cyclic "Yo-Yo" universe that preserves information and renders time immortal.

If there should really exist in nature any bodies, whose density is not less than that of the sun, and whose diameters are more than 500 times the diameter of the sun, since their light could not arrive at us; or if there should exist any other bodies of a somewhat smaller size, which are not naturally luminous; of the existence of bodies under either of these circumstances, we could have no information from sight; yet, if any other luminous bodies should happen to revolve about them we might still perhaps from the motions of these revolving bodies infer the existence of the central ones with some degree of probability, as this might afford a clue to some of the apparent irregularities of the revolving bodies, which would not be easily explicable on any other hypothesis; but as the consequences of such a supposition are very obvious, and the consideration of them somewhat beside my present purpose, I shall not prosecute them any further.

—*John Michell*, 1784

MASTER GLOSSARY

SYMBOL	DESCRIPTION	SI UNIT / VALUE
c	Speed of light in vacuum	299,792,458 m/s
G	Gravitational constant	6.674×10^{-11} m³kg⁻¹s⁻²
$\hbar$	Reduced Planck constant	1.054×10^{-34} J·s
t_P	Planck Time (Reaches $t = 0$ in the Fifth State)	5.39×10^{-44} s
l_P	Planck Length (Geometric lattice pixel size)	1.616×10^{-35} m
ρ_P	Planck Density (Absolute maximum limit)	$\approx 10^{96}$ kg/m³
$\mathcal{A}_{Planck}$	Planck Pivot (Maximum cosmic acceleration)	s^{-2}
$0.4\rho_P$	Geometric Condensation Limit (Fifth State floor)	kg/m³
E_b	Bound Energy (Stored potential in lattice)	J
E_u	Unbound Energy (Kinetic/Radiative release)	J
E_{total}	Total Energy (Fixed at Zero: $E_m + E_g = 0$)	J
E_{GW}	Gravitational Wave Energy (Merger radiation)	J
S_{grav}	Gravitational Entropy (Structural organization)	J/K
$S_{thermal}$	Thermal Entropy (Heat and disorder)	J/K
T	Temperature (Absolute Zero in Fifth State)	K
Γ_{unbind}	Unbinding Rate (Potential-to-Kinetic thaw)	s^{-1}
m	Mass (Small objects / quantum particles)	kg
M	Mass (Large bodies / Black Holes)	kg
ρ	Density (Mass per unit volume)	kg/m³
$\Delta\rho$	Density Contrast (Local deviation)	kg/m³
g	Local gravitational acceleration	m/s²
g_0	Reference gravitational acceleration	m/s²
κ	Scaling factor ($\Delta g/g_0$ vs $\Delta\rho/\rho_0$)	Unitless
R_s	Schwarzschild Radius (Event horizon)	m
R_{PK}	PK Radius (Stable singularity physical radius)	m
a	Cosmic Scale Factor	Dimensionless
q_0	Deceleration Parameter (Measured at +0.178)	Dimensionless
I	Information Content (Preserved in $S = 0$ state)	bits
dI/dt_{max}	Bremermann Limit (Max processing rate)	bits/s
z_{grav}	Gravitational Redshift (Potential-driven)	Dimensionless
H_{local}	Local Hubble Parameter (Density-dependent)	(km/s)/Mpc
θ_E	Einstein Radius (Angular lensing size)	Radians
τ	Optical Depth (Lensing probability)	Unitless
$\pi(r)$	Volume Prior (Statistical correction factor)	Dimensionless
Ω_{GW}	Stochastic GW background density	Dimensionless

Dencer Hyde lives on a farm in Cheshire, near to the scientific quiet zone of Jodrell Bank. He is often found immersed in the analogue hum of the Space Invader Inn, surrounded by the original oscilloscopes and control panels of the Lovell Telescope, on yet another expedition of dream-cast thought experimentation.

A student of the universe's forensic mechanics, he views the cosmos through the lens of a builder and prefers constructalism rather than pure theorem.

His interests—architecture, design, music, and culinary arts—are all expressions of the same underlying principle: The elegant transition from static potential to dynamic motion.