A Paired Universe Theory and its Implications for Fundamental Physics

James Francis Godwin

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Abstract

This paper proposes a cosmological framework in which the universe as we know it — one in which time exists and flows — is paired with a companion universe in which time does not exist. Analogous to the quantum mechanical creation and annihilation of particle/antiparticle pairs, these two universes came into existence together at the Big Bang from nothing, and will eventually annihilate each other, returning to nothing. The expansion of the temporal universe continuously stretches the timeless companion, which resists this stretching and exerts a restoring force. This paper proposes that this restoring force is the origin of gravity, and that the gravitational constant G is not truly constant but increases over time as expansion proceeds. This single underlying principle is shown to offer natural explanations for gravity, dark matter, quantum entanglement, wave-particle duality, the nature of light, the origin of supermassive black holes, the anomalous brightness of early galaxies observed by JWST, and an alternative interpretation of cosmological redshift that removes the need for dark energy. The framework prioritises simplicity and testability, and makes specific predictions that differ from the standard cosmological model (ΛCDM).

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1. Motivation and Philosophy

Modern physics has achieved extraordinary precision, yet it increasingly relies on entities — dark matter, dark energy, additional dimensions, inflation fields — that have never been directly observed. These are introduced to make equations balance, not because they have been detected. A long-standing principle in science, Occam's Razor, holds that when two explanations are available, the simpler one is to be preferred. The increasing complexity of the standard model may be a signal that its foundations require rethinking rather than patching.

This paper proceeds from the conviction that a correct theory of the universe should be simple at its core, and that its simplicity should generate explanations for diverse phenomena rather than requiring a separate new entity for each unexplained observation. The paired universe framework proposed here rests on a single postulate, and the majority of its implications follow from that postulate by straightforward reasoning.

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2. The Core Postulate: Two Paired Universes

2.1 The Particle/Antiparticle Analogy

In quantum field theory, the vacuum is not empty. Virtual particle/antiparticle pairs continuously come into existence and annihilate almost immediately, such that no net energy is created. This phenomenon — confirmed experimentally via the Casimir effect and Hawking radiation — demonstrates a fundamental principle: nothing can become something and return to nothing, as though nothing ever happened.

This paper proposes that the Big Bang was an event of the same character, but at a cosmological scale. Two opposite universes came into existence together from nothing. They are equal and opposite in the sense that one contains time and one does not. Just as a particle and antiparticle are each other's mirror opposites, so the temporal universe (ours) and the timeless universe are paired opposites. They will, in the far future, annihilate each other and return to nothing.

2.2 Defining the Two Universes

The temporal universe is the universe we inhabit. It has four dimensions (three spatial, one temporal), is governed by the laws of physics as we know them, and is expanding.

The timeless universe is the companion. It occupies the same space as our universe — it is overlaid upon it at every point. Crucially, it has no time dimension. This is not a universe with negative time (as proposed in some CPT-symmetric models) but a universe where time is entirely absent. Without time, there is no change, no sequence, and no separation between moments. Every point in space and every moment in time within our universe corresponds to the same undifferentiated state in the timeless universe.

This distinction — timeless rather than time-reversed — is considered a key departure from existing paired-universe theories, and its implications are explored throughout this paper.

2.3 The Ultimate Fate

Because the two universes are paired opposites that emerged from nothing, they must eventually return to nothing. This means the expansion of our universe will ultimately reverse. Gravity, as reconceived in this framework, is the mechanism of that reversal. Dark energy — the force apparently driving accelerating expansion — is reinterpreted in Section 6 as a misreading of observational data rather than a real phenomenon. In this framework, everything that currently appears to push the universe apart will eventually yield to the increasing gravitational pull described below.

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3. Gravity as a Restoring Force

3.1 The Balloon Analogy

Consider a balloon being inflated. The rubber of the balloon resists expansion and exerts a continuous inward force — a restoring tension that grows as the balloon is stretched. Now imagine that the rubber is not merely the surface of the balloon but fills its entire volume, that it is present at every point inside the balloon, and that it was never designed to be stretched.

This is the proposed relationship between the two universes. The timeless universe is present at every point in our universe — it underlies every location in space and every moment in time. As the temporal universe expands, it stretches the timeless companion. The timeless universe resists this stretching and exerts a restoring force. This restoring force is what we experience as gravity.

