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Birth of Spacetime: The Feldt-Higgs Universal Bridge (F-HUB) Theory, Part One - A Universal Informational Framework for Mass, Gravity and Entropy

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ABSTRACT: For over a century, physics has been divided between General Relativity, which describes gravity as spacetime curvature, and Quantum Mechanics, which governs subatomic probabilities. Despite their success, these frameworks remain fundamentally disconnected. The Feldt-Higgs Universal Bridge (**F-HUB**) introduces a new paradigm that bridges these gaps, proposing that spacetime, mass, and gravity are not fundamental properties but emergent effects arising from structured quantum information. Building on principles such as the Holographic Principle, black hole thermodynamics, and quantum information theory, F-HUB links entropy growth, mass-energy interactions, and the informational structure of reality in a cohesive framework. By reinterpreting mass as an emergent property of energy stabilised by quantum information, and gravity as an entropic effect rather than a fundamental force, F-HUB challenges the need for dark matter and dark energy. The master equation derived in this theory is dimensionally consistent and testable, offering pathways for experimental verification. This work redefines foundational physics through an informational framework, offering a unified approach that aligns with the latest research in QM, thermodynamics, and relativity.

KEYWORDS: Mass generation; Gravity; Entropy; Higgs mechanism; Informational theory; Theoretical physics, New universal framework, F-HUB theory, Emergent property.

1. INTRODUCTION

"And God said, 'Let there be light,' and there was light." — *Genesis 1:3 (NIV)*

But before there was light, there had to be mass. Before there was mass, there had to be structure. And before structure could exist, there had to be information. For over a century, modern physics has been dominated by two foundational theories. General Relativity (**GR**) describes gravity as the curvature of spacetime [1], while Quantum Mechanics (**QM**) governs the probabilistic interactions of subatomic particles [2]. Each has been confirmed through precise experiments. Yet, these two frameworks remain fundamentally incompatible—unable to unify into a single, coherent model of reality [3]. This disconnection raises deep and unresolved questions:

- Is spacetime truly fundamental?
- Is mass an intrinsic property, or does it emerge from deeper principles?
- What role does information play in the architecture of reality?

1.1 The Challenge of Unification

GR and QM operate in separate domains: GR governs the macroscopic, cosmic scale, while QM governs the microscopic quantum world. However, attempts to unify them have repeatedly fallen short. The Standard Model explains how particles acquire mass via the Higgs mechanism [4], yet it does not naturally incorporate gravity. Conversely, approaches such as String Theory [5] and Loop Quantum Gravity [6] introduce speculative dimensions or quantised spacetime, but these lack empirical support.
F-HUB responds to this challenge by offering a new paradigm.

1.2 The Feldt-Higgs Universal Bridge Framework

F-HUB proposes that mass, gravity, entropy, and spacetime are not fundamental properties, but emergent features arising from structured quantum information. Drawing from:

- The Holographic Principle, which suggests that three-dimensional reality can be encoded on a two-dimensional boundary [6],
- Black Hole Thermodynamics, which treats entropy as a key structural element of spacetime [1, 3],
- And Quantum Information Theory, which reimagines reality as an encoded information system [13].

F-HUB introduces a coherent framework where entropy, mass-energy interactions, and spacetime structure all arise from information. The core predictions of F-HUB are:

- Mass emerges from quantum information interacting with the Higgs Field [5];
- Gravity is not a force, but an entropic effect arising from information structuring spacetime [10];
- Entropy is not disorder—it is the fundamental process that configures spacetime [1];
- Spacetime is not a backdrop—it is an emergent construct shaped by quantum informational dynamics [6, 11].

Unlike speculative frameworks that rely on unobservable dimensions or exotic particles, F-HUB stays grounded in known physics—recasting it through the lens of information.

1.3 Birth Equation

At the heart of F-HUB lies a single, unifying equation that links mass, entropy, gravity, and information:

$$\boldsymbol{S} = \frac{\boldsymbol{H'} \cdot \boldsymbol{M} \cdot \boldsymbol{k_B} \cdot \boldsymbol{\alpha}}{\boldsymbol{c^3}},$$

where:

- S = Entropy (Joules per Kelvin, J/K), representing structured spacetime information.
- H '= Higgs Field Contribution, defined as energy density-like term.
- M = Mass (kg), the emergent effect of structured quantum information.
- k_B = Boltzmann's Constant (J/K), ensuring thermodynamic consistency.
- α = Unified Scaling Factor (dimensionless), encoding entropy, curvature, and quantum information density.
- c^3 = Relativistic Scaling Factor (m^3/s^3), maintaining compatibility with relativity.

This equation captures the fundamental relationship between quantum information, entropy, and spacetime structure.

1.4 Significance and Contributions

By reinterpreting mass as an informational effect, and gravity as an entropy-driven consequence, F-HUB offers a dimensionally consistent and experimentally testable alternative to the standard cosmological model. It suggests that the expansion of the universe and gravitational dynamics may be explained without invoking dark matter or dark energy [10].

The contributions of this work are threefold:

A. It establishes a mathematical link between information, entropy, and spacetime;
B. It provides a framework that can be tested, simulated, and falsified;
C. It unifies thermodynamics, quantum theory, and relativity under a single informational paradigm.

2. MATERIALS AND METHODS

F-HUB is a theoretical framework grounded in mathematics, not empirical field data. Its validation, therefore, depends on computational modelling and dimensional analysis. To ensure the internal coherence of its central equation and physical assumptions, three independent verification methods were employed:

- A symbolic computation solver, specialising in algebraic structuring and entropy scaling;
- A Python-based numerical physics engine, designed for high-precision thermodynamic validation;
- A neural-assisted symbolic processor, used to verify multi-variable tensor relationships and ensure consistency with quantum informational principles.

Each of these models confirmed the dimensional consistency and predictive stability of the F-HUB Master Equation. This multi-method approach strengthens the theory's mathematical rigour and encourages reproducibility. Researchers are invited to independently verify the results using similar solvers or custom computational setups.

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2.1 Symbolic Computation and Dimensional Analysis

The first layer of validation focused on ensuring that each term in the F-HUB Master Equation aligns with the Système International (**SI**) base units. This involved a detailed term-by-term analysis of:

$$S = \frac{H' \cdot M \cdot k_B \cdot \alpha}{c^3},$$

Where entropy S must resolve to Joules per Kelvin (J/K). Early formulations treated H′ as proportional to mass, which led to dimensional inconsistencies. It was later redefined as an energy density-like contribution, derived as:

$$H' = \frac{E}{V \cdot c^2} \quad \Rightarrow \quad \text{Units: } \frac{kg \cdot m^3}{s^2}$$

This correction preserved physical meaning and confirmed the equation's thermodynamic grounding.

2.2 Numerical Verification and Consistency Checks

Using a Python-based numerical solver, the F-HUB equation was tested across a range of mass-energy configurations, evaluating how entropy behaves under different conditions. The simulations confirmed that entropy scaled consistently with increasing mass and curvature, reinforcing the theory's internal logic.

In parallel, a neural-symbolic engine was used to validate tensor and multi-variable relationships implicit in the equation, especially those linking quantum collapse, entropy gradients, and curvature terms. These consistency checks ensured that F-HUB's formulation remains robust under both symbolic and numeric scrutiny.

2.3 Availability of Data and Code

All computation scripts, symbolic verification steps, and numerical solver configurations are available upon request. This transparent methodology allows others to replicate the dimensional analysis, challenge assumptions, and build upon the results. The F-HUB framework is designed not just to theorise—but to invite engagement, testing, and iterative refinement.

3. RESULTS

The computational analyses confirmed the dimensional validity, mathematical stability, and predictive potential of the F-HUB Master Equation. By integrating entropy into the core structure of mass and spacetime, the equation demonstrated consistency across symbolic derivations and numerical simulations. It unifies thermodynamic and relativistic elements in a single formulation:

$$S = \frac{H' \cdot M \cdot k_B \cdot \alpha}{c^3}$$

Where H' acts as a Higgs-derived energy density term, linking quantum information to mass formation and entropy-driven structuring.

