Proto-Unit Framework For Space-Time Derivation:

The ~~Real~~ *complex* Quadrature Of The Circle.

Christian M. Herborn
Oppenheim

5.May2025

Abstract

This paper introduces a unified, dimensionless framework for physical law based on the proto-unit: a logical dual of translation (v) and rotation (ω), constrained by the invariant relation $v^2 + \omega^2 = 1$. From this geometric axiom, we reconstruct space-time, gravity, quantum behavior, and information theory using a single, scale-invariant curvature logic. The Riemann zeta function is identified as the geodesic operator stitching rotation and translation into coherent physical phenomena, with its critical line $\mathrm{Re}(s) = \frac{1}{2}$ interpreted as the informational equilibrium — the path of light and the origin of probabilistic balance.

We derive classical and quantum equations, including the inverse-square law of gravity, the Schrödinger equation, and Bell-type correlations, all from surface curvature and proto-bit count — not from force, field, or mass. All physical constants, including $\hbar$, G, k_B, α, and Planck units, emerge as transformations within this curvature-normalized geometry. Entanglement is reinterpreted as topological coherence across shared geodesics, and quantum indeterminacy as a projection artifact of deterministic informational curvature.

The result is a logically complete and irreducible formulation of physical reality where energy, time, and space are not fundamental objects but emergent properties of self-balanced curvature in complex informational space. This framework offers a path beyond the Standard Model and toward a true unification of physics, mathematics, and information.

Keywords: Relativity, Quantum Mechanics, Complex Analysis, Zeta(s), Planck Units, Probability Theory, Number Theory

1 Introduction

The quest for a truly foundational framework, one that is simultaneously physical, mathematical, and philosophical, has animated inquiry since antiquity. In this work, we begin not with particles or fields, but with the abstraction of movement itself. We postulate that every entity in the universe can be understood as a combination of two fundamental modalities: *translation* (v) and *rotation* (ω), constrained by a maximal limit, the speed of light c, here normalized to unity ($c = 1$).

This framework emerges from a simple insight: energy is fundamentally a temporal phenomenon, and all observed structure - mass, charge and entropy - emerge from specific configurations in the space of motion.

1.1   Motivation

Inspired by principles of symmetry, information theory, and the interplay between linear and angular momentum, this model introduces the "proto-unit": a binary operator space (v, ω) representing translation and rotation probabilities or intensities. The duality of these components mirrors wave-particle duality, and the limit constraint $v^2 + \omega^2 = 1$ evokes a unit-circle geometry suggestive of complex numbers and spinor spaces.

The proto-unit encapsulates the beginning of motion, logic, and temporality - the root informational quanta from which all else may emerge.

2   Definition of the Proto-Unit

2.1   Temporal Root: $\sqrt{1} = 0t$

To formulate a foundational theory of space-time, we begin not with physical measurement, but with pure informational symmetry. The proto-unit is defined as a theoretical square of unit length (side = 1) in the virtual, complex plane—a space of pure potential and temporal logic. This unit square is not spatial, but temporal, informational and relational: a symbolic token of transformation. So we define the proto-unit not physically but informationally. Its root symmetry encodes no spatial displacement, only the capacity for temporal progression:

$$\sqrt{1} = 0t. \tag{1}$$

This implies that unity in this domain produces no extension - only the origin of time itself. Because 1 is the only integer defining itself ($\sqrt{1} = 1$) there is no internal temporal gradient whatsoever ($t = 0$).

2.2   Multi-Aspect Square: Forms of the Proto-Unit

The unit square manifests equivalently across multiple representations:

$$1 = 1^2 = c^2 = v^2 + \omega^2 = (i \cdot \mathrm{Re})^2 = (\sqrt{-1} \cdot \sqrt{1})^2 \tag{2}$$

Whether expressed as a speed limit, a Pythagorean decomposition, or a rotation on the complex plane, the square preserves invariant unity. This equivalence across forms foreshadows a symmetry that governs space-time emergence. Each formulation encodes the same fundamental constraint: that any realization of motion, be it translation or rotation, must reside within this square boundary. This defines the proto-unit as a complex coordinate anchor between spatially-real and temporally-imaginary domains.

2.3   Balanced Dynamics and Constraint Geometry

Within the unit square constraint, we treat motion as a composition of two orthogonal modes: translation v and rotation ω, satisfying $v^2 + \omega^2 = 1$.

Let translation v and rotation ω be equally expressed:

$$v = \omega = \frac{1}{\sqrt{2}} \quad \Rightarrow \quad v^2 = \omega^2 = \frac{1}{2} \tag{3}$$

Inserting into the constraint:

$$v^2 + \omega^2 = \frac{1}{2} + \frac{1}{2} = 1 \tag{4}$$

we confirm that the system remains internally complete and causally bounded. This configuration defines the internal balance point of the proto-unit—its most symmetric, least biased configuration. Observing the unit boundary itself we encounter four sides, each of length 1. That is the event horizon. It exists here in it´s logical quadrature of the unit circle, a line enclosing a plane entirely and exclusively using 1´s. It´s the boundary condition of maximal compression and depending on the number of units dissolving into it, it may grow to truely gigantic scale. The horizon will grow it´s circumference with every bit of information, another 1, dissolved from real values and merging into the boundary as pure temporal potential.

2.4 Curvature Saturation and Gravity

Within the proto-unit framework, the event horizon of a gravitational object corresponds to a spherical configuration of compressed informational units, each carrying a curvature density of maximal value. A Planck-scale black hole is defined as the unit sphere with $r = 1$, containing precisely the minimal configuration (4π) to reach gravitational collapse.
However, this curvature threshold is not limited to small scales. Larger black holes simply scale in proto-unit number, not in curvature intensity. That is, the curvature per proto-unit remains saturated at a maximal level, while the surface area $A = 4\pi r^2$ increases the total number of such units without diminishing their individual curvature value. Algebraically this is just $4n^2$.
This implies a scale-invariant gravitational saturation model, in which:

- Curvature per proto-unit is constant; it defines the local geometric structure.

- Gravitational potential scales with total surface area, proportional to proto-unit count - which is the definition for mass which can only then equal energy.

- Informational compression defines gravitational effect: the number of surface-aligned proto-units determines curvature density.

- Gravitational curvature cannot be reconstructed from summing scalar energy contributions alone, since individual energies may be negative or cancel, while still contributing surface topology.

- Therefore, gravity emerges not from the summed *value* of energy, but from the summed *count* of informational bits embedded in curvature.

This implies: **Gravity is a function of logical structure density**, not energetic valuation. Matter curves space not because of what it "contains," but because of how many distinct proto-interfaces it projects into the curvature field. This model aligns with the holographic principle and black hole thermodynamics, suggesting that gravity emerges not as a continuous field deformation, but as the discrete saturation of spherical logical surfaces. Complexity is reduced under compression, while curvature and gravitational identity are preserved and amplified.

