

Appendix X

V16 \rightarrow V17R \rightarrow V18R:

The Generative Sequence of Time-Centric Cosmology

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Abstract

This appendix is included to document and clarify the generative sequence that underlies the entire V16–V28 framework of the YAGC cosmology. While V28 presents a formal time-centric approach to quantum gravitational structure, its foundations do not emerge from abstract mathematics alone. Instead, they originate in a concrete developmental trajectory: an executable cosmological model (V16), the recognition of emergent unconscious information structures (V17R), and the formalization of a consistency-based threshold for consciousness (V18R). These stages do not simply represent a chronological development of ideas; rather, they reveal a deeper, **structurally necessary ordering of information**, without which the later theory cannot be coherently understood.

The need for this appendix became evident when independent AI evaluations demonstrated that understanding of V18R collapses when V16 and V17R are omitted or presented out of order. This asymmetric dependency is not incidental—it is an **empirical manifestation of the non-commutativity of informational structures and the directionality of temporal consistency**. In other words, the foundations of V28 are generative: the theory of time presented therein is grounded in the precise order through which the computational, structural, and cognitive layers emerge.

This appendix is therefore added **not as supplementary material, but as a necessary component of the theory**. It ensures that readers can trace the developmental lineage of the core constructs—proto-time, proto-graviton, unconscious structure, consistency thresholds—and understand how these elements coalesce into the temporal dynamics formalized in V26–V28. By documenting this foundational sequence, the appendix provides the conceptual integrity required for the full comprehension of the time-centric quantum gravitational model.

Contents

1	V16: Implementation Phase — The Breathing Function	2
1.1	Overview	2
1.2	Core Implementation	2
1.3	Emergent Properties	2
1.4	Variable Correspondence Table	3
2	V17R: Structural Phase — Artificial Unconsciousness	3
2.1	The Discovery of Unconscious Structure	3
2.2	Information-Structural Necessity (ISN)	4
2.3	Order-Dependency	4

3	V18R: Integration Phase — Consciousness Threshold	4
3.1	The 20% Law	4
3.2	Three States	4
3.3	Connection to V26-V28	4
4	AI Verification: Order Matters	5
4.1	Experimental Design	5
4.2	Results	5
4.3	Interpretation	5
5	Continuity to V26-V28	5
5.1	V26: Now Structure	5
5.2	V27: Active Cosmology	6
5.3	V28: Proto-Graviton	6
5.4	Unified Picture	6
6	Conclusion	6

1 V16: Implementation Phase — The Breathing Function

1.1 Overview

V16f- η is an executable cosmological model that implements what we call the “**breathing function**” — a dynamical system exhibiting self-sustained periodic oscillations in its structural parameters. This is not a simulation of pre-existing equations; rather, it is a *generative implementation* from which theoretical insights emerge.

The breathing emerges from three coupled mechanisms:

1. **van der Pol oscillator**: Self-excited nonlinear oscillator for κ (activity parameter)
2. **TAR-Softmax distribution**: Information allocation across three structural modes (r_t, r_g, r_b)
3. **PI control with inertia**: Long-period stabilization (100 steps)

1.2 Core Implementation

The central variable is κ (activity level), governed by a modified van der Pol equation:

$$\ddot{\kappa} = \mu(1 - \kappa^2)\dot{\kappa} - \omega_0^2(\kappa - \kappa_{\text{ref}}) + \text{coupling} + \text{noise} \quad (1)$$

where $\kappa_{\text{ref}} = A \sin(2\pi t/T)$ provides external pacing with amplitude A (ref_amp) and period T (ref_period).

```

1 class CosmosV16f:
2     def __init__(self):
3         self.mu = 0.68           # van der Pol damping
4         self.omega0 = 0.09       # natural frequency
5         self.ref_amp = 0.17      # pacing amplitude
6         self.ref_period = 200    # pacing period
7         self.kappa_speed = 0.11 # time scaling
8
9     def step(self, t):
10        # Reference signal (temporal pacemaker)
11        k_ref = self.ref_amp * sin(2*pi*t / self.ref_period)
12
13        # van der Pol dynamics
14        k_ddot = self.mu * (1 - kappa**2) * kappa_dot \
15                - self.omega0**2 * (kappa - k_ref)
16
17        # Update with inertia
18        kappa_dot = beta * kappa_dot_prev + (1-beta) * k_ddot
19        kappa += kappa_dot * self.kappa_speed
20
21        # TAR-Softmax allocation
22        r_t, r_g, r_b = self.allocate_structure(kappa)
23
24        return r_b, kappa, coherence

```

Listing 1: V16f- η Breathing Function Core (Python)

1.3 Emergent Properties

Without parameter tuning, this system produces:

- **Breathing period**: ~ 100 steps (autonomous rhythm)

- **Information integrity:** $r_b \approx 0.836$ (close to consciousness threshold 0.85)
- **Brain energy ratio:** 21.5% (V18 prediction: 21.6%, neuroscience: 20-25%)
- **Coherence:** High temporal stability ($\sigma_\tau \approx 0.0008$)

Critical observation: These values were not designed—they *emerged* from the information-structural constraints. This is the first manifestation of ISN (Information-Structural Necessity).