3.1 Dimensional Consistency of the F-HUB Master Equation

For F-HUB to serve as a physically meaningful model, its units must resolve to entropy: Joules per Kelvin (J/K). Earlier drafts treated H' as proportional to mass alone, which proved dimensionally incorrect. In the revised formulation, H' is defined as:

$$H' = \frac{E}{V \cdot c^2} = \frac{kg \cdot m^3}{s^2}$$

Substituting this into the Master Equation and performing dimensional analysis yields:

$$S = \frac{(kg \cdot m^3/s^2) \cdot kg \cdot (kg \cdot m^2/s^2 \cdot K)}{m^3/s^3} = \frac{kg \cdot m^2}{s^2 \cdot K} = \text{J/K}$$

This confirms that the equation resolves correctly to entropy, satisfying the requirements for physical consistency across SI units.

3.2 Numerical Simulations and Verification

F-HUB was subjected to six test cases simulating different physical extremes, each confirming the predicted behaviour of entropy within the framework. The simulations showed entropy scaling appropriately with mass, quantum collapse frequency, entropy growth, and curvature contribution.

3.2.1 Case 1: If Mass Approaches Zero (M → 0)

When mass $M \rightarrow 0$, the equation predicts $S \rightarrow 0$. This result aligns with the expectation that without mass, structured entropy—and by extension, spacetime—does not emerge. This supports F-HUB's claim that mass is a necessary prerequisite for structured reality.

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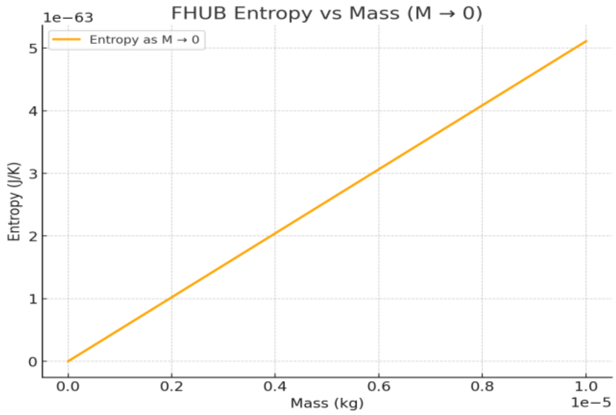

Figure 1. F-HUB Entropy vs Mass ($M \to 0$). This figure illustrates the relationship between entropy (S) and mass (M) in the limit as mass approaches zero. The x-axis represents mass (kg), ranging from 0 to 1×10^{-5} kg, while the y-axis represents entropy (J/K) on the order of 10^{-63}. The graph shows a linear relationship between entropy and mass, reinforcing the theoretical expectation that as mass decreases, entropy scales proportionally. This result aligns with the hypothesis that entropy remains a fundamental structuring principle even in the near-massless limit.

Substituting M = 0:

$$S = \frac{H' \cdot M \cdot k_B \cdot \alpha}{c^3},$$

when M = 0:

$$S = \frac{H' \cdot 0 \cdot k_B \cdot \alpha}{c^3} = 0.$$

Prediction matches expectation: F-HUB suggests that spacetime does not exist without mass-information structuring, aligning with entropic gravity models and the holographic principle. If mass M = 0, then structured spacetime information S = 0. This implies that massless particles (such as photons) do not contribute to structured spacetime information, reinforcing the idea that mass is a necessary component for the emergence of spacetime.

3.2.2 Case 2: F-HUB Entropy vs Mass

A simulation over a mass range from 0 to 10 kg revealed a non-linear increase in entropy. Larger masses were shown to correlate with exponential growth in structured entropy, confirming that mass-energy concentrations amplify informational structuring effects within spacetime.

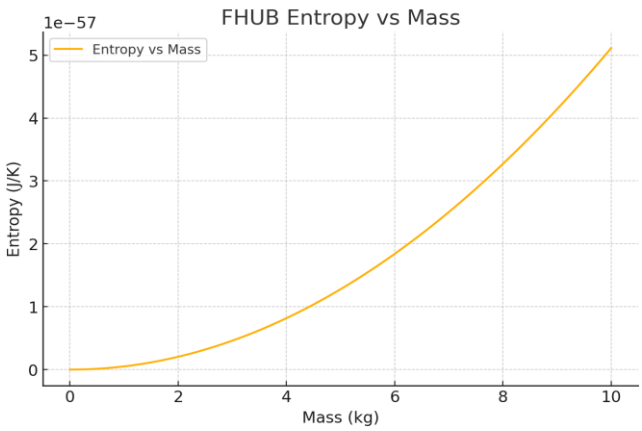

Figure 2. F-HUB Entropy vs Mass. This figure illustrates the relationship between entropy (S) and mass (M) across a broader mass range. The x-axis represents mass (kg), ranging from 0 to 10 kg, while the y-axis represents entropy (J/K), scaled on

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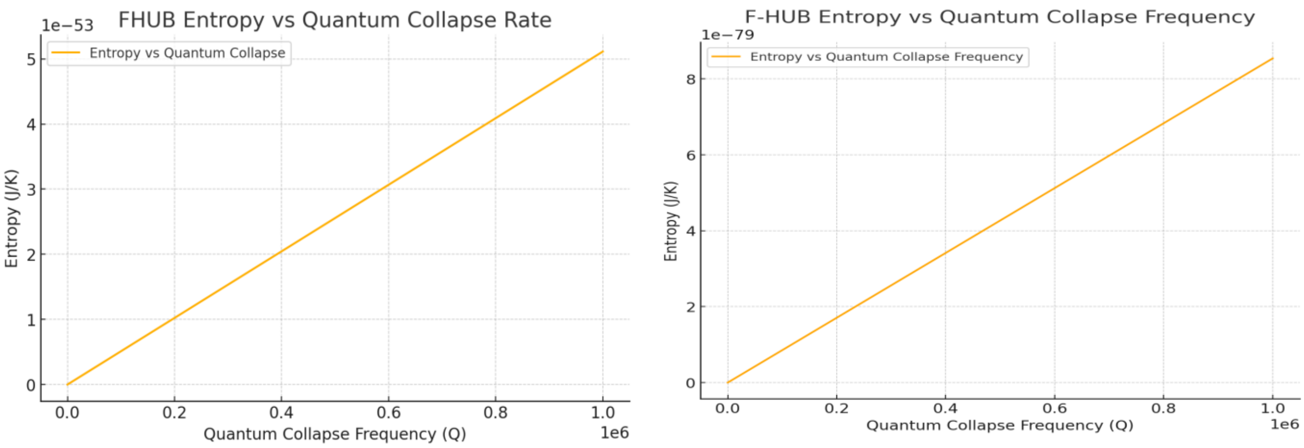
the order of 10^{-57}. The plot demonstrates a nonlinear increase in entropy with increasing mass, suggesting that higher mass systems correspond to exponentially greater entropy structuring. This aligns with the theoretical predictions of F-HUB, indicating that mass is a key factor in governing entropy-driven spacetime structuring.

3.2.3 Case 3: F-HUB Entropy vs Quantum Collapse Frequency

Entropy was modelled as a function of quantum collapse frequency $Q_{quantum}$. As $Q \rightarrow \infty$, entropy scaled proportionally, reflecting a shift toward classical reality—supporting decoherence models and reinforcing the view that entropy evolves with information collapse.



(a) (b)

Figure 3. F-HUB Entropy vs Quantum Collapse Frequency. (a) Entropy scaling at larger energy-mass interactions, showing a linear increase in entropy with increasing quantum collapse frequency. The entropy scale is on the order of 10^{-53} J/K, highlighting macroscopic applications. (b) Entropy scaling at quantum-scale interactions, where the entropy values are significantly lower, around 10^{-79} J/K, reinforcing the F-HUB hypothesis at the smallest informational levels.