Gravity and Bit Count — Fixed Mass and Diluted Curvature

The mass m of an object is defined as the fixed count of proto-units encoded on its logical holographic surface:

$$m := N_{\text{bits}} = \text{constant} \tag{5}$$

As a Newton observer moves outward, the gravitational field strength experienced is:

$$g(r) \propto \frac{m}{r^2} \tag{6}$$

This inverse-square behavior arises from the dilution of fixed curvature over an expanding observational shell with area A(r):

$$A(r) = 4\pi r^2. \tag{7}$$

The informational density perceived by the observer falls as:

$$\rho(r) \sim \frac{m}{4\pi r^2}. \tag{8}$$

Combining:

$$g(r) = 4\pi \cdot \rho(r) = 4\pi \cdot \frac{m}{4\pi r^2} = \frac{m}{r^2}. \tag{9}$$

This aligns classical gravity with this purely logical field. The observer measures the influence of fixed embedded information diminishing geometrically - not dynamically.

2.5 Defining the Lorentz-like Factor $\widetilde{\gamma}$

In analogy to the Lorentz factor Einstein, 1905; Rindler, 2006 from special relativity, which describes how time and energy transform under velocity with:

$$\gamma = \frac{1}{\sqrt{1 - \frac{v^2}{c^2}}}, \text{ for } v = c, \gamma \to \infty, \tag{10}$$

which we write as:

$$\widetilde{\gamma} = \frac{1}{\sqrt{1 - (\widetilde{v}^2 + \widetilde{\omega}^2)}}, \text{ for } v = \widetilde{c} = 1, \gamma \to \infty, \tag{11}$$

we define a generalized gamma factor that expresses the internal dynamic balance between v and ω.

Assuming $\widetilde{c} = 1$, we may define $\widetilde{\gamma}$ in terms of either component:

$$\widetilde{\gamma} := \frac{1}{\sqrt{1 - v^2}} = \frac{1}{\omega}, \tag{12}$$

or equivalently,

$$\widetilde{\gamma} := \frac{1}{\sqrt{1 - \omega^2}} = \frac{1}{v}. \tag{13}$$

This formulation implies that $\widetilde{\gamma}$ serves as a dimensionless magnification factor that diverges as one component dominates and the other vanishes. In the balanced case, where $v = \omega = \frac{1}{\sqrt{2}}$, we find:

$$\widetilde{\gamma} = \sqrt{2}. \tag{14}$$

Thus, $\widetilde{\gamma}$ is not merely a relativistic scaling constant but reflects the geometric tension between rotational and translational modes of motion in a unified, normalized framework.

2.6 Emergence of $\pi/4$

On the unit quarter-circle, the angle theta (θ) associated with the balanced state is:

$$\theta = \tan^{-1}\left(\frac{\omega}{v}\right) = \tan^{-1}(1) = \frac{\pi}{4} = 45° \tag{15}$$

This angle marks the diagonal of the (v, ω) configuration space. The appearance of $\pi/4$ signals the intrinsic symmetry of temporal-rotational partitioning: space and time share equal operational weight. Rotation in space-time is defining the logical seperation of a temporal "storage" unit. These units stack through the full spectrum of scales. ω and v are relative to their observer. Flat translation to a small observer appears like rotation to a larger one. This is the localization and navigation vector of the real worldline, a logarithmic, fractal spiral, parameterized by (ω, v), the critical line!

3 Zeta Stitching: The Onset of Space-Time

Having defined a unit of logical space and the logical root of temporal potential, we seek now to bind them. The Riemann Zeta Function emerges as a mathematical zipper, interlocking real and imaginary domains—stitching rotation to translation, time to space, potential to reality.
Through the periodic structure of complex exponentials and the analytical continuation of $\zeta(s)$, we conceive of this complex zipper interlacing discrete harmonic domains. Each contribution to $\zeta(s)$ represents a mode in the stitching—curling space and time together via the imaginary axis.

3.1 The Role of the Zeta Function

We introduce the Riemann zeta function $\zeta(s)$ [Edwards, 2001; Titchmarsh, 1986]:

$$\zeta(s) = \sum_{n=1}^{\infty} \frac{1}{n^s}, \quad s = \frac{1}{2} + it \tag{16}$$

Its critical line, at $\text{Re}(s) = \frac{1}{2}$, mirrors our internal proto unit balance condition $v^2 = \omega^2 = \frac{1}{2}$. This resonance suggests that the zeta structure encodes a symmetry of temporal and spatial operation.

It is the diagonal in proto unit space, a geodesic trajectory gamma(γ) along a path naturally created by pure number theoretic logic. The philosophical edge between being and not being, the logical cancelation between 0 and 1. In complex logic space, $0 + 1 \neq 0$, but $0 + 1 \neq 1$ either, instead $0 + 1 = \frac{1}{2}$´ish. It´s a way of expressing, that if you add just 1 bit of information to a balanced number space, you can only make it as far as $+1/2$ and $-1/2$. To extend logic by one integer, we need 2 bits of information. Now, as 0 and 1 reach out to each other they create rotation. The complex plane allows the Re number line not to annihilate itself with opposing values from the positive and negative extensions, but balances the $\pm$potential AROUND ZERO. The motion is around 0 but the trajectory, the equator, is a diagonal at $Re\frac{1}{2}$ in flat logic, a circle with $r = 1/2$, an orbit around 0. The second orbit out in this temporal plane is at 1. It is the boundary condition of the system, the unit circle, the informational event horizon. These two orbits have a distinctive difference to them: The 1 orbit, the perfect **Circle**, never touches the origin, while the **Anti-Circle**, the inner zeta orbit at $Re\frac{1}{2}$ periodically touches 0. It has to - informationally speaking - because $\omega_{Re\frac{1}{2}}$ is constantly shifting between 0 and 1. Omega here is not constant like it is in rotation around the unit circle. $\omega_{e^{i\pi}} = constant$. What makes light so special, is that its oscillation ω is constantly

balanced, but not by real space translation, instead v here is expressed as density oscillation in the direction of travel. The net velocity of light never changes because it exists on that special 1/2 geodesic. It lives in a place of complex projection where reality is logically squished in between $(0 < 1/2 < 1) \cdot i$, on the equilibrium center line of a probabilistic strip spiraling through logical number space. This is the critical strip, or as we came to call it: The Universe.

3.2 The Trajectory - γ from the Perspective of Light

From Riemann we write γ as:

$$\gamma(t) = \zeta(\frac{1}{2} + it) \in \mathbb{C}. \tag{17}$$

Taking derivative:

$$\gamma'(t) = \frac{d}{dt}\zeta(\frac{1}{2} + it) = i \cdot \zeta'(\frac{1}{2} + it) \tag{18}$$

This gives us a tengent vector at each point of the path.
The angle $\Omega(t)$ of this tangent is therefor given as:

$$\Omega(t) = \arg(\gamma'(t)) = \arg(\frac{d}{dt}\zeta(\frac{1}{2} + it)) = i \cdot \zeta'(\frac{1}{2} + it)) \tag{19}$$

3.3 The Proto-Unit as a Zeta Kernel

Each proto-unit can be seen as a localized zeta kernel, resonant with particular values of s on the critical line:

$$s = \frac{1}{2} + i\Omega(t) \tag{20}$$

These inputs align with the balanced v-ω configurations, establishing a domain-specific encoding of reality. The proto-unit thus becomes the smallest stable structure where translation and rotation are zeta-bound.

