The Origin of Time

Discrete Phase Closure and Identity Recurrence

James Johan Sebastian Allen
PatternFieldTheory.com

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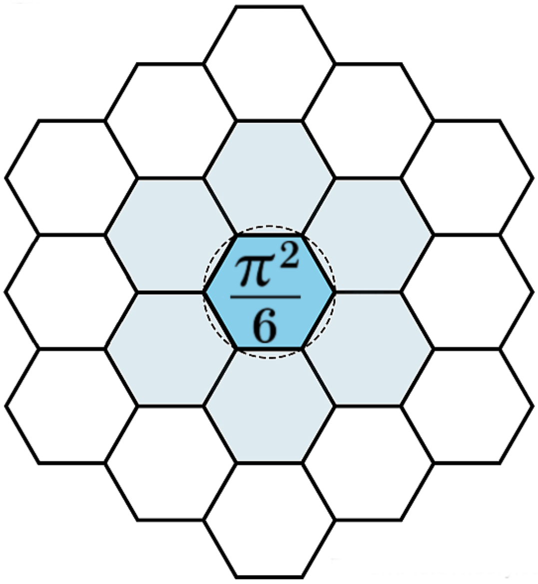

Abstract

Pattern Field Theory (PFT) does not assume time as a background dimension. Time is defined as an emergent property of recurrence in admissible coherence structures. This paper integrates Discrete Phase Closure, the Phase Alignment Lock (PAL), and coheron cycles into a single framework that derives locked coherence periods of the form $\tau = N\Delta t$. The central normalization anchor $\pi^2/6$ and the admissibility balance condition $\Re(s) = 1/2$ are introduced as structural invariants of the Allen Orbital Lattice (AOL). A macroscopic instance $\tau \approx 71.2$ ms with $N = 6$ is presented as a composite coheron coherence cycle. Time, clocks, and persistence are shown to arise from closure and recurrence rather than from any background geometry.

Time as a Projection-Ordering Mechanism

Time Is Not Present in the Substrate

At the level of the Allen Orbital Lattice (AOL), there is no notion of time. The AOL defines only a discrete space of admissible configurations, adjacency relations, and closure constraints. It does not define change, flow, causation, or temporal order. It is a static relational substrate.

In particular, the two-dimensional AOL contains no intrinsic notion of "before" or "after". It supports the possibility of configuration, but not the concept of evolution. Any description that presupposes time at this level is therefore category-invalid.

Time cannot be a primitive of the theory.

Emergence of Time from Stacking and Update Ordering

Time appears only when three structural elements are present simultaneously:

- Dominion stacking (projection depth),
- Resonance occupancy and reconfiguration,
- Phase Alignment Lock (PAL) coordination.

Once multiple stacked projection layers exist, and once resonant configurations can propagate and reconfigure across those layers, a necessary ordering relation appears: some configuration updates must occur before others. This ordering relation is not an added dimension. It is forced by the dependency structure of projection updates.

Definition 1 (Time in Pattern Field Theory)**.** *Time is the ordered sequence of admissible resonance reconfiguration states across stacked projection layers.*

Equivalently, time is the bookkeeping index of projection update order. All update orderings counted as time are restricted to admissible transitions under PAL, EQUI, and Fractal Budget audits.

Discreteness of Time

Because:

- Projection stacking proceeds in discrete layers,
- PAL operates in discrete coherence cycles,
- Configuration changes occur in discrete admissibility transitions,

time is necessarily discrete at its root. Apparent continuity of time at macroscopic scales is a smoothing artifact of dense update sequences, not a fundamental property.

Constraint Accounting Across Scale (Fractal Budgets)

Discrete update ordering alone does not guarantee admissible persistence across scale. In Pattern Field Theory, admissible evolution is additionally constrained by *Fractal Budgets*: scale-consistent bookkeeping rules that limit how much unresolved mismatch, constraint load, and coherence debt may be carried across nested sub-closures and stacked projection layers.