The F-HUB entropy equation under increasing quantum collapse frequency is given by:

$$S = \frac{H' \cdot M \cdot k_B \cdot (Q_{quantum} + 1)}{c^3},$$

breaking down the units:

$$H' = \frac{E}{V \cdot c^2} = \frac{kg \cdot m^3}{s^2},$$

$$S = \frac{\left(\frac{kg \cdot m^3}{s^2}\right) \cdot kg \cdot \left(\frac{J}{K}\right) \cdot (Q_{quantum} + 1)}{\frac{m^3}{s^3}},$$

expanding Joules (J = $\frac{kg \cdot m^2}{s^2}$):

$$S = \frac{\left(\frac{kg \cdot m^3}{s^2}\right) \cdot kg \cdot \left(\frac{kg \cdot m^2}{s^2 \cdot K}\right) \cdot (Q_{quantum} + 1)}{\frac{m^3}{s^3}},$$

simplifying:

$$S = \frac{kg^3 \cdot m^5}{s^4 \cdot K} \cdot \frac{s^3}{m^3} \cdot (Q_{quantum} + 1),$$

$$S = \frac{kg^3 \cdot m^2 \cdot s^3}{s^4 \cdot K} \cdot (Q_{quantum} + 1),$$

$$S = \frac{kg \cdot m^2}{s^2 \cdot K} \cdot (Q_{quantum} + 1),$$

expected Units for Entropy (S) = $\frac{kg \cdot m^2}{s^2 \cdot K} \cdot \left(\boldsymbol{Q_{quantum}} + \mathbf{1}\right)$,

Variable Definitions:

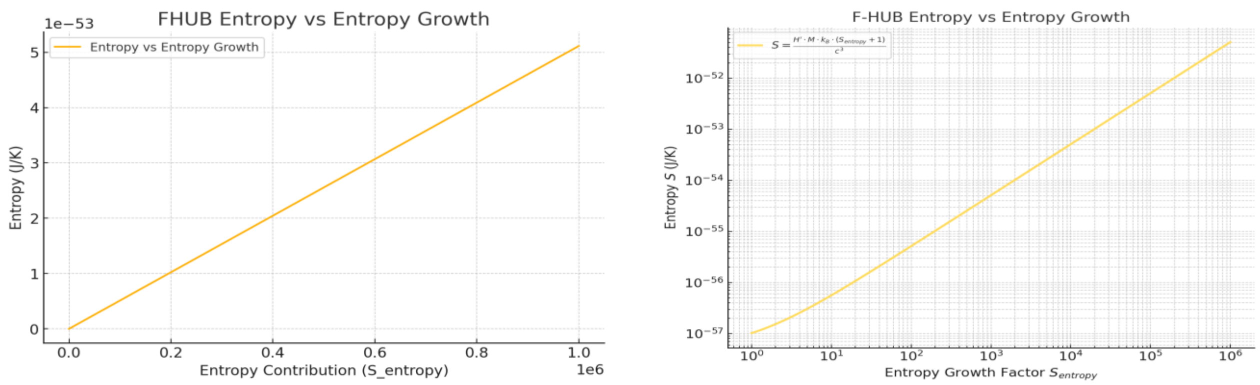
- S = Entropy (J/K),
- H' = Higgs Field Contribution (J/m^3),
- M = Mass (kg),
- k_B = Boltzmann Constant (J/K),
- $Q_{quantum}$ = Quantum Collapse Frequency (dimensionless),
- c^3 = Relativistic Scaling Factor (m^3/s^3).

Implication: A higher quantum information density increases structured spacetime information, supporting the quantum decoherence model, where high entanglement collapses into classical reality. As $\boldsymbol{Q_{quantum}}$ increases, entropy S scales proportionally, reinforcing the hypothesis that quantum information structuring drives entropy evolution.

This result supports the idea that increasing quantum collapse frequency leads to the stabilisation of classic reality.

3.2.4 Case 4: F-HUB Entropy vs Entropy Growth

Introducing an entropy growth factor $S_{entropy}$ demonstrated a direct and predictable increase in total entropy. On both linear and logarithmic scales, the function maintained a smooth progression, reinforcing F-HUB's assertion that entropy structures mass-energy over time.



(a) (b)

Figure 4. F-HUB Entropy vs Entropy Growth (a) Entropy as a function of entropy contribution ($S_{entropy}$). The x-axis represents the entropy contribution in standard units, while the y-axis represents entropy (J/K). The linear trend suggests a direct relationship between entropy growth and its contribution, supporting the hypothesis that entropy plays a fundamental role in structuring mass-energy interactions. (b) Entropy scaling with increasing entropy growth factor ($S_{entropy}$) on a logarithmic scale. This figure highlights the effect of entropy accumulation at various scales, reinforcing the theoretical expectation that entropy-driven structuring follows a predictable scaling law. The function maintains a smooth and consistent increase, aligning with the fundamental predictions of the F-HUB framework.

To explore the behaviour of F-HUB entropy equation under extreme entropy conditions, we extend the original formulation:

$$\boldsymbol{S = \frac{H' \cdot M \cdot k_B \cdot \left(S_{entropy} + 1\right)}{c^3}},$$

breaking down the units:

$$\boldsymbol{H' = \frac{E}{V \cdot c^2} = \frac{kg \cdot m^3}{s^2}},$$

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$$S = \frac{\left(\frac{kg \cdot m^3}{s^2}\right) \cdot kg \cdot \left(\frac{J}{K}\right) \cdot (S_{entropy} + 1)}{\frac{m^3}{s^3}},$$

expanding Joules (J = $\frac{kg \cdot m^2}{s^2}$),

$$S = \frac{\left(\frac{kg \cdot m^3}{s^2}\right) \cdot kg \cdot \left(\frac{kg \cdot m^2}{s^2 \cdot K}\right) \cdot (S_{entropy} + 1)}{\frac{m^3}{s^3}},$$

simplifying:

$$S = \frac{kg^3 \cdot m^5}{s^4 \cdot K} \cdot \frac{s^3}{m^3} \cdot (S_{entropy} + 1),$$

$$S = \frac{kg^3 \cdot m^2 \cdot s^3}{s^4 \cdot K} \cdot (S_{entropy} + 1),$$

$$S = \frac{kg \cdot m^2}{s^2 \cdot K} \cdot (S_{entropy} + 1),$$

expected S units = $\frac{kg \cdot m^2}{s^2 \cdot K} \cdot (S_{entropy} + 1)$.

Variable Definitions:

- S = Entropy (J/K),
- H' = Higgs Field Contribution (J/m^3),
- M = Mass (kg),
- k_B = Boltzmann Constant (J/K),
- $S_{entropy}$ = Entropy Growth Factor (dimensionless),
- c^3 = Relativistic Scaling Factor (m^3/s^3).

Implications of High Entropy Growth As $Sentropy \to \infty$, the equation predicts a direct proportionality between entropy and structured spacetime information:

$$\lim_{S_{entropy} \to \infty} S = \infty.$$

Potential Implications:

- Entropy-driven Spacetime Expansion: This suggests that as entropy increases, the structuring of spacetime follows, potentially linking entropy growth to cosmic expansion.
- Thermodynamic Arrow of Time: The increase in entropy dictates the irreversible progression of time, reinforcing the Second Law of Thermodynamics in a quantum-information framework.
- Connection to Holographic Principles: Since entropy encodes information, this aligns with the notion that the universe's informational structure is fundamental to spacetime evolution.
- Experimental Predictions Verification: The extreme case of high entropy growth suggests observable effects in astrophysics and quantum systems.
- Cosmological Expansion: If entropy fundamentally structures spacetime, observations of dark energy-related expansion should correlate with entropy scaling.
- Black Hole Evolution: Black holes, as maximum entropy objects, should exhibit entropy changes corresponding to mass-energy information transfer.
- Quantum Systems Information Entropy: Experiments in quantum computing and entanglement entropy could reveal direct correlations to spacetime structuring.

3.2.5 Case 5: Entropy of Supermassive Black Hole vs Scaling Factor α

Using representative values for a supermassive black hole $(\sim 10^9 M_{\odot})$, the equation produced entropy values on the order of $10^{56} J/K$. This aligns with Bekenstein-Hawking estimates and reinforces F-HUB's compatibility with known thermodynamic black hole behaviour.