3.2 Implications for the Gravitational Constant

If gravity is a restoring tension that grows as the universe expands, then the gravitational constant G is not truly constant. In the early universe, when the temporal universe was small and the timeless companion barely stretched, the restoring force would have been weak — gravity was weaker. As the universe has expanded over 13.8 billion years, the stretching has increased, and gravity has grown stronger. G is therefore a function of cosmic time:

$$G = G(t), \quad \text{where G increases as the scale factor } a(t) \text{ increases}$$

This represents a significant departure from both Newtonian gravity and General Relativity, which treat G as a universal constant. It is worth noting that Paul Dirac proposed in 1937 (the Large Number Hypothesis) that G might vary with cosmic time, though he proposed it should decrease. This framework proposes the opposite: G increases over time, providing a mechanism that Dirac's hypothesis lacked.

3.3 A Modified Friedmann Equation

The standard Friedmann equation governing cosmic expansion is:

$$(\dot{a}/a)^2 = (8\pi G/3)\rho - k/a^2$$

Where a is the scale factor, ρ is energy density, and k is curvature. In the paired universe framework, two modifications are proposed: G becomes G(t), and an additional restoring tension term $\lambda\perp$ is introduced representing the pull of the timeless companion:

$$(\dot{a}/a)^2 = (8\pi G(t)/3)\rho - \lambda\perp/a^n$$

Here $\lambda\perp$ is a new constant representing the coupling strength between the two universes, and n determines how rapidly the restoring tension grows with expansion. This term acts in opposition to dark energy: rather than driving accelerating expansion, it acts as an ever-increasing brake. The precise form of G(t) and the value of n are open questions to be determined by matching the framework's predictions against observational data.

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4. Dark Matter as Enhanced Gravitational Coupling

Dark matter was proposed to explain why the outer regions of galaxies rotate faster than the distribution of visible matter can account for. Something unseen is providing additional gravitational pull, and it appears to form an invisible halo around galaxies. Despite decades of searching, no dark matter particle has been detected.

This framework offers two candidate explanations that require no new particles:

First, if the timeless companion universe couples to our universe more strongly in regions of higher mass density — a natural expectation if the coupling is related to the degree of local stretching — then the effective gravitational pull would be enhanced wherever matter is concentrated. The galactic rotation curve would then reflect the geometry of this coupling, not the distribution of invisible mass.

Second, and more specifically: black holes are proposed in this framework to be puncture points — locations where the curvature of our universe is so extreme that it breaks through into the timeless companion (see Section 7). Every black hole would therefore create a localised region of strongly enhanced coupling between the two universes. Galaxies contain supermassive black holes at their centres and potentially millions of stellar-mass black holes throughout. These would create a distributed pattern of enhanced gravitational effect that closely mimics what is observed and attributed to a dark matter halo. No new particles are required: the 'dark matter' is the timeless universe, made locally more accessible by the presence of black holes.

This prediction is testable: the distribution of gravitational anomalies attributed to dark matter should correlate with estimated black hole density, both at galactic centres and throughout galactic discs.

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5. Quantum Phenomena

5.1 Quantum Entanglement

Quantum entanglement is one of the most experimentally robust yet conceptually mysterious phenomena in physics. Two particles, once entangled, exhibit correlated behaviour instantaneously regardless of the distance between them. No signal passes between them at the speed of light; the correlation is immediate. Einstein called this 'spooky action at a distance' and spent years trying to explain it away. It has since been experimentally confirmed to be real.

In the paired universe framework, an explanation emerges naturally. The timeless universe contains no time dimension, and therefore no spatial separation in the temporal sense. All points in our universe — regardless of their distance from one another — correspond to the same undifferentiated state in the timeless universe. Two entangled particles are, in the timeless universe, effectively the same point. When one is measured, the correlation propagates not through our universe but through the timeless companion, where no distance exists. Instantaneous correlation is therefore not mysterious — it is a geometric consequence of the timeless universe's structure.

This is conceptually related to the ER = EPR conjecture of Maldacena and Susskind (2013), which proposes that entangled particles are connected by microscopic wormholes. In the paired universe framework, the timeless companion universe plays the role of those wormholes, but more fundamentally: it is the connective substrate underlying all of space.

5.2 Wave-Particle Duality

Every quantum object — electron, photon, even large molecules — exhibits both wave-like and particle-like behaviour depending on how it is observed. When not observed, a quantum object spreads out as a wave of probability. When measured, it appears as a localised particle. No satisfactory physical explanation for this duality has been given within standard quantum mechanics; it is typically treated as an irreducible feature of nature.

This framework proposes a physical interpretation: quantum objects exist simultaneously in both universes. In the temporal universe, they manifest as particles — localised, discrete, subject to time. In the timeless universe, they manifest as waves — extended, non-localised, not subject to change. The act of measurement forces an interaction that pins the object to the temporal universe, producing the particle outcome. The wave function, in this reading, is not merely a mathematical tool but a description of the object's real existence in the timeless companion.