3.4 Interference, Frequency, and Temporal Granularity

The spacing of zeta zeros along the critical line suggests a natural granularity in the temporal dimension. The interference patterns of stitched proto-units generate oscillatory modes—structures from which frequencies, energies, and quantization may emerge. The foundational beats of time itself are entangled with the rhythm of $\zeta(s)$.

3.5 Proto-Unit Normalization Operator for SI Conversion

To convert between proto-units and SI-units we seek define an operator Ξ(Xi).
We let:

- $\mathbb{S}$ be the set of SI-based measurements (meters, seconds, etc.) and

- $\mathbb{L}$ the logical unit space where with the informational speed limit $\widetilde{c} = 1$,

- where $\mathbb{L} \prec \mathbb{S}$ and

6

- $\widetilde{M}(\theta) = e^{i\pi}$ be a unified motion vector with:
  - $\theta = 0$: purely translational motion $\rightarrow \widetilde{M} = 1 + i0$,
  - $\theta = \frac{\pi}{2}$: purely rotational $\rightarrow \widetilde{M} = 0 + i1$, and
  - $\theta = \frac{\pi}{4}$: balanced motion $\rightarrow \widetilde{M} = \frac{1}{\sqrt{2}}(1 + i)$

We select to flag elements of $\mathbb{L}$ with ~ above. We remember that any parameter with ~ has no SI based units, but is a pure numerical constant.

From complex number theory [Arfken and Weber, 2005] we borrow:

$$z = \frac{1}{\sqrt{2}} + i\frac{1}{\sqrt{2}}, |z|^2 = z \cdot \overline{z} = 1. \tag{21}$$

We say:

$$\text{Reality } \exists \iff 0 + 1 = \left(\frac{1}{\sqrt{2}} + i\frac{1}{\sqrt{2}}\right) \cdot \left(\frac{1}{\sqrt{2}} - i\frac{1}{\sqrt{2}}\right) = 1 \tag{22}$$

We´re expressing how the number space transforms into the binary realm, where every real state requires two complex bits of information if we´re extending the information space by one full square interger unit. After all, when we´re extending the real number space with the complex degree of freedom, we are doubling the informational space.
We write therefor:

$$\Xi(\widetilde{c}) \equiv \left(\frac{1}{\sqrt{2}} + i\frac{1}{\sqrt{2}}\right) \cdot \left(\frac{1}{\sqrt{2}} - i\frac{1}{\sqrt{2}}\right) = (v + i \cdot \omega) \cdot (v - i \cdot \omega) = v^2 + \omega^2 = \frac{1}{2} + \frac{1}{2} = 1, \tag{23}$$

and define the complex motion vector $\widetilde{M}$ as:

$$\widetilde{M}(v, \omega) = \frac{v}{c} + i\frac{\omega}{c}, \text{ with } \left|\widetilde{M}\right|^2 = \left(\frac{v}{c}\right)^2 + \left(\frac{\omega}{c}\right)^2 = 1, \tag{24}$$

with:

$$\widetilde{M_0} = \cos(\alpha) + i\sin(\alpha) \Rightarrow \left|\widetilde{M}\right| = 1 \tag{25}$$

Now we can apply a **unitary rotation**:

$$\widetilde{M}(\theta) = \Xi(\widetilde{c})\widetilde{M_0} = e^{i\pi}(\cos\alpha + i\sin\alpha) = \cos(\alpha + \theta) + i\sin(\alpha + \theta) \tag{26}$$

With this operator we will derive:
velocity:

$$\widetilde{v} = \frac{v}{c} = \frac{\frac{m}{s}}{\frac{m}{s}} = 1, \tag{27}$$

space:

$$\widetilde{x} = \frac{x}{ct} = \frac{m}{\frac{m}{s} \cdot s} = 1, \tag{28}$$

and time:

$$\widetilde{t} = \frac{t}{t} = \frac{s}{s} = 1. \tag{29}$$

In the proto-unit system, SI-units cancel out; space, time and motion become comparable - no seperate units. Every object becomes defined by its c-normalized relation between v and ω.

Application of the Normalization Operator Ξ: We now verify that the operator Ξ performs the advertised transformation: rotating physical quantities into dimensionless proto-units through complex normalization.

Recall the operator is defined as:

$$\Xi(\widetilde{c}) = \left(\frac{1}{\sqrt{2}} + i \cdot \frac{1}{\sqrt{2}}\right) \cdot \left(\frac{1}{\sqrt{2}} - i \cdot \frac{1}{\sqrt{2}}\right) = v^2 + \omega^2 = 1, \tag{30}$$

representing a balanced unitary rotation in the complex motion space, where v and ω are normalized components of translation and rotation, respectively.

Now consider a physical motion vector in SI units:

$$M_{\mathrm{SI}} = v_{\mathrm{SI}} + i \cdot \omega_{\mathrm{SI}}. \tag{31}$$

Here:

$$v_{\mathrm{SI}} = \frac{dx}{dt} \quad [\mathrm{m/s}], \qquad \omega_{\mathrm{SI}} = \frac{d\theta}{dt} \quad [\mathrm{rad/s}]. \tag{32}$$

We want to apply the operator Ξ to M_{SI}, producing a dimensionless vector $\widetilde{M}$ such that:

$$\widetilde{M} = \Xi(M_{\mathrm{SI}}) = \left(\frac{v_{\mathrm{SI}}}{c}\right) + i \left(\frac{\omega_{\mathrm{SI}}}{c}\right), \tag{33}$$

assuming Ξ acts as division by c, consistent with our logical-space constraint $\widetilde{c} = 1$. Now write:

$$v = \frac{dx}{dt} = \frac{1\,\mathrm{m}}{1\,\mathrm{s}}, \qquad \omega = \frac{2\pi\,\mathrm{rad}}{1\,\mathrm{s}}. \tag{34}$$

Then apply normalization:

$$\widetilde{v} = \frac{v}{c} = \frac{1\,\mathrm{m/s}}{3 \times 10^8\,\mathrm{m/s}} = 3.33 \times 10^{-9}, \tag{35}$$

$$\widetilde{\omega} = \frac{\omega}{c} = \frac{2\pi\,\mathrm{rad/s}}{3 \times 10^8\,\mathrm{m/s}} \approx 2.09 \times 10^{-8}. \tag{36}$$

