

Addendum 260: The Fold Clock

Two corpus readings, conditional selection of $C-\eta$,
and the reduction of the unit problem

TOE Corpus

2026-06-09

Skill: gap-closure v1.1 — **Outcome:** Case B+ (clock selected conditionally; unit problem reduced, not closed) — **Task:** TASK_031 — **Verifier:** `verify_P260.py` — all PASS

Abstract

A256 established empirically that fold completions are equally spaced in their clock and left the clock’s identity open (OI-256-1). This addendum derives what the corpus can and cannot say about it. *First*, the corpus supports exactly two readings of fold pacing: the P32 fold-rate remark (interior observer counts completed folds as proper time) selects cosmic time — the $C-t$ map, viable only in A256’s untestable $z_4 \geq 8$ tail — while the P28 dual-observer construction, in which all phase propagation on S^3 is angular and hence uniform in conformal time, selects $C-\eta$. The $\ln a$ clock has no corpus reading at all: e-fold counting appears nowhere in the canon as a dynamical variable. *Hence*: if the fold clock is derivable from existing corpus structure, **$C-\eta$ is selected**, and the $C-\ln a$ survivor’s PBH/SIGW predictions become tests of new structure rather than of the canon. *Second*, the absolute calibration of any fold clock reduces to a single unknown length: the curvature radius of the spatial S^3 , which is the same unknown as the B^4 physical scale (P04, open). One unit problem, not two. *Third*, A259’s α^6 candidate conditionally closes it: $R_{\text{curv}} = 7.5 \times 10^4$ Mpc gives the universe’s present conformal age as $\chi_0 = \eta_0/R_{\text{curv}} \approx 0.19$ rad of S^3 arc — the fold history is then a measured angular traversal, and each fold quarter subtends a computable arc. All numerics certified by `verify_P260.py`.

1 Two Readings, One Selection

Proposition 1.1 (Reading 1: fold-rate proper time $\Rightarrow C-t$). *P32’s fold-rate remark (§Octonionic Correspondence) assigns the interior observer a proper time that counts completed folds. For a comoving cosmological observer, proper time is cosmic time t ; uniform fold ticks in interior proper time give $t(J_1) = \frac{1}{2}t(J_2)$ — the $C-t$ map. A256’s grid (checks 27, 33b of `verify_P256.py`) shows $C-t$ places the seeding epoch at $z_1 \in [9, 13]$ for $z_4 \in [4, 6]$ — too late to grow UHZ1-class objects — and becomes viable only in the untestable $z_4 \geq 8$ tail. Reading 1 is therefore either wrong or pushes the framework into unfalsifiability.*

Proposition 1.2 (Reading 2: conformal phase $\Rightarrow C-\eta$). *In P28, all dual-observer dynamics is phase propagation on S^3 : the intrinsic arc-speed is constant ($\|\Omega\| = 2\pi$, P28 §numerical experiments) and observables are functions of traversed arc. On an FRW background with spatial slice S^3 of radius R_{curv} , equal arc intervals $\Delta\chi$ correspond to equal conformal-time intervals $\Delta\eta = R_{\text{curv}} \Delta\chi$. A fold completion — a global phase-locked event of the S^3 boundary — paced uniformly in traversed arc is therefore paced uniformly in η : the $C-\eta$ map.*

Theorem 1.3 (Conditional selection). *The corpus admits exactly the two readings above; $\ln a$ (e-fold counting) appears nowhere in the canon as a dynamical clock. Since Reading 1 is confined to the untestable tail (Prop. 1.1), the corpus-derivable fold clock in the testable window is conformal: if the fold clock is derivable from existing structure, $C\text{-}\eta$ is selected.*

Corollary 1.4 (Status of $C\text{-}\ln a$). *The $C\text{-}\ln a$ survivor of A256 requires clock structure the canon does not currently contain (NEW THEORY flag). Its observational signatures — the 10^{24} g PBH band (A256), the mandatory 0.45–0.95 mHz SIGW spike (A257), and the α^6/Ω_k pinning (A259) — remain valid as stated, but a detection would now carry a stronger implication: it would demonstrate new clock structure beyond the present corpus, not merely confirm it. Conversely the canonical near-term tests of the corpus-derivable branch are $C\text{-}\eta$ ’s: JWST seed demographics at $z_1 \approx 17\text{--}26$ coupled to a $w(z)$ step at $z_4 \approx 4\text{--}6$.*

2 The Unit Reduction

Theorem 2.1 (One unit problem, not two). *Absolute calibration of the fold clock requires converting system units to SI. The corpus’s clock constants ($T_{\text{breath}} = \pi\alpha^{-1}$, A239; the Θ -cycle phase ledger, P28) are dimensionless or in system units; the only corpus-native object that can carry an SI length is the radius R_{curv} of the spatial S^3 — which is precisely the B^4 physical scale whose absence P04 records as open (Schwarzschild connection). Under Reading 2 the conversion is explicit: $\Delta\eta = R_{\text{curv}} \Delta\chi$, so every fold-clock interval is an arc on S^3 scaled by R_{curv} . The fold-clock unit problem and the B^4 -scale problem are therefore the same problem.*

Remark 2.2 (Conditional closure via A259). *A259’s curvature pinning gives the conditional anchor: if the transfer fraction is $s = \alpha^6$, then $R_{\text{curv}} = 7.5 \times 10^4$ Mpc. The present-day conformal age is then a measured arc,*

$$\chi_0 = \frac{\eta_0}{R_{\text{curv}}} \approx \frac{1.42 \times 10^4 \text{ Mpc}}{7.5 \times 10^4 \text{ Mpc}} \approx 0.19 \text{ rad},$$

and with $z_4 = 5$ (mid-window) the four boundary folds each subtend $\chi(z_4)/4 \approx 0.022$ rad of S^3 arc. The proximity of this per-fold arc to the edge fraction $\pi/\alpha^{-1} = 0.0229$ is recorded as an unexplored observation, not a claim (PSLQ-honesty convention); it is exact only at one point of the z_4 window. A failed Ω_k test of A259 (Rem. 3.2 there) voids this anchor without affecting Theorems 1.3 and 2.1.

3 Verdict and Open Items

OI-256-1 verdict: reduced and conditionally selected (Case B+). The clock is $C\text{-}\eta$ if corpus-derivable (Thm. 1.3); its absolute units are the B^4 scale (Thm. 2.1); the scale is conditionally 7.5×10^4 Mpc via A259’s α^6 candidate (Rem. 2.2). Full closure requires either the OI-259-1 transfer rule (which would simultaneously fix s , Ω_k , R_{curv} , and the clock unit — four locks, one key) or an independent derivation of R_{curv} .

Open items.

1. **OI-260-1.** Derive the fold-completion pacing from the kernel (why uniform arc per fold — candidate: the Wheel’s Plateau/Oscillate alternation on the Δ_{S^1} sector as the fold metronome). This would upgrade Thm. 1.3 from conditional to unconditional.

2. **OI-260-2.** The per-fold arc vs. edge-fraction proximity (Rem. 2.2): coincidence audit once z_4 is measured.

Verifier. Lumen/corpus/addenda/verify/verify_P260.py — all checks pass, exit 0. Task: Codex/Write/TASK_031 (executed by Cowork directly, 2026-06-09).