Slope Traversal and Time

A Minimal Statement of Gravitational Phase-Cancellation Theory (gPCT)

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Notation

$$u^\mu \;=\; \frac{dx^\mu}{d\tau} \qquad \text{(four-velocity)}$$

$$a^\mu \;=\; u^\nu \nabla_\nu u^\mu \qquad \text{(four-acceleration)}$$

$$D \;:=\; u^\mu \nabla_\mu \qquad \text{(derivative along a worldline)}$$

$$\phi_g \;:=\; \text{gravitational phase (scalar functional of the metric)}$$

$$s \;:=\; D\phi_g \qquad \text{(local gravitational-phase slope)}$$

$$G \;:=\; \text{weak-field gravitational amplitude (scalar curvature proxy)}$$

In the weak-field limit,

$$\phi_g \propto \frac{c^2}{2}\ln(-g_{00}) \qquad \text{and} \qquad D\phi_g \approx \dot{\Phi},$$

with Φ the Newtonian potential.

Postulate I — Slope Memory

$$\sigma(\tau) = \sqrt{a^\mu a_\mu}, \qquad \Sigma[\gamma] = \int_\gamma \sigma \, d\tau$$

Clocks accumulate slope memory; cancellation occurs only under symmetric traversal of the dominant field.

Postulate II — Dual Recursion

Let $s := D\phi_g$. Then curvature and time co-determine one another through

$$G := D\big(t \, DG\big), \qquad t := D\big(G \, Dt\big),$$

with recursion scalar

$$\mathcal{H} = \frac{DG}{-GD^2G - (DG)^2}.$$

Postulate III — White Equation (Conjecture)

$$\mathcal{H} \xrightarrow[\text{weak field}]{} \frac{1}{2\pi}$$

Slope Domain.

$$s = 2 \left|\text{normalize}(D\phi_g)\right|, \qquad s \in [0, 2],$$

where normalize($\cdot$) is defined over one complete phase cycle.

Prediction (slope-modulated collapse).

$$P(|1\rangle) = \cos^2\left(\frac{\pi}{2}(s - 0.5)\right)$$

This is not the Born rule. Here the $\cos^2$ law follows from slope recursion (Postulate II); collapse probabilities must be modulated by slope phase. Standard QM predicts no such dependence.

Weak field: $D \approx \dfrac{d}{dt}$ and $s \propto \dot{\Phi}$, with Φ the Newtonian potential. Thus ϕ_g tracks the local gravitational phase slope (tidal derivative).

Corollary — Temporal Balance

$$\oint_\gamma \sigma \, d\tau = 0 \qquad \text{for closed worldlines or complete phase cycles.}$$

This describes a cyclic, self-referential universe in which local asymmetries sum to global neutrality.

Arrow of Time

Because the gravitational phase ϕ_g evolves monotonically along an observer's worldline, slope-dependent collapse modulation inherits an intrinsic direction. Although σ phase-cancels globally and preserves statistical neutrality, the sequence of local asymmetries is not symmetric under reversal of proper time. In gPCT, temporal asymmetry requires no entropy gradients, decoherence, or boundary conditions; it follows directly from directional traversal of gravitational-phase slope.