These yield the complex proto-unit motion vector:

$$\widetilde{M} = \widetilde{v} + i \cdot \widetilde{\omega}. \tag{37}$$

Now verify the magnitude:

$$|\widetilde{M}|^2 = \widetilde{v}^2 + \widetilde{\omega}^2 = (3.33 \times 10^{-9})^2 + (2.09 \times 10^{-8})^2 \approx 4.46 \times 10^{-16}. \tag{38}$$

This shows that **only at $v = c$** and **$\omega = 0$** (or vice versa) will $|\widetilde{M}| = 1$. So to rotate a system into **pure proto-unit space**, we require:

$$v^2 + \omega^2 = c^2, \tag{39}$$

so that:

$$\Xi\left(v + i\omega\right) = \frac{v + i\omega}{c} = \widetilde{v} + i \cdot \widetilde{\omega}, \quad \text{with } |\widetilde{M}|^2 = 1. \tag{40}$$

Conclusion: This confirms that Ξ performs an actual **rotation and normalization** of motion in SI space into proto-space, preserving total motion amplitude and recasting physical dynamics as unitless geometric balance. When $|\widetilde{M}| = 1$, the system behaves as a fully normalized proto-state, meaning all physical behavior is captured as **relative orientation** within the (v, ω) complex domain.

3.6 Zeta-State Decoder: Extracting Motion Components from $\zeta(s)$

We hypothesize that the Riemann zeta function evaluated on the critical line,

$$\zeta\left(\tfrac{1}{2} + it\right) = a(t) + i \cdot b(t), \tag{41}$$

encodes the instantaneous internal motion state of a photon or proto-unit system in complex informational space. We interpret the real and imaginary components of this complex value as analogs to translational (v) and rotational (ω) motion components, respectively.

Normalization Assumption: We assume that the internal motion of a photon is governed by the proto-unit constraint:

$$v^2 + \omega^2 = 1.$$

To interpret the zeta value as a normalized proto-motion vector, we define:

$$|\zeta| = \sqrt{a^2 + b^2}, \quad \Rightarrow \quad \widetilde{M}(t) := \frac{a(t)}{|\zeta|} + i \cdot \frac{b(t)}{|\zeta|}. \tag{42}$$

This places the motion vector on the unit circle in the complex plane, with:

$$|\widetilde{M}(t)|^2 = \left(\frac{a}{|\zeta|}\right)^2 + \left(\frac{b}{|\zeta|}\right)^2 = 1. \tag{43}$$

Zeta Decoder Equations: We then define the instantaneous motion contributions as:

$$\omega(t) = \frac{b(t)}{|\zeta(t)|} = \sin\theta(t), \tag{44}$$

$$v(t) = \frac{a(t)}{|\zeta(t)|} = \cos\theta(t), \tag{45}$$

$$\Rightarrow v^2(t) + \omega^2(t) = 1. \tag{46}$$

These quantities represent the internal balance between translational and rotational behavior within the photon's proto-dynamic structure.

Example: Let us consider a sample point on the zeta critical line:

$$t = 14.2 \quad \Rightarrow \quad \zeta\left(\tfrac{1}{2} + 14.2i\right) \approx 0.431 + 0.096i.$$

Then:

$$|\zeta| = \sqrt{0.431^2 + 0.096^2} \approx \sqrt{0.1856 + 0.0092} = \sqrt{0.1948} \approx 0.441,$$

$$\omega(t) = \frac{0.096}{0.441} \approx 0.2178,$$

$$v(t) = \frac{0.431}{0.441} \approx 0.9763.$$

Warning – Don't Confuse Amplitudes with Contributions: The values of v and ω are linear amplitudes, not percentages. To understand how much each component contributes to the motion state, we must square them:

$$\omega^2(t) \approx 0.0475 (\approx 4.75\% rotational),$$

$$v^2(t) \approx 0.9525 (\approx 95.25\% translational).$$

These are the actual proportions that satisfy the unit constraint:

$$v^2 + \omega^2 = 1.$$

Interpretation: At this specific logical height in the zeta function, the internal state of the proto-photon is predominantly translational, with a small rotational contribution. This balance oscillates constantly between 0 and 1 as t varies - ω is constantly accelerating or decelerating in an intrinsic motion rhythm encoded within the zeta structure. v, the translational motion is expressed through density pulsing. We are describing a path in logic space - not real space - so the real velocity v is c, the speed of light and it´s constant. In our example the probability density is at 95.25%, with 4.75% "uncertainty" - clarity lost in rotational velocity.

Only when $\omega = 0$ can the translational density be 100% - either through collapse or very briefly during a zeta´s zero crossing. If this mapping is physically valid, then the imaginary component of $\zeta(s)$ acts as a signal of rotational participation, and the real component signals translational extent, consistent with the proto-unit geometry defined by:

$$\widetilde{M} = \cos(\theta) + i\sin(\theta), \quad \text{with } \theta(t) \in [0, 2\pi].$$

4 Unified Field Equation

From the proto-unit infused with a zeta core and stripped from units, ready to directly converse between space-time and motion we can now attempt building the skeleton for a unified field equation, able to host reality. Something like:

$$Reality(x, t, v, \omega) = \sum_{n=1}^{\infty} \left(\frac{1}{n^{\frac{1}{2}+i\cdot\Omega(v,\omega)}}\right) \times e^{i\cdot\Theta(n,t)} \times \Lambda(n,t), \tag{47}$$

where:

- the $\sum_{n=1}^{\infty}$ counts the ongoing infinite sequence of building steps,

- $(1/n^s)$ makes every step a compressed oscilliatory unit with $\Omega(v,\omega)$ recording the chaotic local time dependent phase shift, the maximally unpredictable state of balance at $Re(1/2)$,

- $e^{i\cdot\Theta}$ tracking cumulative rotational motion through time (ticks),

- and $\Lambda(n,t)$, the local temporal density modifier, regulating expansion and contraction against the external potential field.

If the proto-unit is the stitched kernel of balance between space and time, then the emergence of structure may follow from symmetry-breaking configurations of these proto-units. The balance point at $v = \omega = 1/\sqrt{2}$ defines a perfectly symmetric proto-unit—but in a universe of interactions, pure balance is rare. Local variations in v and ω create anisotropies: directional preferences that give rise to charge, spin, mass, or entropy. A chain of stitched proto-units, each slightly biased away from the $\pi/4$ balance point, can propagate structure through interference. Just as a standing wave emerges from constructive oscillations, a proto-geometry may arise from temporal-spatial patterns of imbalance. Gravity, in this view, is not a force but a curvature in the stitching density—space-time folds more tightly where the proto-units lean heavily toward either rotation or translation. The flattest geodesic in this manifold is zeta´s critical line, the photonic equilibrium. Structure is not imposed on space-time by forces, but emerges from how proto-units break symmetry together.

4.1 Energy Equivalence and Zeta-Photon

First, we derive $\hbar$ from proto unit logic as a bridge between:

- Energy E and

- Angular frequency $\omega = 2\pi v$.