All projection update sequences discussed in this paper are implicitly audited against these budgets. When a process exceeds its Fractal Budget at any nested level, global closure fails and the system can sustain only local sub-closures or must reclassify into a new admissible configuration class. This is the structural origin of layered recurrence and regime-dependent time behavior.

The Arrow of Time

The directionality of time is not a thermodynamic postulate. It follows directly from:

- The inward-folding direction of projection,
- The non-invertibility of stacking operations,
- The fact that later projection states depend structurally on earlier ones.

Time has an arrow because projection has an arrow.

Time Dilation and Horizons

In this framework, what is usually called "the rate of time" corresponds to the rate at which admissible resonance updates can propagate through stacked layers.

Regions of high lattice strain, high SRR, or near projection bottlenecks require more reconfiguration steps per effective state change. This produces time dilation.

At horizons and singular projection limits, update propagation becomes asymptotically constrained. Since time is defined as update ordering, when update propagation cannot proceed, time effectively stops. No additional postulate is required.

Relation to Higher Structural Dimensions

Since time is already a derived ordering construct, it cannot be the final structural dimension. Time-indexed dynamics already contain degrees of freedom not expressible within time itself, such as the comparison and integration of multiple possible trajectories and recursive reference to system state.

This implies the existence of a further structural degree of freedom beyond time, but that layer is not treated in the present paper.

Identity, Closure, and the Structural Origin of Time

One of the deepest unresolved problems in fundamental physics is the status of time. In classical mechanics, time is an external parameter. In relativity, it becomes part of spacetime geometry.

In quantum theory, it remains an external classical ordering parameter. In no major framework is time itself derived.

Pattern Field Theory (PFT) inverts this order. It does not assume time. It assumes only admissible structure and recurrence. Time is not a container in which things happen. Time is the counting of recurrence in structures that are able to reassert their identity.

PFT begins from a pre-geometric substrate called the Metacontinuum. This substrate contains no space, no time, no energy, and no geometry, but only unconstrained motion potential. Nothing persists there. Persistence begins only when admissible closed recurrence structures form. The minimal such structure is called a coheron: a closed, self-consistent recurrence in the space of admissible configurations.

Let AOL denote the Allen Orbital Lattice, the discrete space of admissible configurations. Evolution proceeds by discrete transitions between admissible states. We define a state transition as:

$$S(t) \to S(t + \Delta t),$$

where Δt is the characteristic relaxation or update interval of the local constraint-satisfaction dynamics.

The admissible configuration space admits a discrete phase-sector structure induced by its hexagonal and prime-seeded closure constraints. Let the phase sector index be:

$$k \in \{0, 1, 2, \ldots, N - 1\}.$$

For the minimal AOL closure geometry, $N = 6$.

Identity is not defined by continuous existence. Identity is defined by closure: a structure is the same if and only if it returns to the same admissible configuration class and phase sector.

We define identity recurrence as the minimal number of admissible transitions required for a configuration to return to the same closure class and phase sector.

We define Discrete Phase Closure by the rule:

$$k(t + \Delta t) = (k(t) + 1) \bmod N.$$

After m steps, the system is in:

$$k(t + m\Delta t) = (k(t) + m) \bmod N.$$

Identity recurrence requires returning to the same phase sector. The smallest positive integer m such that $m \equiv 0 \pmod{N}$ is $m = N$. Therefore, the minimal recurrence time is:

$$\tau = N\Delta t.$$

This recurrence time is not a free parameter. Because N is fixed by structure and Δt is fixed by local relaxation dynamics, τ is a structural invariant. This is the origin of clocks, periodicity, and stable coherence cycles in PFT.

As illustrated in Figure 1, six discrete phase sectors enforce that identity can only be reasserted on a full closure cycle, yielding the minimal recurrence time $\tau = N\Delta t$ with $N = 6$ for the AOL hex closure geometry.

