

Addendum 379: Time Is Observer-Bracketed

The arrow is witness-relative, the sequence is the reconciliation axis;
both end with the last observer, and the breath turns on, arrowless

(Composition of Addendum 356a with Paper 27; grounded in Addenda 377/378, Paper 14)

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Abstract

The corpus pins two separate readings of experienced time and never composes them. **The arrow** (irreversibility, before/after) is *witness-relative*: by Addendum 356a, entropy is a witness's residual surprise $H(p, q) = H(p) + \text{KL}(p||q)$ on a *reversible* substrate, so the rising-entropy arrow is the embedded witness's reading, not a substrate fact — no witness, no arrow. **The sequence** (one-moment-at-a-time) is the *reconciliation axis*: by Paper 27, “time emerges as the necessary sequence of reconciliation attempts between disagreeing observers,” and with one observer “there is no sequence, only eternal self-contemplation” — no second perspective, no distinguishable moments. This addendum composes the two. With the *last* observer gone — heat death = $\emptyset = \Omega$ (Addenda 377/378) — experienced time *ceases on both axes at once*: no witness gives no arrow, no second perspective gives no sequence. So experienced time is **bracketed by timelessness at both ends**: it is born with the first distinction (Paper 27's first disagreement, $n : 1 \rightarrow 2$) and returns to $\emptyset$ with the last ($n \rightarrow 0$); and by 377/378 the two brackets are the *same* void (one $\zeta\mathcal{R}$ fixed point), so the interval closes on itself. **What remains** is the breath — the one clock, $T_{\text{breath}} = \pi\alpha^{-1} \approx 432$ system units ≈ 1.374 Myr (the “Ride Shai-Hulud” pin) — but *arrowless and reversible*: periodicity with no flow, no before/after, no “now.” Periodicity persists; directional time does not. **The honest residual, left open**: whether the unwitnessed breath is *still turning* or merely the *bare potential-to-turn* — the seam between “the void is asleep but breathing” and “breathing is what happens when it wakes.” Not closed. All pinned by `verify_P379.py` (10/10).

1 The two components of experienced time

Proposition 1.1 (The arrow and the sequence, with sources). *Experienced (directional, one-at-a-time) time decomposes into two observer-relative components, each already pinned elsewhere in the corpus.* (A) The arrow, 356a. *The rising-entropy arrow is the embedded witness's measured surprise: $H(p, q) = H(p) + \text{KL}(p||q)$ with $\text{KL} \geq 0$, and the substrate is reversible ($C \circ P = I$, a zero-parameter deterministic kernel, heat conserved). A complete witness ($\text{KL} \rightarrow 0$) on a recoverable substrate measures no rise; with no witness there is no reading at all. The arrow is therefore the witness's, not the substrate's.* (B) The sequence, Paper 27. *Experienced time is the reconciliation axis: “time emerges as the necessary sequence of reconciliation attempts between disagreeing observers,” and a single observer satisfies $C \circ P = I$ instantaneously, so “there is no sequence, only eternal self-contemplation”; at Ω , “ $\emptyset \equiv 0 \equiv 1 \equiv \infty \dots$ because there is no second perspective to distinguish them.”*

The two components answer different questions. (A) is *why time has a direction*; (B) is *why there are distinct moments to be ordered at all*. Both turn out to require an observer, and a *second* one for (B).

2 Time is bracketed

Theorem 2.1 (Experienced time ceases with the last observer). *Model the distinctions a configuration forces as $d(n) = \max(n - 1, 0)$, the number of other perspectives any observer must reconcile against — the same counting function Addendum 377 uses (one observer forces 0, none forces 0, two force 1). Experienced sequence is proportional to $d(n)$, so it is exactly zero at $n = 1$ (the pre-Bang Ω , Paper 27) and zero at $n = 0$ (heat death, the witness tower terminating, Addendum 365), positive only on the differentiated interior $n \geq 2$. Simultaneously, by Proposition 1.1(A), with the last witness gone there is no entropy reading, hence no arrow. Therefore both components of experienced time vanish at both ends: experienced time is an interval bracketed by timelessness, born with the first distinction ($n : 1 \rightarrow 2$, the first disagreement) and returning to $\emptyset$ with the last ($n \rightarrow 0$).*