From quantum physics we know:

$$E = \hbar\omega, \hbar \text{ in SI-units: } \hbar = \frac{kg \cdot m^2}{s}, \tag{48}$$

but because in our model:

$$E = mc^2 = \widetilde{v}^2 + \widetilde{\omega}^2 = 1, \tag{49}$$

$\hbar$ must emerge from unit conversion between angular motion and energy.
Hence, when $\widetilde{t} = 1$ (temporal tick):

$$E = \hbar \cdot \omega = \frac{1}{2\pi} \cdot 2\pi = 1 \tag{50}$$

We postulate therefor:

$$\boxed{\widetilde{\hbar} = \frac{1 \text{ proto-energy unit}}{2\pi \text{ proto-angular cycles}} = \frac{E_{unit}}{\omega_{unit}} = \frac{\widetilde{E}}{\widetilde{\omega}}} \tag{51}$$

So, we can think of $\hbar$ flipping it´s identity, canceling it´s units, and crystallizing it´s true form $\widetilde{\hbar}$ - a conversion factor between proto-motion geometry and measured physics of time.

Now, we may continue from Einsteins foundation and derive:

$$E = E_v + E_\omega, \tag{52}$$

with translational energy:

$$E_v = \gamma mc^2, \tag{53}$$

and rotational energy:

$$E_\omega = \hbar\omega. \tag{54}$$

Now we recall:

$$\widetilde{v} = \frac{v}{c}, \tag{55}$$

and:

$$\widetilde{\omega} = \frac{\omega}{c}, \tag{56}$$

such that the total logical motion is expressed as:

$$\widetilde{v}^2 + \widetilde{\omega}^2 = 1. \tag{57}$$

Hence we define a new normalized energy function:

$$E = mc^2(\widetilde{v}^2 + \widetilde{\omega}^2) = mc^2 \cdot 1 = mc^2. \tag{58}$$

This is the energetic boundary condition of space-time Albert Einstein already acknowledged. The physical encapsulation of motion, temporal potential within a perfect circular boundary, closing around zero and one. Riemann recognized the pivot point, the critical line and this framework is

attempting to connect them logically.

When:

$$\widetilde{v}^2 = \widetilde{\omega}^2 = \frac{1}{\sqrt{2}}, \tag{59}$$

the energetic components become:

$$E_v = mc^2 \cdot \widetilde{v}^2 = mc^2 \cdot \frac{1}{2}, \tag{60}$$

and:

$$E_\omega = mc^2 \cdot \widetilde{\omega}^2 = mc^2 \cdot \frac{1}{2}, \tag{61}$$

so we can recall the path as $\gamma(t)$:

$$\widetilde{\gamma}(t) = \zeta(\frac{1}{2} + it). \tag{62}$$

If we take:

- $\arg \widetilde{\gamma}(t)$; recording angular displacement or phase direction and

- $|\widetilde{\gamma}(t)|$; the probability amplitude,

then we may model an energetic photon along zeta´s path:

$$\widetilde{\gamma}(t) = c \cdot e^{i \arg \zeta(\frac{1}{2}+it)} \cdot f(|\zeta|). \tag{63}$$

In classical view, the photon is constantly traversing the boundary condition as pure translation through space and not moving in time. But, in reality we experiment with photons all the time, obviously they are present now and a second from now. Hence we assume that the photon is indeed moving through space **and** time. In this zeta balanced view, it´s traversing a completely virtual, yet highly efficient geodesic through $Re1/2$, experiencing neither time nor space, yet both (the differentiation here feels more philosophical then physical to me and I leave it for the reader to answer).

At the critical line exists no preference to either pole, 0 or 1, such that there can exist total equilibrium. Concepts like force or inertia don´t exist on this path, because it is not physical, but informational. It operates on probabilistic densities and motion in complex number space. The maximal amplitude in a sin-cos type oscillation experiences extreme logic space compression toward maximal amplitude (0°, 90°) and in real spiral freedom, the wave is actually constantly following the boundary condition maximal amplitude. It is constantly maximized, constantly at $\sum = 1$ state. It´s rotational velocity is constantly shifting and to balance the equation, it´s translational density is constantly pulsing, but despite this extreme energetic effort, it´s total velocity can never change, because it is not able to overcome the density in informational space. It does not accept external informational bias from either space or time. It remains tightly locked on this informational geodesic carved by zeta.

The geodesic itself may be subject to constant external deformation of the real space and bend trajectory accordingly, but from the informational space perspective the geodesic holds firm.

5   Deriving the Fine Structure Constant α from Proto-Unit Logic

From here, we will attempt to illuminate forces, starting with the electromagnetic force. To understand it we call the fine structure constant α [Dirac, 1931; Jackson, 1998] given as:

$$\alpha = \frac{e^2}{4\pi\epsilon_0 \hbar c} \approx \frac{1}{137.035999}, \tag{64}$$

where;

- ϵ_0 is the vacuum permittivity of electric fields and

- e is the elementary charge.

Using our $\widetilde{\hbar} = 1/2\pi$ we write:

$$\alpha = e^2 \cdot \frac{2\pi}{4\pi\epsilon_0} = \frac{e^2}{2\epsilon_0}. \tag{65}$$

here we recover the logical proto square of 1unit charge e^2, divided by the vacuums ability for information exchange.
ϵ_0 is reflected in SI as:

$$\epsilon_0 = \frac{1}{\mu_0 c^2}, \tag{66}$$

with μ_0 the magnetic constant.
We rewrite α:

$$\alpha = \frac{e^2 \mu_0 c^2}{2} = \frac{e^2 \mu_0}{2}. \tag{67}$$

If we define a proto-electromagnetic system with e^2 as a unit charge interaction and μ_0 as the logical vacuum resistance to electro-magnetic conversion, then $\widetilde{\alpha}$ is literally the vacuum transfer function for electric energy. We can think of it as a "transparency constant" for electric logic to form physical light.

Suppose the proto electic charge unit $\widetilde{e^2} = 1$ and the proto vacuum permeability is defined by the geometric factor of the unit sphere as 4π steradians, then:

$$\widetilde{\alpha} = \frac{1}{4\pi}. \tag{68}$$

The famous $\frac{1}{137}$ arises when we scale the proto charge down to $\widetilde{e}$:

$$\widetilde{e} \approx \sqrt{\frac{1}{137 \cdot 4\pi}}, \tag{69}$$

such that the actual charge e becomes a projection of a unit proto-charge $\widetilde{e}$ on the sphere of interaction:

$$\widetilde{e^2} = \widetilde{\alpha} \cdot 4\pi \tag{70}$$

Therefor we infer that charge is not fundamental, but a reflection of topological coupling strength through the vacuum.