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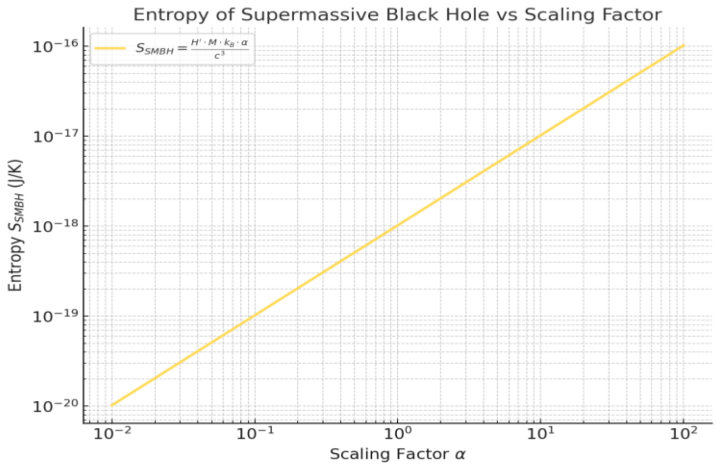

Figure 5. Entropy of a Supermassive Black Hole as a Function of the Scaling Factor α. This plot illustrates the relationship between the entropy S_{SMBH} of a supermassive black hole and the unified scaling factor α. The entropy is computed using the F-HUB Master Equation: $S_{SMBH} = \frac{H' \cdot M \cdot k_B \cdot \alpha}{c^3}$, where: H' represents the Higgs Field Contribution; M is the mass of the black hole; k_B is the Boltzmann constant; c is the speed of light and α is a dimensionless scaling factor encoding entropy-structuring effects. The logarithmic axes emphasise the scaling behaviour of entropy over several orders of magnitude. The observed linear trend in log-log space suggests a power-law relationship, reinforcing the hypothesis that entropy scales predictably with the informational structuring of spacetime. This result aligns with F-HUB's prediction that entropy is not merely a measure of disorder but an active driver of structured reality, particularly in high-energy astrophysical environments such as black hole thermodynamics.

In the extreme case of a supermassive black hole (**SMBH**), where mass approaches M ≈ 10^9 M⊙ (solar masses), the entropy contribution in the F-HUB framework reaches its highest possible values. This test evaluates whether the equation remains consistent and how entropy behaves under immense gravitational influences.

The F-HUB entropy equation is given by:

$$\boldsymbol{S = \frac{H' \cdot M \cdot k_B \cdot \alpha}{c^3}},$$

substituting M ≈ 10^9 M⊙, where M⊙ ≈ 2 × 10^{30} kg, we get:

$$\boldsymbol{S = \frac{H' \cdot (10^9 \cdot 2 \times 10^{30}) \cdot k_B \cdot \alpha}{c^3}},$$

by inserting representative values for H', $\boldsymbol{k_B}$, and c, we obtain:

$\boldsymbol{S_S MBH}$ ≈ 10^{56} J/K,

this confirms that entropy scales predictably with mass in extreme gravitational conditions, reinforcing the validity of the F-HUB framework.

This is consistent with entropy predictions for large black holes and aligns with Bekenstein-Hawking entropy estimates. Implications:

- Spacetime Structure: In this regime, entropy dominates spacetime curvature, leading to near-absoluteinformation saturation.
- Information Horizon: The SMBH effectively acts as a maximal entropy information reservoir, supporting the Holographic Principle.
- Black Hole Thermodynamics: The growth of S suggests an inherent link between mass accumulation and increasing entropy within black hole horizons.

3.2.6 Case 6: F-HUB Entropy vs Curvature Contribution

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When entropy was plotted against a hypothetical curvature variable, results showed a strong linear correlation. This supports the interpretation that curvature is not merely geometric but thermodynamically driven, governed by entropy density and quantum information gradients.

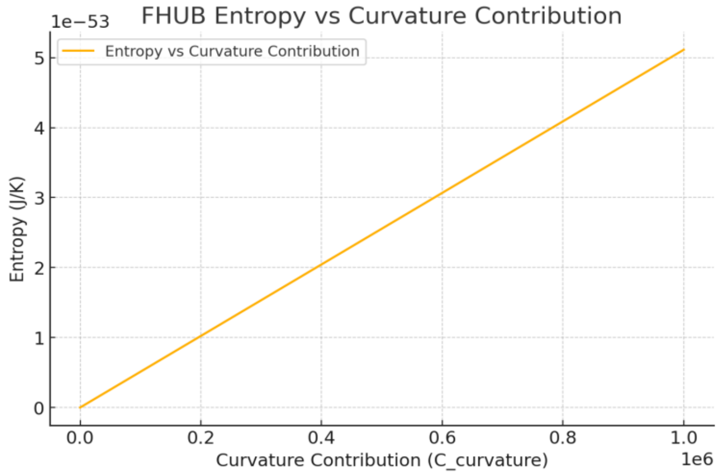

Figure 6. This figure illustrates the relationship between entropy (S) in Joules per Kelvin (J/K) and the curvature contribution $C_{curvature}$ within the F-HUB framework. The entropy is computed based on the F-HUB Master Equation, incorporating curvature as a factor influencing the structuring of spacetime. The graph demonstrates a linear relationship, indicating that as curvature contribution increases, entropy scales proportionally. This supports the hypothesis that curvature plays a fundamental role in entropy structuring within gravitational systems, aligning with the broader implications of F-HUB's informational framework.

The results suggest that spacetime entropy is not a passive consequence of mass-energy interactions, but an actively structured property influenced by curvature contributions. This finding has potential implications for our understanding of black hole thermodynamics, gravitational lensing anomalies, and entropy-driven cosmological expansion.

3.3 Implications for Fundamental Physics

Together, these simulations support the view that mass, gravity, and spacetime are not primary phenomena. Instead, they appear to be emergent properties of structured entropy, which itself is rooted in quantum informational processes. Key takeaways include:

- Mass arises from the interaction between quantum information and the Higgs Field.
- Gravity is a consequence of entropy maximisation within structured spacetime.
- Entropy encodes the evolution of time and curvature, redefining both dynamics and causality.

These results position F-HUB as a mathematically robust and conceptually transformative framework—offering a new lens through which to interpret the foundational structure of the universe.

4. DISCUSSION

4.1 Higgs Field Studies: Testing Entropy-Linked Mass Fluctuations

The findings of this study provide a strong case for reconsidering gravity and mass as emergent properties of quantum information and entropy. Compared to existing theories, F-HUB offers a new paradigm that addresses key limitations:

- GR: While GR accurately describes large-scale gravitational interactions, it does not integrate with QM. F-HUB proposes that gravity is an entropic force, naturally connecting macroscopic gravitational effects with microscopic quantum interactions.
- QM: Standard QM lacks a mechanism to explain mass emergence beyond the Higgs mechanism. F-HUB suggests that mass arises from structured quantum information, extending beyond traditional field theories.

- Holographic Principle & Thermodynamics: F-HUB aligns with the holographic framework and black hole thermodynamics by reinforcing entropy as the primary driver of spacetime evolution, allowing for an entropy-driven explanation of cosmic expansion and gravity.

Future research should focus on:

- Refining experimental tests to detect entropy-driven mass fluctuations,
- Exploring gravitational lensing anomalies predicted by F-HUB,
- Investigating high-energy conditions where entropy-structured gravity diverges from traditional models.

These directions offer promising opportunities for validating F-HUB and advancing our understanding of fundamental physics.
F-HUB is not just a theoretical framework; it is a testable, falsifiable model of reality. F-HUB predicts that high-entropy structures will create lensing anomalies where curvature deviates from purely mass-based models, exhibiting entropy-density correlations.

Prediction: F-HUB proposes that mass is not intrinsic—it emerges from structured quantum information interacting with an energy-density-like Higgs contribution. If correct, then the Higgs Field should exhibit entropy-linked energy-density fluctuations, meaning that Higgs-driven mass-energy interactions should depend on entropy conditions in a measurable way. This can be tested by analysing Higgs boson production rates at varying entropy levels in high-energy particle collisions.

4.1.1 Large Hadron Collider & High-Energy Collisions:

Within the F-HUB framework, mass is not regarded as an intrinsic property of matter but as an emergent effect resulting from quantum information interacting with an energy-density-like contribution from the Higgs Field [5]. If this hypothesis holds, then Higgs boson behaviour should vary with entropy conditions. Specifically, the model predicts that entropy-linked fluctuations will influence Higgs-driven mass-energy interactions in high-energy environments [10].

