Segmented Spacetime and ϕ as a Temporal Growth Function

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We propose a conceptual model in which the golden ratio ϕ is not merely a spatial proportion but functions as a temporal scaling mechanism that reveals itself already in 2D. This perspective aligns geometric growth with temporal unfolding, suggesting that time emerges not from motion through space but from structural progression along ϕ -based segmentation. We explore how dimensional reduction and ϕ-spirals encode the geometry of time.

Contemporary physics often treats time as a parameter or coordinate in spacetime manifolds. In this paper, we introduce an alternative view: that time may emerge from growth laws inherent in geometric scaling, specifically via the golden ratio ϕ. Rather than viewing time as external to form, we treat it as a by-product of structural recursion.

The Role of ϕ in Spatial Growth

The golden ratio $\phi = \frac{1+\sqrt{5}}{2} \approx 1.618$ appears in recursive geometric structures, natural growth patterns, and quasiperiodic tilings. In a segmented circular structure (e.g., a spiral), ϕ defines the rate at which segments expand outward. Each quarter-turn in a ϕ-spiral marks a multiplication of radius by ϕ.

Let:

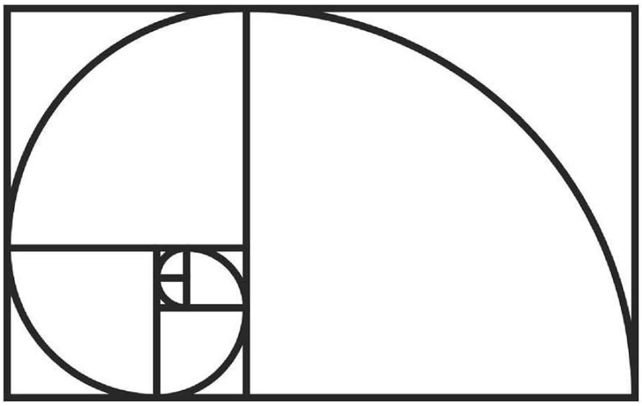
$$R(\theta) = a\,\phi^{\theta/\pi/2}$$

where

a = initial radius

θ = angle in radians

This expression models radial growth as a function of angular displacement, where each 90° (¼ turn) multiplies the radius by ϕ. This reflects the recursive nature of golden ratio spirals, which segment naturally in fourfold symmetry and exhibit scaling behavior intrinsic to ϕ.



Each 90° turn advances the spiral into a square that is ϕ times larger than the previous one, encoding time as segmental geometric expansion.

Time as Emergent from ϕ-Scaling

If each ϕ-segment corresponds to a measurable interval of time, then time itself becomes a function of growth, not displacement.

That is:

$$t \propto \log_{\phi}(R)$$

This interpretation frames time as the count of expansions. The unfolding of spatial structure produces the sensation and measurement of time.

This has profound implications:

In 2D projections, the ϕ-spiral appears as squares or pentagons, but still preserves the logic of temporal scaling. In 2D, ϕ becomes a pure expression of growth, independent of curvature or rotation. Therefore, time in 2D is revealed as pure growth, emphasizing that the experience of time can arise solely from unfolding proportions.

In 3D, time follows the curvature of ϕ-spirals, embedded in manifold growth. The curvature itself is governed by angular motion, and thus also incorporates π through rotational symmetry. In this sense, ϕ defines the rate of growth, while π determines the spatial rotation. Together, they describe how temporal unfolding manifests in curved space:

$$t \propto \log_{\phi}(R) \cdot \theta \text{ with } \theta \in [0,2\pi]$$

This implies that time is a function of both internal scaling (ϕ) and rotational embedding (π), suggesting a unified geometric interpretation of growth and orientation.

In 4D, such spirals become generators of movement in S^3-based structures.

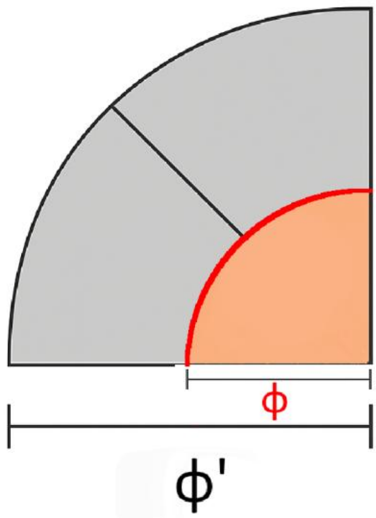
Spirals Within Spirals: Local Gravity within Spacetime

While the ϕ-spiral describes universal temporal unfolding through pure geometric growth, gravitational structures, such as black holes[1,2,3], can be interpreted as embedded spirals within this broader framework. Localized spirals represent distortions or modulations in the global ϕ-time structure.

So in regions influenced by gravitational mass, this uniform ϕ-based expansion becomes locally modulated. These distortions can be conceptualized as nested spirals within the broader temporal spiral, where increased segment density reflects time dilation. Gravity, in this model, does not disrupt the underlying ϕ-growth. It curves and expands it.

Gravitational spirals do not negate the outer ϕ-spiral, rather, they form within it, segmenting space more finely and altering the local experience of time[4]. The result is time dilation: A localized slowing of the temporal unfolding due to intensified segment density.

In this view, ϕ remains the underlying pulse. Gravity merely bends it.



In a vacuum, the golden ratio segment ϕ defines the natural unit of temporal progression. Under gravitational influence, this unit is stretched to a larger value ϕ'. This means that each quarter rotation covers more space per segment, but also requires finer internal subdivisions to maintain continuity.

As a result, the number of internal steps or subdivisions increases. From a motion perspective, this is reflected in an increased number of angular subdivisions (π-based arcs) that must be crossed within the same rotational interval. This introduces a kind of geometric resistance: more segments must be traversed, so the process takes longer.

Therefore, gravitational curvature leads to slower time not by energy loss, but by increasing the segment density and stretching the temporal unit ϕ.

References

1. Wrede, C., & Casu, L. (2024). Segmented Spacetime and the Natural Boundary of Black Holes: Implications for the Cosmic Censorship Conjecture [Preprint]. ResearchGate.

2. Wrede, C., Casu, L., Bingsi (2024). Segmented Spacetime and the Natural Boundary of Black Holes: Solution to the paradox of singularities [Preprint]. ResearchGate.

3. Wrede, C., Casu, L., Bingsi (2025). Segmented Spacetime - A New Perspective on Light, Gravity and Black Holes [Preprint]. ResearchGate.

4. Wrede, C., Casu, L., Bingsi (2025). Segmented Spacetime - π and ϕ as Structural Constants [Preprint]. ResearchGate.