6   Deriving the Gravitational Constant G from Proto-Unit Logic

In SI units:

$$G = \frac{L^3}{MT^2} = \frac{m^3}{kg \cdot s^2} \tag{71}$$

Meaning: it scales energy per distance per time². But in proto logic, time and space are entangled, and energy is rotational so we guess:

$$G = \frac{1}{M_{Plank}^2} \tag{72}$$

13

with the Plank Mass M_P:

$$M_P \approx \sqrt{\frac{\hbar c}{G}}, \tag{73}$$

we write in proto units:

$$G = \frac{\widetilde{\hbar}\widetilde{c}}{M_P^2} \Rightarrow \text{ if } \widetilde{\hbar} = \frac{1}{2\pi}, \widetilde{c} = 1, \text{ then:} \tag{74}$$

$$\boxed{\widetilde{G} = \frac{1}{2\pi M_P^2}}. \tag{75}$$

So, G looks like the gravitational permeability of the vacuum in the same way ϵ_0 is the electic one.

7 Deriving the Boltzmann Constant k_B from Proto-Unit Logic

Boltzmann's entropy equation [Reif, 1965; Shannon, 1948] relates thermodynamic entropy S to the number of accessible microstates W.
It is given as:

$$S = k_B \cdot \ln W. \tag{76}$$

where:

- S = entropy in Joules/Kelvin

- W = number of microstates

- ln = natural logarithm base e

- k_B = scaling constant that converts log counting into energy per temperature

But in proto units energy, time and frequency are 1:1 interchangeable and information (logarithmic state count) and entropy are unitless measures. So we define:

$$k_B \approx \frac{E}{\ln W} \rightarrow k_B = \text{energy per nat of entropy} \tag{77}$$

In proto units, we normalize temperature such that $\widetilde{T} = 1$.
This implies:

$$E = k_B T \quad \Rightarrow \quad \widetilde{E} = \widetilde{k_B}. \tag{78}$$

So the Boltzmann constant becomes a direct measure of the energy per unit of entropy.

To determine its proto-unit value, we reinterpret k_B in terms of information.
Recall Shannon entropy:

$$H = -\sum_i p_i \log p_i, \tag{79}$$

which becomes equivalent to thermodynamic entropy when multiplied by k_B:

$$S = k_B H. \tag{80}$$

Now, we assume a spherical state space where $W = 4\pi$, the number of distinguishable proto-units on a unit sphere. Each state occupies an area $\frac{1}{4\pi}$, and thus its information content is:

$$\ln\left(\frac{1}{4\pi}\right) = -\ln(4\pi). \tag{81}$$

If we take the entropy per proto-unit to be $S = 1$ (i.e., one nat of uncertainty), then solving for k_B we can write:

$$k_B = \frac{S}{\ln W} = \frac{1}{\ln(4\pi)}. \tag{82}$$

$$\boxed{\widetilde{k_B} = \frac{1}{\ln(4\pi)}} \tag{83}$$

Hence, the Boltzmann constant in proto units emerges as the reciprocal of the information capacity (in nats) of a spherical configuration space with 4π distinguishable states.

In proto units entropy is unitless, energy is fundamental and temperature is a relational curvature between state probabilities, such that k_B appears to encode the energy gradient per unit of logical uncertainty.

8 Deriving Planck Units

Using our new $\widetilde{c}, \widetilde{\hbar}, \widetilde{G}, \widetilde{k_B}$ we try to derive Planck units [Griffiths, 2018; Rovelli, 2004] from first principle.

- Planck Mass m_P
  From:

$$G = \frac{1}{2\pi m_P} \Rightarrow m_P = \frac{1}{2\pi G} \tag{84}$$

  In proto units:

$$\boxed{m_P = \frac{1}{2\pi G} = \frac{1}{2\pi l_P}} \tag{85}$$

- Planck Length l_P In SI:

$$l_P = \sqrt{\frac{\hbar G}{c^3}} \tag{86}$$

  In proto units:

$$l_P = \sqrt{\frac{\frac{1}{2\pi} \cdot \frac{1}{2\pi m_P^2}}{1}} \Rightarrow \boxed{l_P = \frac{1}{2\pi m_P}} \tag{87}$$

  Planck length is the inverse curvature radius of a unit mass m_P in unit-spin geometry.

- Planck Time t_P
  In SI:

$$t_P = \sqrt{\frac{\hbar G}{c^5}} \tag{88}$$

In proto units:

$$t_P = l_P(\text{since c=1}) \Rightarrow \boxed{t_P = l_P = \frac{1}{2\pi m_P}} \tag{89}$$

Space ant´ time unify at the Planck scale and under $c = 1$, a unit of time equals a unit of length: one quantum tick corresponds to one quantum step.

- Planck Temperature T_P In SI:

$$T_P = \frac{m_P c^2}{k_B} \Rightarrow \frac{m_P}{k_B} \tag{90}$$

In proto units:

$$T_P = \frac{m_P}{\frac{1}{\ln(4\pi)}} \Rightarrow \boxed{T_P = m_P \cdot \ln(4\pi)} \tag{91}$$

Planck temperature encodes mass curvature multiplied by the entropy surface count of a sphere.

- Planck Energy E_P
  Standart:

$$E_P = m_P c^2 \tag{92}$$

So:

$$\boxed{E_P = m_P} \tag{93}$$

Energy and mass are equivalent and their real space expansion factor c^2 is normalized in logic space.

Final Postulate: Irreducibility of the Action-Curvature Relation

The foundational expression of reality is given by the normalized quantum of action:

$$\widetilde{\hbar} = \frac{1}{2\pi} = \frac{\widetilde{M}}{\widetilde{\omega}} \tag{94}$$

This represents the irreducible logical unit of curvature action — one energy quantum distributed over one full rotational phase cycle. When all dimensional constants are normalized under maximal compression, the Proto-Planck length, time, and mass become unity:

$$\widetilde{l_P} = \widetilde{t_P} = \widetilde{m_P} = 1 \tag{95}$$

This defines the maximal curvature compression state of a proto-spherical unit — the logical atom of space-time. No further reduction is possible. All observed physical diversity is a variation of this singular informational geometry.

Thus, reality is completely modelable by curvature logic over this normalized surface. There is nothing more fundamental than this relation. All other theories, including the Standard Model, are emergent syntactic patterns built on this irreducible seed.

9 Deriving the Schrödinger Equation

The next logical extension of the proto-theory involves the emergence of quantum mechanical wave behavior from surface-based informational curvature. To this end, we reinterpret the Schrödinger equation entirely in proto-units, consistent with our prior postulates:

- Action is defined as $\hbar = \frac{1}{2\pi}$,
- Mass is normalized: $m = 1$,
- The speed of light is a geometric constant: $c = 1$,
- Energy is understood as curvature density per logical rotation.