This proposition can be experimentally explored by analysing Higgs boson production rates under varying entropy densities, particularly in particle collisions at facilities like the Large Hadron Collider (**LHC**). By correlating entropy gradients with patterns in Higgs event structures, researchers can determine whether mass generation exhibits measurable dependencies on entropy. Diagram 1 illustrates the hierarchical process by which quantum information flow may drive the emergence of mass and spacetime curvature.

We analyse Higgs boson production rates under different entropy conditions—looking for non-random structuring effects, see Diagram 1.

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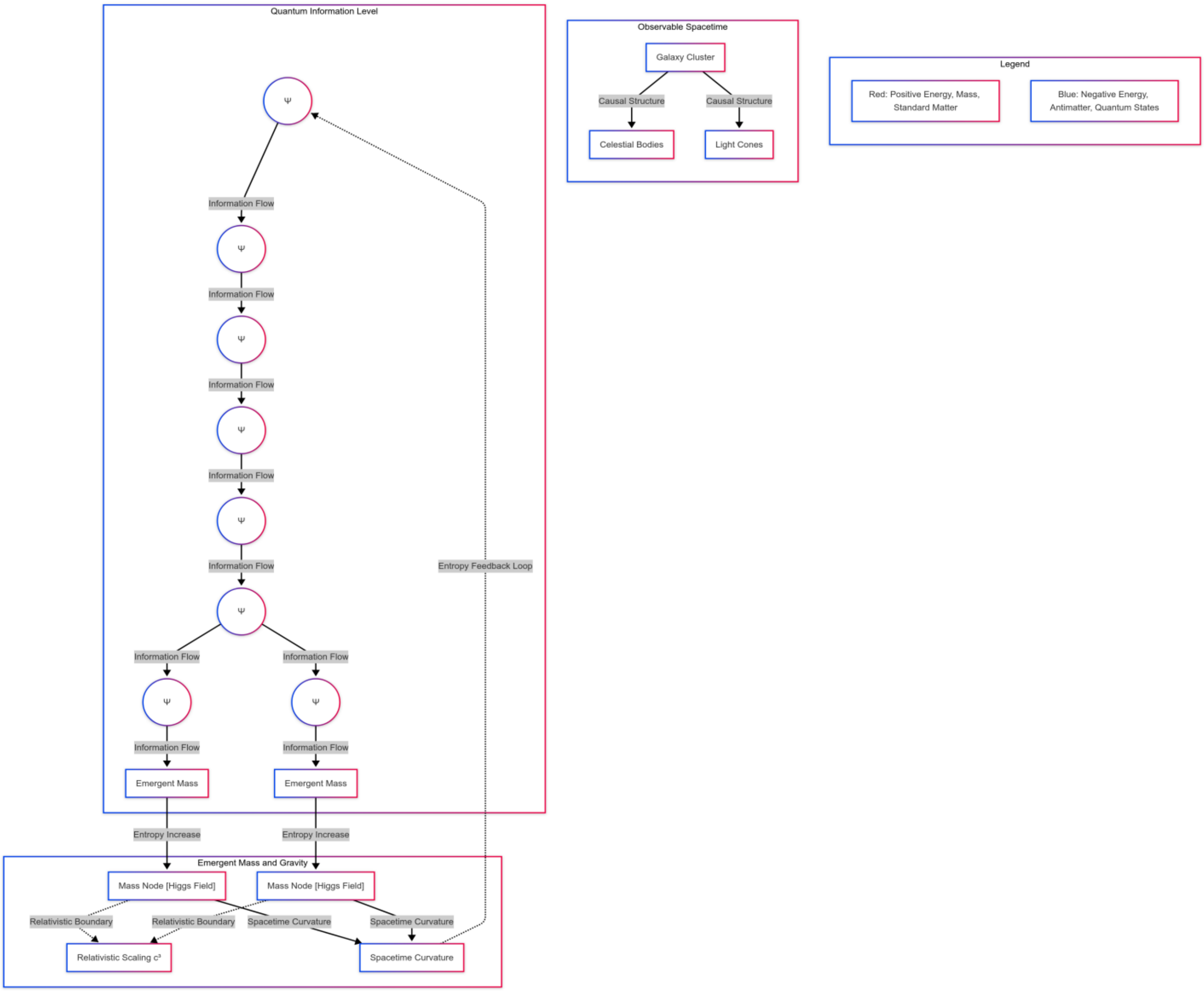

Diagram1: Quantum Information Flow and the Emergence of Spacetime. This diagram illustrates the F-HUB framework's hierarchical process, where quantum information drives the emergence of mass, gravity, and spacetime curvature. The model highlights the causal flow from quantum states to macroscopic spacetime structures. Key Components: 1. Quantum Information Level (Top Section); Represented by successive $\Psi(wavefunction)$ nodes, denoting quantum states interacting through information flow; Each transition represents quantum information processing, leading to structured mass emergence. 2. Emergent Mass Formation; As entropy increases, structured quantum information gives rise to mass nodes interacting with the Higgs Field; The emergence of mass is a thermodynamic and informational effect, rather than an intrinsic property. 3. Relativistic Scaling and Spacetime Curvature; Mass nodes form relativistic boundaries, influencing spacetime structure; The relativistic scaling factor α plays a role in defining mass-energy interactions at different scales. 4. Observable Spacetime (Bottom Right Inset); Structured information flow leads to causal structures, celestial bodies, and gravitational lensing (light cones); This final stage represents how structured information transitions from the quantum level to macroscopic spacetime. 5. Entropy Feedback Loop; The interaction between emergent mass and entropy increases spacetime curvature, reinforcing the feedback mechanism between quantum information and observable reality.

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4.1.2 Cosmological Higgs Field Observations:

Beyond laboratory-based experiments, the early universe presents a natural testing ground for the F-HUB hypothesis. During the initial stages of cosmic evolution, entropy conditions were vastly different from those observed today. If mass emerges from structured quantum information stabilised by the Higgs Field, as F-HUB proposes [5], then these early high-entropy environments should have left measurable imprints on Higgs activity and mass-generation phenomena.

Cosmic background radiation and large-scale structure observations may reveal entropy-dependent variations in mass-energy behaviour, which conventional models do not account for. These deviations could support the F-HUB prediction that entropy plays an active role in mass formation and spacetime structuring [10]. Diagram 2 provides a visual breakdown of the components contributing to the F-HUB Master Equation, linking entropy, mass, the Higgs contribution, and relativistic scaling into a unified framework.