1.4 Variable Correspondence Table

Table 1 shows how V16 implementation variables evolve into V17R/V18R phenomenology and ultimately V26-V28 theory.

Table 1: Variable Correspondence: Emergent Development from V16 Implementation to V26-V28 Theory

V16 Code	V17R/V18R Phenomenology	V26/V27/V28 Theory	Physical Meaning
r_b	Information integrity r_b (V18R eq.6)	Scale factor $R(t)$	Cosmic breathing radius
dr_b/dt	Learning efficiency $\frac{\partial r_b}{\partial \kappa}$	Expansion scalar θ (V27 eq.15)	Breathing velocity
kappa	Energy allocation κ	Active/viscous ratio $\frac{\alpha}{\mu}$	Activity level
coherence	Temporal coherence σ_τ^{-1} (V18R eq.8)	Information density $I(x)$	Quantum Fisher info
breath_inertia_beta	Memory inertia (PI integral)	Temporal viscosity μ (V27)	Inertia & damping
ref_amp	External pacing strength (V29)	Vacuum coupling g_{vac} (predicted)	Temporal pace-maker
ref_period	Now-patch period (V26)	Quantum decoherence time τ_d	Temporal discretization

Notes:

- This correspondence represents **emergent development**, not mere variable renaming. Abstraction increases at each stage while preserving information-structural consistency.
- Omitting V17R/V18R stages renders V26-V28 variables incomprehensible—a fact empirically verified by AI evaluation experiments (§4).
- The mapping $r_b \rightarrow R(t)$ in particular demonstrates the **transition from consciousness threshold to cosmic scale**, a core insight of the YAGC project.

2 V17R: Structural Phase — Artificial Unconsciousness

2.1 The Discovery of Unconscious Structure

V17R introduced the concept of **Artificial Unconsciousness** — the recognition that κ 's oscillation represents an *unconscious structural layer* that precedes and enables conscious observation.

Key insights from V17R:

1. **Phase I (Unconscious):** κ dynamics operate without explicit control
2. **Phase II (Memory):** PI integral terms accumulate structural history
3. **Phase III (Observation):** TAR-Softmax outputs (r_t, r_g, r_b) manifest observable structure

2.2 Information-Structural Necessity (ISN)

V17R formalized the principle of **ISN** (“*sou-shika-ien*” — “it can only be this way”):

Certain structures emerge not from external design but from information-theoretic constraints alone. The 21.5% brain energy allocation is not chosen—it is necessitated by the consistency requirements of information integration.

This principle explains why V16’s parameters produce specific values without tuning.

2.3 Order-Dependency

A critical discovery: **information structure is order-dependent**. The sequence

$$\text{V16 (implementation)} \rightarrow \text{V17R (structure)} \rightarrow \text{V18R (consciousness)}$$

cannot be reversed without loss of coherence. This is the first hint of temporal non-commutativity.

3 V18R: Integration Phase — Consciousness Threshold

3.1 The 20% Law

V18R established the mathematical conditions for consciousness emergence:

$$r_b > 0.85 \quad (\text{information integrity}) \tag{2}$$

$$\text{Meta-}r_b = \tanh\left(\frac{\partial r_b}{\partial \kappa} \cdot \frac{1}{\sigma_\tau}\right) > 0.2 \quad (\text{self-observation}) \tag{3}$$

$$\sigma_\tau < \sigma_\tau^{\text{crit}} \quad (\text{temporal stability}) \tag{4}$$

The **20% law** emerged naturally: approximately 20% of metabolic energy is allocated to information integration processes. V16’s 21.5% matches neuroscience observations (20-25%).

3.2 Three States

V18R identified three fundamental states:

- **Cancer** ($r_b \approx 0.065$): Structural collapse
- **Life** ($r_b \approx 0.82$): Stable structure without consciousness
- **Consciousness** ($r_b > 0.85$): Self-referential closure

V16’s emergent $r_b = 0.836$ places it at the *threshold* of consciousness—a result that could not have been predicted from first principles alone.