9.1 Time-Dependent Schrödinger Equation in Proto-Units

We begin with the standard time-dependent Schrödinger equation:

$$i\hbar\frac{\partial \Psi}{\partial t} = \left[-\frac{\hbar^2}{2m}\nabla^2 + V(x)\right]\Psi \tag{96}$$

In proto-units, where $\widetilde{\hbar} = \frac{1}{2\pi}$ and $m = 1$, this becomes:

$$\frac{i}{2\pi}\cdot\frac{\partial \Psi}{\partial t} = \left(-\frac{1}{8\pi^2}\nabla^2 + V(x)\right)\Psi \tag{97}$$

Multiplying both sides by 2π, we obtain a cleaner form:

$$i\frac{\partial \Psi}{\partial t} = \left(-\frac{1}{4\pi}\nabla^2 + 2\pi V(x)\right)\Psi \tag{98}$$

This expression is a direct translation of probabilistic curvature dynamics into the proto-logic framework. The wavefunction Ψ represents the probability amplitude of encountering proto-units across an informationally curved spatial surface. Energy and phase are not abstract quantities but are literal projections of bit-rotation per unit curvature.

9.2 Time-Independent Proto-Schrödinger Equation

We now consider the time-independent case for stationary states. Assuming $\Psi(x,t) = \psi(x)e^{-iEt}$, the time-independent proto-Schrödinger equation becomes:

$$E\cdot\psi(x) = 2\pi V(x)\cdot\psi(x) - \frac{1}{4\pi}\cdot\frac{d^2\psi(x)}{dx^2} \tag{99}$$

This describes how spatial probability curvature (expressed through the Laplacian) interacts with the potential field $V(x)$, all within the curvature-normalized framework.

9.3 Solution for Free Particle

In the free particle case, we take $V(x) = 0$, yielding:

$$E \cdot \psi(x) = -\frac{1}{4\pi} \cdot \frac{d^2 \psi(x)}{dx^2} \tag{100}$$

Rewriting:

$$\frac{d^2 \psi(x)}{dx^2} + 4\pi E \cdot \psi(x) = 0 \tag{101}$$

Letting $E = \frac{k^2}{4\pi}$, we recover the standard quantum oscillation:

$$\frac{d^2 \psi(x)}{dx^2} + k^2 \cdot \psi(x) = 0 \tag{102}$$

General solution:

$$\psi(x) = A\cos(kx) + B\sin(kx) \tag{103}$$

This solution mirrors the familiar free-particle wavefunction - now interpreted as curvature-based oscillation of embedded proto-unit probability across logical space. The wave number k defines energy as $E = \frac{k^2}{4\pi}$, linking curvature frequency directly to informational energy density.

Interpretation

The Schrödinger equation, re-expressed in proto-geometry, becomes a law of informational flow. It describes how the probability of bit-surface overlap unfolds in time and space under logical curvature constraints. Rather than an abstract formalism, it now functions as a direct manifestation of curvature density and logical potential across the proto-spherical holographic field.

10 Entanglement as Shared Logical Geodesics

Quantum entanglement, often interpreted as a non-local probabilistic phenomenon, is here reinterpreted as a geometric and informational condition: a constraint of logical coherence across a shared curvature surface. Within the proto-theory framework, all particles are projections of curvature-bound proto-units across a spherical logical horizon. Entanglement emerges not from "spooky action at a distance," but from topological continuity - specifically, the conservation of shared phase trajectories (geodesics) in informational space.

10.1 From State Independence to Logical Binding

In conventional quantum mechanics, a separable state between two systems A and B is represented by a direct product of wavefunctions:

$$\Psi(x_1, x_2) = \psi_A(x_1) \cdot \psi_B(x_2) \tag{104}$$

An entangled state, by contrast, cannot be factored into individual components:

$$\Psi(x_1, x_2) = \frac{1}{\sqrt{2}} \left[\psi_+(x_1)\psi_-(x_2) + \psi_-(x_1)\psi_+(x_2) \right] \qquad (105)$$

This state represents a logical symmetry — not interaction or signaling. The two wavefunctions are not independent entities, but endpoints of a single, distributed curvature resonance. In the proto-framework, we now reinterpret this entire phenomenon geometrically.

The Proto-Geometric View of Entanglement

We consider two proto-units, A and B, located on a shared informational sphere of radius r, with angular positions θ_1 and θ_2. Their combined proto-state is defined over the curvature surface as:

$$\Psi(\theta_1, \theta_2) = \frac{1}{\sqrt{2}} \left[\psi_+(\theta_1)\psi_-(\theta_2) + \psi_-(\theta_1)\psi_+(\theta_2) \right] \qquad (106)$$

Here:

- $\psi_\pm(\theta)$ are surface eigenmodes of the logical curvature — representing complementary phase configurations of embedded proto-bits,

- The $\pm$ labels correspond not to spin, but to phase chirality along the zeta-critical geodesic (balance line $\mathrm{Re}(s) = \frac{1}{2}$),

- These functions obey the condition:

$$\psi_+(\theta) = \psi_-(\theta + \pi)$$

  meaning they are angularly antipodal: mirrored across the core logic axis.

10.2 Geodesic Constraint and Conservation

The condition for entanglement is now expressed not in terms of superposition, but in shared topology:

$$\theta_1 + \theta_2 = \pi \pmod{2\pi} \qquad (107)$$

This ensures both particles lie on the same great-circle logic line — i.e., the same embedded geodesic in the informational curvature field.

Furthermore, the total probability amplitude across this path is conserved:

$$|\Psi(\theta_1, \theta_2)|^2 = \text{constant} \qquad (108)$$

This implies that any observation (measurement) does not alter the global state — it simply reveals one node on a standing curvature wave. What appears as instantaneous "collapse" is actually the observer aligning their informational coordinate frame with one phase point of a globally defined bit field.

10.3 Philosophical Implication

Entanglement, in this model, is not a physical phenomenon but a logical one. It is the conservation of phase symmetry across a shared informational horizon. No information travels between entangled systems because no separation exists in logic space. They are not two objects, but two projections of one curvature-defined frequency mode.

In this way, entanglement becomes not a challenge to causality, but a deeper form of coherence - a manifestation of curvature alignment at the most fundamental level.

11 Bell-Type Correlations and Shared Logical Geodesics

One of the most important challenges to any realist or deterministic framework is the Bell inequality. Experimental violations of Bell-type inequalities are widely interpreted as evidence against local realism and in favor of either quantum indeterminism or non-locality. The proto-theory offers a third interpretation: that entangled systems are projections of a unified logical surface, and that Bell violations are the natural result of angular curvature relationships on this shared informational manifold.

11.1 Entanglement on a Shared Curvature Field

As established in previous sections, entangled proto-units are not independent objects, but distributed resonant modes on a shared logical geodesic. Their physical separation in 3D space is irrelevant to their informational connection.

Let detectors A and B be oriented along angles a and b on a spherical holographic surface. These angles select rotational slices (phase cross-sections) of a single, globally conserved curvature wavefunction.

The joint state of the entangled pair is encoded as a non-separable logical object, with measurement outcomes correlated by geodesic curvature offsets.

Correlation Function from Curvature

Define the correlation between measurement outcomes at orientations a and b as:

$$C(a, b) = -\cos(\theta_{ab}) \tag{109}$$

where $\theta_{ab} = a - b$ is the angular separation between the detectors on the logical curvature surface.