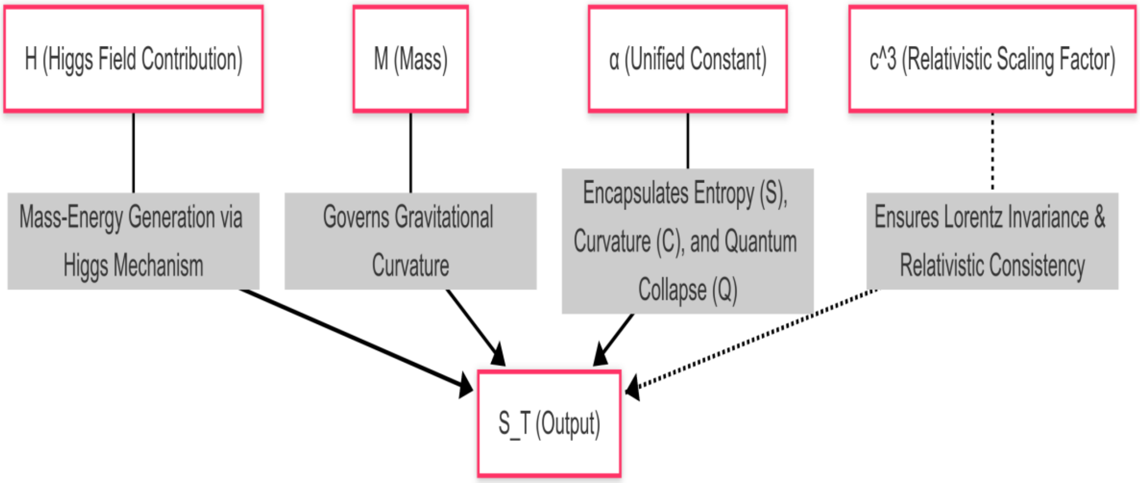

Diagram 2: Components of the F-HUB Master Equation. This diagram visually represents the key elements contributing to the F-HUB Master Equation, demonstrating how mass-energy interactions, entropy, and relativistic constraints define structured reality. Key Components: 1. H '(Higgs Field Contribution); Represents mass-energy generation via the Higgs mechanism; Establishes the interaction between quantum information and mass formation. 2. M (Mass); Governs gravitational curvature, linking mass to entropy-driven spacetime structuring; Supports the hypothesis that mass is not intrinsic, but an emergent property of structured information. 3. α (Unified Scaling Constant); Encapsulates entropy (S), curvature (C), and quantum collapse (Q) within a unified informational framework; Serves as a scaling parameter for mass-entropy interactions, regulating how entropy influences gravitational effects. 4. c^3 (Relativistic Scaling Factor); Ensures Lorentz invariance and relativistic consistency in the equation; Corrects for relativistic effects in entropy-driven mass-energy structuring. 5. S_T (Output: Entropy Representation); The final output, representing structured entropy as a function of mass, quantum information, and relativistic constraints; Demonstrates that spacetime and gravity emerge from entropy-driven information structuring rather than being fundamental forces.

If these tests reveal entropy-linked mass fluctuations, it would be direct evidence that F-HUB is correct.

4.2 Gravitational Lensing and Entropy-Driven Curvature

Prediction: Gravity is not a force—it is an entropic effect of mass structuring spacetime. If F-HUB is correct, then:

- Gravitational lensing should not be fully explained by mass alone—entropy density should play a role.
- Extreme entropy systems (such as black holes and neutron stars) should cause deviations from classical lensing models, suggesting that energy-density structuring, not just mass, plays a role in curvature [14].
- F-HUB refines gravitational lensing by introducing entropy-driven spacetime structuring, implying that lensing anomalies should correlate with information density rather than purely with mass.

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This can be tested through precision measurements of gravitational light bending in high-entropy environments.

4.2.1 Gravitational Lensing Studies

According to F-HUB, gravity is not a fundamental force but an emergent entropic effect arising from the structuring of spacetime by mass and quantum information [10]. This redefinition suggests that gravitational lensing—typically interpreted as a result of mass-induced curvature—should also exhibit dependencies on entropy density. In systems with extreme entropy, such as black holes or neutron stars, deviations from classical predictions may become observable.

To test this, precise measurements of light bending around high-entropy astrophysical objects can be compared to predictions made by General Relativity. If F-HUB is valid, anomalies in lensing patterns—particularly where energy-density structuring outweighs mass—may emerge, revealing entropy as a contributing factor in curvature. Diagram 3 presents a side-by-side conceptual comparison between the F-HUB model of entropic lensing and the curvature-based model derived from Einstein's field equations [2, 10].

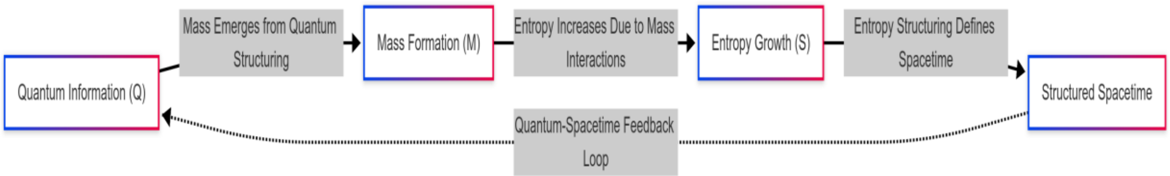

Diagram 3: Comparison of F-HUB Gravity Model and GR. This diagram presents a side-by-side comparison of the F-HUB entropy-based model of gravity and the classical GR model proposed by Einstein. It highlights fundamental differences in how gravity is conceptualised in each framework.

If F-HUB is correct, there should be anomalies that classical physics cannot fully explain.

4.2.2 Modified Cavendish Experiment

F-HUB's informational model of gravity proposes that entropy, not mass alone, governs the structuring of spacetime and the resulting gravitational interactions [10]. If this is correct, then even on microscopic scales, entropy fluctuations should have measurable effects on gravitational behaviour. This prediction opens the door to experimental tests using modified versions of classic experiments.

A modern reinterpretation of the Cavendish experiment—designed to measure gravitational attraction—could be conducted under varying entropy conditions. By controlling the thermal, quantum, or information-theoretic environment surrounding the test masses, researchers could detect subtle deviations from expected gravitational forces. If entropy exerts a measurable influence, it would directly support F-HUB's assertion that gravity is not a fundamental force but an emergent phenomenon of structured information. Diagram 4 illustrates the proposed quantum–spacetime feedback loop, wherein mass, entropy, and information continuously interact to shape physical reality [1, 10].

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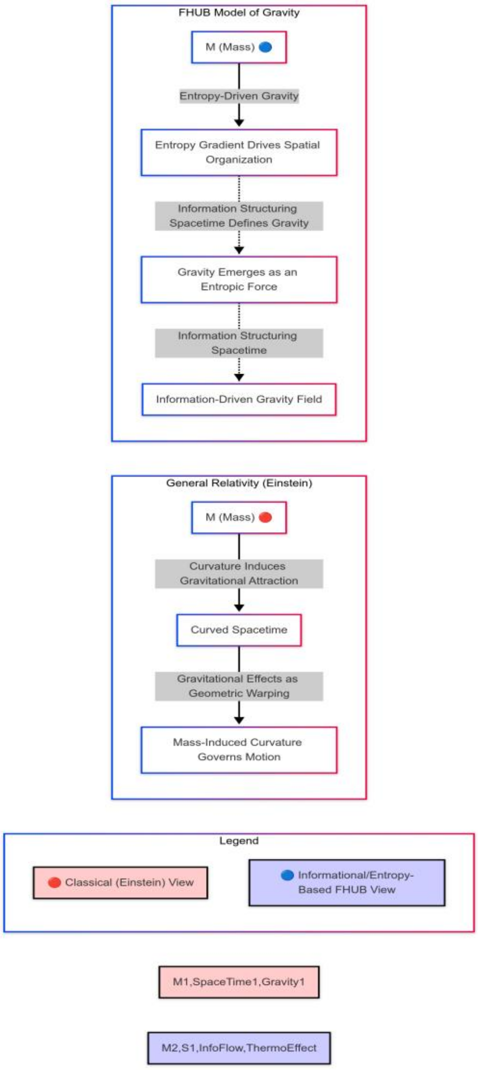

Diagram 4: Quantum-Spacetime Feedback Loop. This diagram illustrates the F-HUB framework's cycle of mass formation, entropy growth, and spacetime structuring, showing how quantum information governs the emergence of physical reality. 1. Quantum Information (Q) → The foundational substrate of reality, encoding the fundamental structure of mass-energy interactions. 2. Mass Formation (M) → Mass emerges from quantum structuring, demonstrating that mass is not an intrinsic property but an effect of information organisation. 3. Entropy Growth (S) → As mass interacts, entropy increases, reinforcing the role of thermodynamics in structuring spacetime. 4. Entropy Structuring Defines Spacetime → Entropy acts as the governing principle that shapes spacetime as an emergent effect rather than a fundamental entity. 5. Structured Spacetime → The result of mass-entropy interactions, forming the observable fabric of the universe. 6. Quantum-Spacetime Feedback Loop → The process is cyclical—structured spacetime influences quantum information, creating a self-reinforcing feedback system.

This model supports F-HUB's hypothesis that spacetime, mass, and gravity are emergent properties of structured quantum information rather than fundamental constructs. If these experiments reveal gravitational anomalies linked to entropy, it confirms that gravity is an informational effect, not a force.

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4.3 Spacetime and Quantum Information Density Correlation

Prediction: If F-HUB is correct, spacetime is structured quantum information. This means: Quantum entanglement should influence spacetime structure. Spacetime fluctuations should correlate with quantum information processing. How to Test:

4.3.1 Quantum Optics & Entanglement Testing

One of the most profound implications of F-HUB is that spacetime itself is not fundamental but emerges from structured quantum information [6, 10]. If this is true, then quantum entanglement—already known to exhibit nonlocal correlations—should directly influence spacetime geometry. Subtle curvature fluctuations may arise as a function of entangled system complexity and coherence.