This interpretation is structurally similar to the de Broglie-Bohm pilot wave theory, in which a real wave guides a real particle. The paired universe framework gives this a physical substrate: the wave literally exists in the other universe.

5.3 The Nature of Light

Special relativity establishes that a photon — a particle of light — does not experience time. From the photon's own reference frame, its entire journey from emission to absorption is instantaneous. It is, in a precise mathematical sense, outside time.

This is exactly the defining property of the timeless universe. The proposal here is that light is not merely consistent with the timeless universe — it is a direct manifestation of it. Light is the phenomenon that arises at the interface between the two universes: it propagates through the temporal universe but belongs, in its fundamental nature, to the timeless one. This would explain why the speed of light is a universal constant — it is set not by the properties of space alone but by the coupling between the two universes, which is uniform. It would also explain why nothing in the temporal universe can reach the speed of light: to do so would be to fully enter the timeless universe.

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6. Reinterpreting Cosmological Redshift and Dark Energy

The accelerating expansion of the universe is inferred primarily from observations that distant supernovae appear fainter — and therefore further away — than expected. This leads to the conclusion that the expansion of the universe is speeding up, driven by a mysterious 'dark energy' comprising approximately 68% of the total energy content of the universe. Dark energy has never been directly detected.

This framework offers an alternative interpretation. When we observe very distant galaxies, we are looking far back in time — we see them as they were billions of years ago. If G was smaller in the early universe (as this framework proposes), then the spacetime geometry of that earlier epoch was different from today's. The propagation of light through that different geometry would affect the observed redshift in ways that current models, which fix G as constant throughout history, do not account for.

In other words: what is being interpreted as evidence of faster recession in the early universe may instead be a signature of weaker gravity in that epoch. The further back we look, the lower G was, and the more this manifests as anomalous redshift. Dark energy may not exist as a physical entity at all — it may be a mathematical artefact of applying a constant-G model to a universe where G was once smaller.

This is a testable prediction. If a specific G(t) function is derived from this framework, it should be possible to compute the expected redshift-distance relationship and compare it directly to supernova and galaxy survey data. Agreement without the need for a dark energy term would constitute strong evidence for the framework.

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7. Black Holes as Punctures Between Universes

At the centre of a black hole, under General Relativity, spacetime curvature becomes infinite — a singularity. The laws of physics as we know them cease to apply. This is widely regarded as a signal that General Relativity is incomplete at extreme densities, rather than a description of physical reality.

This framework proposes a physical interpretation: a black hole singularity is a puncture point where the curvature of the temporal universe becomes so extreme that it breaks through into the timeless companion. The singularity is not a breakdown of physics but an interface — the point at which the two universes make direct contact.

This has several implications. It explains why information appears to be lost in black holes (the information enters the timeless universe, where the concept of information storage is different). It provides a physical basis for Hawking radiation — the timeless universe's influence leaking back through the interface. And it directly supports the dark matter mechanism described in Section 4: every black hole is an anchor point that draws the timeless universe into closer coupling with the local region of our universe, enhancing gravitational effects in a halo-like pattern.

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8. Galaxy Formation and Early Universe Anomalies

8.1 A Weaker G in the Early Universe

Standard models of galaxy formation assume G has always had its current value. Under this assumption, the first stars formed from gas clouds that collapsed under gravity, ignited fusion, lived short lives, and either exploded as supernovae or collapsed into black holes. The largest stars that can form today are limited in mass by the Eddington limit — the point at which radiation pressure from fusion balances the inward pull of gravity.

If G was significantly smaller in the early universe, this changes fundamentally. A weaker gravitational pull means gas clouds could accumulate far more mass before the conditions for fusion were met — because the inward force driving collapse was lower, more material had to accumulate before the core temperature and pressure became sufficient to ignite. The result would be hyper-massive stars — objects far beyond anything that forms today — which would burn intensely, live briefly, and collapse into or explode around supermassive black holes.

8.2 The JWST Anomaly

The James Webb Space Telescope (JWST) has, since 2022, systematically found galaxies in the very early universe that are too large, too bright, and contain black holes far too massive to have formed by standard processes in the time available. This has been described by cosmologists as deeply puzzling, and no consensus explanation exists within the standard model.

The paired universe framework offers a natural explanation: those early galaxies are the remnants of hyper-massive stars that formed under a weaker G. The supermassive black holes at their centres are the collapsed cores of those stars. The surrounding gas, dust, and stellar populations are the ejecta from their eventual explosive deaths — the raw material from which the rest of the galaxy then assembled. The galaxy, in this picture, did not grow gradually from small pieces; it formed rapidly around a pre-existing massive black hole, seeded by a single hyper-massive progenitor.