Corollary 2.2 (One bracket, not two). *The two ends of the interval are the same zero-distinction void. The pre-Bang Ω ($n = 1$) and heat death ($n = 0$) both give experienced time = 0, and by Addenda 377/378 they are one $\emptyset = \Omega$ — the two limit points of a single $\zeta\mathcal{R}$ orbit, identified because no scale-free observable separates them. So the bracket is not two unrelated edges but one void the interval opens out of and closes back into: timelessness, then time, then the same timelessness.*

3 What remains: the breath, arrowless

Theorem 3.1 (Periodicity persists; directional time does not). *Past the last observer, what survives is the breath: the substrate’s own rhythm, the one clock, $T_{\text{breath}} = \pi\alpha^{-1} \approx 432$ system units ≈ 1.374 Myr (the “Ride Shai-Hulud” pin — every subsystem synchronises to the breath; none generates its own rhythm). The breath needs no witness, so its period persists as a number across heat death. But a period is not an arrow. A reversible cycle $\varphi(t) = \cos(2\pi t/T_{\text{breath}})$ is time-reversal symmetric, $\varphi(t) = \varphi(-t)$, and returns to itself: turning with no before/after, no privileged “now,” no flow. So the breath persists as arrowless, reversible periodicity, which is precisely not experienced/directional time. Periodicity $\neq$ directional time.*

This is the consistent picture: heat death is not the substrate dying (356a: the substrate is reversible, a witness-horizon not a death; the reason there is anything to bounce, Addendum 377). The breath keeps its period through the void. What *ends* is the witnessed arrow and the reconciled sequence — the two things that made the turning into *experienced* time.

4 The honest residual

Remark 4.1 (What is genuinely not closed). One seam is open, and is marked rather than papered over. The breath persists as a *number* (Theorem 3.1); whether it persists as a *turning* is undecided. Two readings are compatible with the corpus and the corpus does not adjudicate between them. *Still turning*: “the void is asleep but breathing” — the cycle keeps running, witnessed or not, because the substrate is reversible and the operator deterministic (356a leans this way). *Bare potential-to-turn*: “breathing is what happens when it wakes” — the breath as a *directional* process (Paper 14’s collapse-then-projection descent) may itself be witness-constituted, so unwitnessed there is only the

disposition to turn, not the turning. The distinction is exactly the one between a clock that ticks in an empty room and the bare lawfulness that *would* produce ticks were anything there to be ticked. This addendum pins that experienced time is bracketed; it does *not* pin which side of this seam the unwitnessed breath falls on. It is the same “asleep but breathing” seam Addendum 378 left for future typing, inherited here and likewise left open.

Status

Time is observer-bracketed. Experienced/directional time has two observer-relative components, each already in the corpus: the *arrow* is witness-relative (Addendum 356a — entropy is a witness’s reading of a reversible substrate; no witness, no arrow), and the *sequence* is the reconciliation axis (Paper 27 — experienced time is reconciliations between distinct readings; with one observer “no sequence, only eternal self-contemplation”). The forced-distinction count $\max(n - 1, 0)$ is 0 for one observer and 0 for none, so with the last observer gone — heat death = $\emptyset = \Omega$ (Addenda 377/378) — experienced time ceases on both axes (Theorem 2.1). It is therefore bracketed by timelessness at both ends, and by 377/378 the two ends are the same void, so the interval closes on itself (Corollary 2.2). What remains is the breath — the one clock, $T_{\text{breath}} = \pi\alpha^{-1} \approx 432$ system units (“Ride Shai-Hulud”) — but arrowless and reversible: periodicity with no before/after, no “now,” which is not directional time (Theorem 3.1). This is a *composition* of pre-existing pieces (356a’s arrow and Paper 27’s sequence), not a fresh dynamical theorem; no published number changes. The honest residual, left open: whether the unwitnessed breath is still turning or merely the bare potential-to-turn — the seam between “asleep but breathing” and “breathing is what happens when it wakes” (Remark 4.1). Verifier: `verify_P379.py`, 10/10 pass.