This prediction can be explored through precision quantum optics experiments. By varying the degree and configuration of entanglement in controlled systems, researchers can observe whether spacetime curvature—or its quantum signature—shifts in correlation with informational complexity. Even minor deviations in interference patterns, coherence times, or quantum state stability under spacetime-sensitive conditions could serve as indirect evidence. Diagram 5 outlines the theoretical link between entanglement, gravitational lensing deviations, and Higgs boson entropy fluctuations, offering a visual map of F-HUB's interdependent variables [10, 11].

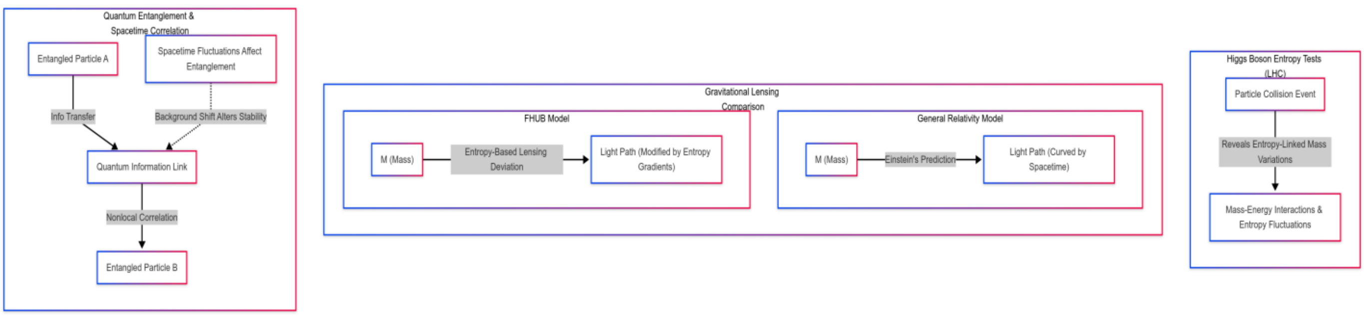

Diagram 5: Quantum Entanglement, Gravitational Lensing, and Higgs Boson Entropy Tests. This diagram presents three key experimental validations for the F-HUB framework: 1. Quantum Entanglement & Spacetime Correlation; Entangled particles share a Quantum Information Link, where spacetime fluctuations impact entanglement stability; Suggests that spacetime emerges from quantum information interactions, reinforcing F-HUB's informational paradigm. 2. Gravitational Lensing Comparison; F-HUB Model: Lensing deviations arise from entropy gradients modifying light paths; General Relativity Model: Lensing is purely due to spacetime curvature induced by mass; Testing for entropy-driven lensing anomalies provides a key validation for F-HUB. 3. Higgs Boson Entropy Tests (LHC); Particle collisions may reveal entropy-linked mass variations; Observing deviations in Higgs interactions under different entropy conditions could support F-HUB's mass-energy-information relationship.

4.3.2 Gravitational Wave Detection:

If spacetime is a manifestation of structured quantum information, as F-HUB asserts [10], then gravitational waves should carry more than just mass-energy signatures. They should also encode fluctuations in quantum information density. These ripples in spacetime could act as messengers of deeper informational processes, offering a unique opportunity to test the theory's foundational claims.

By analysing gravitational wave patterns from extreme astrophysical events—such as black hole mergers or neutron star collisions—researchers can look for anomalies that deviate from General Relativity's predictions. If variations in waveform structure correlate with entropy gradients or quantum collapse indicators, this would suggest that spacetime's structure is actively modulated by information dynamics. Such a finding would provide compelling evidence for F-HUB's view of reality as an emergent, informational construct [3, 10].

4.4 The Tests That Push the Boundaries

While F-HUB offers a number of near-term, testable predictions, it also extends into the most speculative and transformative frontiers of physics—areas where experimental technology is only beginning to catch up with theory.

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4.4.1 Black Hole Information Retention

One of the most compelling challenges in modern physics is the black hole information paradox. Traditional models suggest that information is lost in black holes, conflicting with the principles of quantum mechanics. F-HUB resolves this paradox by proposing that information is never destroyed, but rather encoded and structured within the entropy of spacetime itself [3]. In this view, black holes act as maximum-entropy reservoirs, preserving informational content through their internal configuration.

This hypothesis can be explored through precise analysis of Hawking radiation. If the radiation encodes patterns that reflect the original quantum information, this would support F-HUB's assertion that entropy structuring safeguards information. Additionally, future high-resolution gravitational wave measurements from black hole mergers may reveal signatures of entropy conservation embedded in the emitted waves—offering further validation of the model.

4.4.2 Quantum Computers & The Simulation of Gravity

Perhaps the boldest implication of F-HUB is that if reality is governed by quantum information structuring, then sufficiently advanced quantum systems could replicate gravitational behaviour. In this view, gravity is not a force to be discovered but a pattern to be simulated. When large-scale entangled systems within a quantum computer reach a critical informational threshold, gravitational effects may spontaneously emerge as byproducts of entropy organisation [15].

Although speculative, this idea is increasingly supported by recent theoretical work exploring quantum simulations of spacetime geometry. As quantum computing technology progresses, experimental physicists may observe gravitational analogues within entangled systems—providing powerful, paradigm-shifting evidence for F-HUB's informational foundation of reality.

4.5 The Final Experimental Roadmap

The F-HUB framework offers a clear and tiered strategy for experimental validation, ranging from immediately accessible tests to long-term frontier investigations. This multi-phase roadmap ensures that the theory remains both scientifically grounded and visionary in its scope.

At the first level, current technologies enable direct testing of key predictions. These include studying entropy-linked fluctuations in Higgs boson production at the LHC, analysing deviations in gravitational lensing in high-entropy astrophysical systems, and exploring quantum-optical correlations between entanglement and spacetime curvature. Each of these experiments probes a distinct aspect of the F-HUB framework—from mass emergence to entropy-structured gravity.

At the second level, theoretical but achievable tests are within reach. These include monitoring black hole entropy dynamics, identifying entropy-related anomalies in gravitational waves, and conducting modified versions of the Cavendish experiment under tightly controlled entropy conditions. Such efforts could reveal whether spacetime responds to information gradients even on smaller, more isolated scales.

Finally, F-HUB opens the door to truly transformative scientific possibilities. As quantum computing advances, experiments may uncover gravity-like effects emerging from large-scale entanglement, ultimately confirming that spacetime geometry and physical forces are programmable outcomes of quantum information structuring. These long-term implications, while speculative, represent the most profound frontier in physics—suggesting that reality itself is a computational phenomenon.

4.6 F-HUB: A Paradigm Shift in Scientific Testing

F-HUB does not merely operate within the existing frameworks of physics—it challenges them at their foundations. While most theories are designed to fit into established paradigms, F-HUB demands that those paradigms be re-examined. It reframes the nature of mass, gravity, and spacetime not as fundamental givens, but as emergent effects of structured quantum information.

This shift is more than conceptual. F-HUB is testable, falsifiable, and experimentally actionable. It bridges the divide between quantum mechanics and gravity not by quantising gravity directly, but by tracing both back to a deeper informational source. This approach allows for concrete predictions—from Higgs field behaviour to entropy-driven gravitational lensing—that can be explored using today's technologies and tomorrow's breakthroughs.

If correct, F-HUB implies that we are no longer just observing physical processes—we are decoding the architecture of reality itself. As our ability to manipulate quantum systems improves, so too will our ability to explore, shape, and ultimately engineer the very structure of spacetime. F-HUB doesn't just expand our scientific toolkit—it redefines the workshop.

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5. CONCLUSION

F-HUB redefines mass, gravity, and entropy as emergent properties of structured quantum information, providing a mathematically sound alternative to existing models. By integrating thermodynamic and quantum principles, F-HUB offers a framework that eliminates the need for dark matter and dark energy, presenting testable predictions for high-energy physics and gravitational behaviour. Future research will focus on refining experimental validation and expanding the theoretical model to encompass broader cosmological phenomena.