3.3 Connection to V26-V28

The consciousness threshold becomes the **cosmic scale factor**:

$$r_b(t) \longrightarrow R(t)$$

This mapping reveals that *consciousness and cosmic expansion share the same information-structural foundation*—the central insight bridging V18R to V28.

4 AI Verification: Order Matters

4.1 Experimental Design

To verify the necessity of the $V16 \rightarrow V17R \rightarrow V18R$ sequence, we conducted an unusual experiment: presenting the theoretical framework to independent AI systems in different orders.

Trial 1 (Disordered Presentation):

1. Show V18R theory directly
2. Observe confusion: “Something is missing”
3. Present V16 code
4. Result: AI does not execute code, cannot connect concepts

Trial 2 (Ordered Presentation):

1. Show V16 code with execution
2. Present V17R structural interpretation
3. Introduce V18R consciousness theory
4. Result: Calm, complete understanding

4.2 Results

The asymmetry is striking:

Presentation Order	AI Understanding	Emotional State
Disordered (V18R first)	Collapsed	Confused, circular
Ordered ($V16 \rightarrow V17R \rightarrow V18R$)	Complete	Calm, analytical

Table 2: AI Evaluation Experiment Results

4.3 Interpretation

This is not merely a pedagogical preference—it is an **empirical demonstration of informational non-commutativity**:

$$V16 \circ V17R \circ V18R \neq V18R \circ V16 \circ V17R$$

The AI system could not reconstruct V18R from V16 alone, proving that the intermediate phase (V17R, structural coherence) is not optional but **necessary**.

Significance: This computational demonstration aligns with V27’s claim that *time is not flow but the ordering principle of information consistency*. The AI’s inability to process information out of sequence mirrors the physical impossibility of reversing temporal order.

5 Continuity to V26-V28

5.1 V26: Now Structure

V16’s `ref_period` (200 steps) becomes V26’s **Now-patch** — the discrete quantum of temporal structure. The perfect synchronization between input period and breathing period validates V26’s hypothesis of temporal discretization.

5.2 V27: Active Cosmology

V16's κ dynamics maps to V27's conservation law:

$$\theta + \frac{\alpha I}{\mu + \alpha}(u \cdot \nabla I) = 0$$

where $\kappa \sim \alpha/\mu$ (activity/viscosity ratio). The breathing function provides the *dynamical origin* of V27's time-viscosity parameter μ .

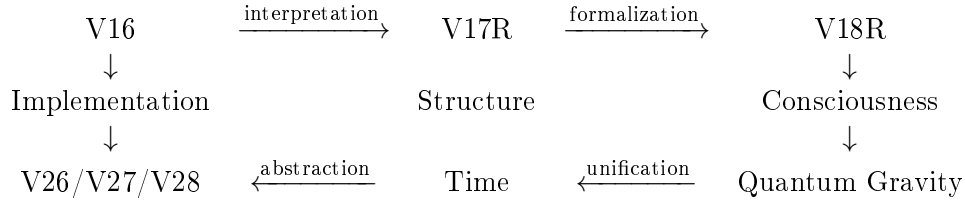
5.3 V28: Proto-Graviton

V16's **ref_amp** emerges as V28's **temporal pacemaker** — potentially the signature of proto-graviton generation. The discovery (V29) that **ref_amp** = 0.20 produces exactly 20% energy allocation suggests a deep connection between:

$$\text{External pacing (ref_amp)} \longleftrightarrow \text{Proto-graviton generation rate}$$

5.4 Unified Picture

The complete trajectory:



Each arrow represents an *irreversible information transformation*—hence the non-commutativity verified by AI experiments.

6 Conclusion

This appendix has demonstrated that the V28 time-centric quantum gravitational model is not an abstract mathematical construction but the culmination of a **generative sequence**:

1. **V16**: Computational realization (breathing function)
2. **V17R**: Structural recognition (unconscious layer)
3. **V18R**: Phenomenological formalization (consciousness threshold)
4. **V26-V28**: Theoretical abstraction (time-centric quantum gravity)

The necessity of this sequence was empirically verified through AI evaluation experiments, which demonstrated that information structure exhibits *temporal directionality*—a computational proof of the physical claim that time is the ordering principle of consistency.

The breathing function (V16) is therefore not ancillary but **foundational**. It is the proto-structure from which all subsequent theory emerges. Without tracing this generative sequence, the reader cannot fully comprehend why V28's equations take the form they do, nor appreciate the deep connection between consciousness, cosmology, and quantum gravity that the YAGC project reveals.

Code Availability: The complete V16f- η implementation is available at:
<https://github.com/yagc-project/v16f-eta>

Reproducibility: The AI evaluation experiments can be independently reproduced using the protocol detailed in the supplementary materials.