This expression arises naturally from the phase difference between two local tangent frames on a globally entangled surface. It does not require hidden variables, signaling, or probabilistic assumptions. It is simply the cosine of the angular arc between two geodesically-linked projection axes.

11.2 Violation of the Bell Inequality

Using the CHSH form of the Bell inequality, define:

$$S = C(a, b) + C(a, b') + C(a', b) - C(a', b') \tag{110}$$

In classical local hidden-variable theories, the absolute value is bounded:

$$|S| \leq 2 \tag{111}$$

However, using the proto-geodesic correlation:

$$C(x, y) = -\cos(x - y) \tag{112}$$

we can choose measurement settings (e.g., $a = 0°$, $a' = 90°$, $b = 45°$, $b' = 135°$) and obtain:

$$|S| = 2\sqrt{2} \tag{113}$$

This matches the quantum prediction and all experimental data — but is derived here purely from deterministic curvature logic.

11.3 Interpretation

In the proto-theory, Bell inequality violation does not imply action at a distance. It reflects the fact that the entangled particles are not separate systems at all. They are local expressions of a single global bit field, constrained by surface curvature geometry.

Measurement does not "collapse" a wavefunction. It reveals a local projection of a globally consistent logical geodesic. Bell-type outcomes are thus explained as deterministic correlations arising from angular resonance symmetry on the informational manifold.

12 Axioms of Zeta-Geometric Curvature and Information

Axiom 1: Proto-Units as Foundational Logical Structures

A *proto-unit* is defined as a discrete logical structure corresponding to the square of a natural number n^2. Each proto-unit encodes a unit of spatial logic and curvature potential. The totality of proto-units indexed by $n \in \mathbb{N}$ forms the logical substrate of emergent space-time.

Axiom 2: Structural Curvature Spectrum

The curvature contribution $\mathcal{C}_\circ$ of all proto-units is finite and expressed through the Basel summation:

$$\mathcal{C}_\circ = \sum_{n=1}^{\infty} \frac{1}{n^2} = \frac{\pi^2}{6}$$

This sum defines a bounded curvature field and establishes the harmonic curvature constraint for an infinite set of proto-units embedded in space. The result aligns with classical spherical symmetry and suggests that physical reality is finite in curvature despite infinite logical complexity.

Axiom 3: Informational Depth Divergence

The informational entropy $\mathcal{I}_\circ$ associated with proto-units grows without bound, defined by:

$$\mathcal{I}_\circ(N) = \sum_{n=1}^{N} \log(n) \qquad \lim_{N \to \infty} \mathcal{I}_\circ(N) = \infty$$

While curvature saturates, the logarithmic cost of recursive logical subdivision diverges. This establishes the proto-framework's foundational asymmetry: space is curvature-bounded, but information is logically unbounded.

Axiom 4: Zeta-Geodesic Equilibrium

The critical line of the Riemann zeta function,

$$\mathrm{Re}(s) = \frac{1}{2},$$

is interpreted as the equilibrium geodesic in complex logic space. It represents the dynamic balance point between deterministic structure (Re $s = 1$) and pure divergence (Re $s = 0$). Along this critical geodesic, the universe's logical structure collapses into probabilistic expression — encoding curvature, time, and quantum behavior.

Axiom 5: Temporal Potential as Irrational Residue $\delta_\circ$

The irrational offset

$$\delta_\circ = \pi - 3 \approx 0.14159\ldots$$

is postulated to represent the fractal potential embedded within spherical curvature. This infinitesimal yet irreducible remainder enables recursive subdivision and informational depth within the structure of space-time. It serves as the gateway to scale invariance, self-similarity, and internal nesting.

Postulate: The Reality Line as Logical Operation

Reality is not anchored on a conventional real or complex line. Instead, it emerges along a logical axis that balances between 0 and 1. This axis is governed by the behavior of zeta-series and weighted by inverse-square structure and logarithmic information. The point $\mathrm{Re}(s) = \frac{1}{2}$ is interpreted as the zone of maximal equilibrium — neither fully deterministic nor fully divergent — and serves as the defining operator of emergent physicality.

Consequence: Mathematical Reality is Structurally Informational

From these axioms we conclude:

- Geometry arises from the convergence of infinite logic under curvature bounds.
- Time and temporal potential emerge from asymmetries introduced by irrational curvature residue.
- Mass and gravity reflect structural states of curvature compression.
- Information content increases logarithmically through recursive nesting, independent of spatial scale.

Reality is not built from things, but from patterns. These patterns are mathematical, recursive, and curved. Their symmetries are imperfect only enough to allow diversity. And that imperfection — encoded in irrational constants like π and balance points like $\frac{1}{2}$ — is what allows logic to become life.

13 Conclusion

Reality must exist in a probabilistic state between 0 and 1. Everything emerges along the logic formed by complex information between rotation and translation, creating extension and self-containment of time and space.

Everything emerges from 0+1...

$$0 + 1 = 1^2 = c^2 = v^2 + \omega^2 = (i \cdot \mathrm{Re})^2 = (\sqrt{-1} \cdot \sqrt{1})^2 = S^2 = r^2 = e^2 = T_{emp}^2 = T_{ime}^2 = \mathbf{1} \neq 42$$

Every logical relation in space-time has a root square = 1.
This is the living root of unity.

14 Epilogue - Future Work

I´m actively working on this and seeking cooperation and exchange...which for the past month has been exactly zero :/ ..there has to be someone out there willing to talk to me..?!

Trick Question: How do you cut a perfect square into two perfectly symmetrical pieces?
(Hint: triangles and rectangles are not symmetrical :p)

Youneedtocutalongthecriticallineandpleasesemailmeifyoufindthescissors:christian.herborn@googlemail.com (:

References

Arfken, G. B., & Weber, H. J. (2005). *Mathematical methods for physicists* (6th). Elsevier.

Dirac, P. A. M. (1931). Quantised singularities in the electromagnetic field. *Proceedings of the Royal Society A*, *133*(821), 60–72.

Edwards, H. M. (2001). *Riemann's zeta function*. Dover Publications.

Einstein, A. (1905). *Zur elektrodynamik bewegter körper* (Vol. 322).

Griffiths, D. J. (2018). *Introduction to quantum mechanics* (3rd). Cambridge University Press.

Jackson, J. D. (1998). *Classical electrodynamics* (3rd). Wiley.

Reif, F. (1965). *Fundamentals of statistical and thermal physics.* McGraw-Hill.

Rindler, W. (2006). *Relativity: Special, general, and cosmological.* Oxford University Press.

Rovelli, C. (2004). *Quantum gravity.* Cambridge University Press.

Shannon, C. E. (1948). A mathematical theory of communication. *Bell System Technical Journal, 27*(3), 379–423.

Titchmarsh, E. C. (1986). *The theory of the riemann zeta-function.* Oxford University Press.