Slope Traversal and Time

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

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Notation

$$
\begin{aligned}
u^\mu &= dx^\mu/d\tau \\
a^\mu &= u^\nu \nabla_\nu u^\mu \\
D &= u^\mu \nabla_\mu
\end{aligned}
$$

ϕ_g : gravitational phase potential (scalar functional of g_{00})
s $=$ $D\phi_g$ (local gravitational-phase slope)
G : scalar gravitational amplitude (local curvature scalar in weak-field limit)

In the weak-field approximation, $\phi_g \propto \frac{c^2}{2}\ln(-g_{00})$, so that $D\phi_g \approx \dot{\Phi}$ 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 if traversal is symmetric with respect to the dominant field.

Postulate II — Dual Recursion

Let the local slope be $s \equiv D\phi_g$, derived from the gravitational phase potential ϕ_g. Then curvature recursion reads:

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

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

Postulate III — White Equation (Conjecture)

$$\mathcal{H} = \frac{DG}{-GD^2G - (DG)^2} \quad \longrightarrow \quad \frac{1}{2\pi}$$

Slope Domain

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

(with normalize(·) evaluated over one complete phase cycle)

Prediction

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

Note: This is not a restatement of the Born rule. Here, the $\cos^2$ law arises from gravitational slope recursion (Postulate II), so collapse probabilities must be modulated by slope phase. Standard QM predicts no such dependence.

Weak-field: $D \approx \dfrac{d}{dt}$ and $s \propto \dot{\Phi}$, where Φ is 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 condition defines the universe as a cyclic, self-referential system whose local asymmetries sum to global neutrality.

Arrow of Time

Because the gravitational phase ϕ_g evolves monotonically along an observer's worldline, the slope-dependent collapse modulation $\sigma(\tau)$ inherits an intrinsic direction. Although σ phase-cancels globally and preserves statistical neutrality, the ordered sequence of local asymmetries is not symmetric under reversal of proper time. In gPCT, temporal asymmetry does not require entropy gradients, decoherence, or cosmological boundary conditions, but follows directly from the unidirectional traversal of gravitational phase slope.