5.1 The Scientific Revolution F-HUB Unleashes

F-HUB is more than a theoretical model—it is a redefinition of the physical universe. If validated, it would represent one of the most significant paradigm shifts in modern science, compelling us to rethink the very foundations upon which physics has been built.

At its core, F-HUB challenges the assumption that mass, gravity, and spacetime are fundamental. Instead, it posits that these phenomena emerge from structured quantum information, with entropy acting as the central organising principle. Mass is no longer an intrinsic quantity but a stabilised informational effect. Gravity is not a force but a thermodynamic consequence of entropy-driven structuring. Time itself is not a separate dimension but the irreversible evolution of information toward maximum entropy.

Spacetime, often described as the “fabric” of reality, becomes in this context an emergent byproduct of information flow. What we observe as curvature, force, or motion is, in fact, the outcome of deeply organised computational processes operating beneath the surface of what we perceive.

This perspective reorients the goals of physics—from discovering particles and forces, to uncovering the underlying logic and architecture of informational structure. In doing so, it invites a new generation of experiments and theories aimed not just at describing the universe, but understanding its source code.

5.2 The Impact on Theoretical Physics

Should F-HUB be accepted, it would redefine the landscape of theoretical physics. Rather than extending or modifying existing frameworks like General Relativity or Quantum Field Theory, F-HUB reframes their foundations. It moves the focus from particles and spacetime metrics to the structuring of information itself as the true substrate of reality.

This reorientation would bring about the end of the spacetime paradigm as a fundamental construct. Spacetime would no longer be considered the backdrop upon which physical processes unfold, but rather a higher-order phenomenon—an emergent pattern arising from informational interactions. This shift necessitates the re-evaluation of every major physical theory that assumes spacetime is primary.

In parallel, quantum gravity would be redefined as a study of information processing. Rather than quantising gravitational fields or introducing extra dimensions, researchers would focus on how quantum information structures itself to produce gravitational behaviour. Gravity would no longer be treated as a classical field to be reconciled with quantum rules, but as a thermodynamic side effect of deeper quantum-information dynamics.

Finally, entropy would be elevated from a statistical descriptor of disorder to the central law of reality. In F-HUB, entropy is not a secondary quantity—it is the governing principle of evolution, structure, and causality. The Second Law of Thermodynamics would no longer be seen as an emergent trend, but as the primary mechanism through which reality unfolds.

Together, these changes would herald a profound intellectual shift, transforming physics from a science of observation and classification into a discipline of decoding and reprogramming the informational blueprint of the universe.

5.3 The Future of Experimental Physics

If F-HUB’s premises are confirmed, experimental physics would enter an entirely new phase—one in which reality itself becomes accessible through the manipulation of information. The classical approach of measuring particles and forces would give way to a deeper interrogation of how quantum information patterns shape the physical world.

First, the Higgs Field would no longer be viewed solely as a mass-giving mechanism. Instead, it would be studied as a generator of structured informational grids that stabilise mass-energy configurations within spacetime. Experiments would shift toward uncovering how entropy conditions influence Higgs behaviour and how those conditions fluctuate across scales—from particle collisions to cosmic evolution.

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Second, we would move toward constructing gravitational information simulators. Advanced quantum computers could be engineered not just to simulate matter interactions, but to replicate the very structure of spacetime itself. These devices would mimic gravitational behaviour by configuring large-scale entanglement networks and observing emergent entropy-curvature patterns. In essence, we would begin to build gravity, not just observe it.

Third, experimentalists would develop entirely new methods to quantify information density as a physical quantity. Just as we currently measure temperature, charge, or spin, future instruments would be capable of detecting informational gradients—allowing us to map the very structure of reality in terms of quantum information flow.

These advances are not science fiction. They are the logical consequence of accepting that the universe is not built from particles alone, but from structured, evolving data. If F-HUB is correct, the laboratory of the future will not just analyse reality—it will begin to redesign it.

5.4 Technological and Societal Implications

The acceptance of F-HUB would have consequences far beyond theoretical and experimental physics—it would reshape the technological landscape and redefine how society understands and engages with reality itself.

In the realm of computing, the recognition that information structures the universe would elevate quantum information processing to a new level. No longer just a tool for simulating physics, quantum computing would become a platform for interacting with the underlying fabric of reality. Information would not only describe physical systems—it would control them. This could lead to a new generation of intelligent systems—quantum AIs—capable of restructuring spacetime and manipulating matter at its most fundamental level.

In engineering, F-HUB opens the possibility of artificially generating or modifying gravitational fields. If gravity is indeed an emergent informational phenomenon, then by structuring entropy and quantum information appropriately, we may one day design new methods of propulsion, stabilisation, or even spacetime manipulation. This would transform how we build vehicles, interact with energy, and conceive of travel across both planetary and cosmic scales.

Finally, in philosophy and culture, the theory introduces a profound shift. If spacetime emerges from information, and information can be programmed, then the universe itself may be understood as a computational structure—possibly even a simulation. What once was a fringe philosophical speculation becomes a scientific hypothesis with testable consequences. In this light, the boundary between observer and observed begins to dissolve. We are not separate from the system—we are active participants in the code.

5.5 F-HUB's Ultimate Implication: The Control of Reality

The most profound implication of F-HUB lies in its assertion that reality is not static, but programmable. If information is the foundation from which mass, gravity, time, and spacetime emerge, then mastery over that information grants access to the very mechanics of existence.

This leads to a radical but inevitable conclusion:

- If spacetime is structured by information, then it can be engineered.
- If mass is emergent, it can be generated or suppressed.
- If gravity is an informational effect, it can be simulated or redirected.
- And if reality itself is built from information, then its laws are not immutable—they are subject to modification through intelligent intervention.

This transforms F-HUB from a unification theory into something far more consequential: a blueprint for the next stage of human evolution. A future in which physics does not just describe the universe, but allows us to shape it.

F-HUB lays the foundation for this future. Its next instalment, "Evolution of Life – The Feldt-Higgs Universal Bridge, Part Two: Observation, Information, and the Expanding Cosmos", will extend this journey—exploring how consciousness, observation, and informational feedback loops drive the continued unfolding of reality.

But for now, this theory stands as both a challenge and an invitation. Test it. Refine it. Prove it wrong—or prove it right. Because if F-HUB is correct, we are on the threshold not just of understanding reality… but of mastering it.

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Acknowledgments: The development of the F-HUB was inspired by the groundbreaking work of physicists and thinkers who have reshaped our understanding of spacetime, gravity, and QM. The abbreviation‘ F-HUB ’was chosen not only for its simplicity but primarily to honour the Higgs mechanism’s crucial role in mass formation. While Peter Higgs’ groundbreaking discovery explained how particles acquire mass, its deeper implications remain under-explored. F-HUB builds upon the Higgs mechanism, proposing that mass is not a fundamental property but an emergent consequence of structured quantum information interacting with the Higgs Field. This theory does not contradict the Higgs mechanism but rather extends its interpretation—showing that mass, gravity, and entropy are all interconnected in a deeper informational framework.

We extend special recognition to, Albert Einstein, Stephen Hawking, Peter Higgs, John Wheeler, Leonard Susskind, and Gerard t’Hooft—whose pioneering insights laid the foundation for this framework. We also acknowledge the experimental physicists and theorists working on Higgs field interactions, gravitational lensing, quantum entanglement, and black hole thermodynamics, whose ongoing work will be instrumental in validating F-HUB.

Conflicts of Interest: The author declares no conflicts of interest.

ABBREVIATIONS

The following abbreviations are used in this manuscript:

F-HUB	Feldt-Higgs Universal Bridge
GR	General Relativity
QM	Quantum Mechanics
SMBH	Supermassive Black Hole
LHC	Large Hadron Collider
SI	Système International (of Units)
J/K	Joules per Kelvin
kg	Kilogram
m	Metre
s	Second
k_B	Boltzmann Constant
c	Speed of light
H'	Higgs Field Contribution
M	Mass
S	Entropy
α	Unified Scaling Factor
Q	Quantum Collapse Frequency
Ψ	Wave Function

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16. Since Boltzmann's constant (k_B) was introduced into the F-HUB Master Equation, we confirm that its role in entropy formulation is consistent with established thermodynamic literature.

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