This also explains why every large galaxy appears to have a supermassive black hole at its centre: not because black holes grew over time by accretion, but because they were there first.

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9. Testable Predictions

A theory is only scientifically meaningful if it makes predictions that can, in principle, be proven wrong. The paired universe framework makes the following specific predictions, each of which differs from the standard model:

- The gravitational constant G is not constant but increases over cosmic time. This predicts that stars and black holes in the early universe should reflect a lower effective G — they should be more massive than current stellar physics allows, exactly as JWST is observing.

- The redshift-distance relationship for distant supernovae and galaxies should deviate from the ΛCDM prediction in a specific, calculable way once G(t) is included. The deviation attributed to dark energy should be recoverable from a varying G alone.
- The spatial distribution of dark matter anomalies (inferred from gravitational lensing and galaxy rotation curves) should correlate with the distribution of black holes, both at galactic centres and throughout galactic discs.
- The cooling rate of white dwarf stars at different cosmic epochs should show a systematic trend consistent with a changing G. More distant (older) white dwarfs should reflect a slightly different G than nearby ones.
- If the timeless universe acts as the connective substrate for quantum entanglement, then entanglement experiments conducted across very large distances should show no deviation from instantaneous correlation — consistent with the prediction that the timeless universe has no spatial separation.
- Binary pulsar systems at different cosmological distances should show systematically different orbital decay rates, reflecting the different value of G at the time their light was emitted.

The most immediately actionable prediction is the JWST anomaly. If a specific G(t) function is derived and used to compute the expected maximum stellar mass in the early universe, the result should match the observed masses of the earliest black holes. This is a quantitative, falsifiable prediction that could be tested against existing JWST data.

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10. Summary of Explanatory Power

The table below summarises the phenomena addressed by this framework and contrasts the proposed explanation with the standard one:

Phenomenon	Standard Explanation	Paired Universe Explanation
Gravity	Spacetime curvature (GR)	Restoring tension from timeless companion universe
Increasing gravity over time	Not predicted; G assumed constant	Expansion stretches companion universe, increasing pull-back force
Dark matter	Unknown particles (WIMPs, axions etc.)	Black holes as anchor points intensifying coupling between universes
Quantum entanglement	Non-local correlation (no mechanism)	Shared location in timeless universe where all points coexist
Wave-particle duality	Quantum superposition	Particles exist in temporal universe; waves in timeless universe
Light being timeless	Special relativity consequence	Light is a direct manifestation of the timeless universe
Dark energy	Unknown repulsive force	Misinterpretation of weaker past gravity in redshift measurements
Supermassive black holes	Origin unclear; appear too early	Remnants of hyper-massive stars formed under weaker early G

Phenomenon	Standard Explanation	Paired Universe Explanation
Black hole singularities	Breakdown of known physics	Interface / puncture point between the two paired universes
Big Bang origin	Singularity from nothing (unexplained)	Particle/antiparticle-style pair creation: two opposite universes from nothing
Ultimate fate of universe	Heat death or continued expansion	Eventual annihilation of paired universes returning to nothing

The breadth of phenomena addressed by a single underlying postulate — two paired universes, one temporal, one timeless — is considered a strength of the framework. In contrast to the standard model, which requires separate undetected entities (dark matter particles, dark energy, inflaton fields) for each anomaly, this framework requires no new particles and no new dimensions. The timeless companion universe is the single new element, and all other explanations follow from it.

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11. Conclusion and Invitation for Collaboration

This paper has presented a speculative but internally consistent cosmological framework. Its core claim is simple: our universe has a timeless companion, they emerged together from nothing as opposites, and the tension between them is gravity. From this single idea, explanations emerge for gravity, dark matter, quantum entanglement, wave-particle duality, the nature of light, the origin of supermassive black holes, the JWST anomalies, and an alternative to dark energy.

The framework is explicitly not a completed theory. The mathematical form of G(t) has not been derived from first principles. The precise coupling mechanism between the two universes has not been specified. The relationship between the timeless universe and the quantum wave function has not been formalised. These are open problems that require collaboration with physicists working in cosmology, quantum gravity, and observational astronomy.

The author invites engagement from researchers willing to take these ideas seriously and to test them against data. The specific suggestion is to begin with the JWST anomaly — deriving a G(t) that explains the observed early black hole masses, and then checking whether the same G(t) eliminates the need for dark energy in the redshift data. If it does, that would be a significant and falsifiable result.

Researchers whose existing work is most directly relevant include those working on modified gravity theories, alternatives to dark matter and dark energy, the foundations of quantum mechanics, and the origin of supermassive black holes. The framework described here may provide a unifying context for results that currently appear unrelated.

James Francis Godwin

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