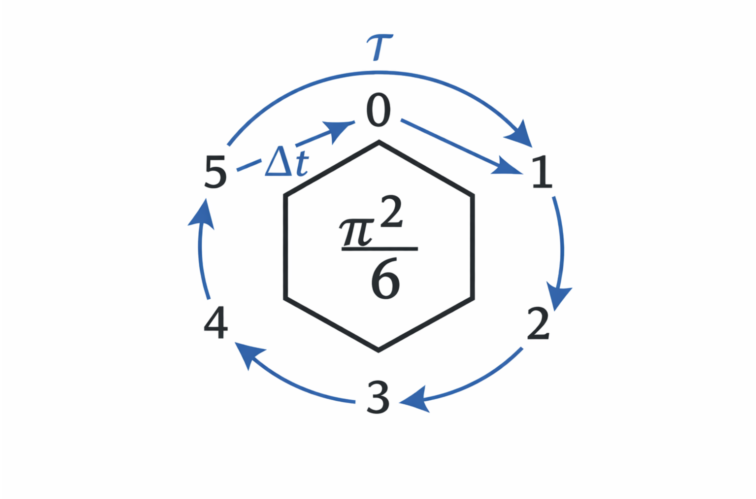

Figure 1: Hex-sector phase closure on the AOL. One complete loop corresponds to one coheron recurrence cycle τ.

Remark 1. *The diagram shows the central hexagonal AOL anchor, the six discrete phase sectors, and the closed recurrence loop corresponding to one full coherence cycle* τ*.*

Lemma 1 (Nested and Partial Recurrence Under Fractal Budget Constraints)**.** *When global closure is not satisfied, recurrence does not vanish. Instead, admissibility constraints partition into (i) a subspace that can still close and (ii) a residual mismatch that cannot be resolved within the available constraint budget. The closing subspace produces a well-defined local recurrence cycle, while the residual mismatch prevents full identity reassertion at the global level.*

Formally, let the admissible configuration constraints at scale L *be decomposed into a satisfiable component and a residual component:*

$$\mathcal{C}(L) = \mathcal{C}_{\text{close}}(L) \;\oplus\; \mathcal{C}_{\text{res}}(L),$$

where $\mathcal{C}_{\text{close}}(L)$ *admits a closed phase-sector cycle and* $\mathcal{C}_{\text{res}}(L)$ *does not.*

Then there exists at least one local recurrence period

$$\tau_{\text{loc}} = N_{\text{loc}}\Delta t$$

generated by closure on $\mathcal{C}_{\text{close}}(L)$*, even when global closure fails on* $\mathcal{C}(L)$*. In general, different nested sub-closures yield a family of local periods* $\{\tau_i\}$ *that need not be commensurate.*

Thus, failure of global closure implies fragmentation of recurrence into layered sub-cycles rather than disappearance of recurrence. The closure "bell" still tolls: recurrence continues to signal, but it no longer certifies full identity of the composite structure.

Remark 2. *In this regime, global identity is certified only on cycles that close across all nested constraints; otherwise the system exhibits local coherence without global identity.*

Fractal Budgets and Admissibility Audits

The phrase "constraint budget" used above is formalized in Pattern Field Theory as *Fractal Budgets*. A Fractal Budget is the admissibility allowance available to a structure to maintain compatibility across nested closure constraints over a full recurrence interval. Budgets are scale-indexed: a composite closure must satisfy not only local closure constraints, but also the budget compatibility conditions required to maintain coherence across all nested sub-closures for the entire duration of the attempted global cycle.

Operationally, Fractal Budgets function as an audit layer alongside EQUI and PAL:

- **EQUI** enforces global balance of admissible coherence accounting.
- **PAL** enforces phase-locked closure on full discrete sector cycles.
- **Fractal Budgets** enforce scale-consistent viability of that closure across nested constraint layers.

When Fractal Budgets are exceeded, the system cannot commission global identity recurrence even if local sub-closures remain well-defined. The observable consequence is layered recurrence: stable local ticks without full composite identity reassertion.

We now define the Phase Alignment Lock (PAL) as the global admissibility constraint requiring that composite coherence structures close only on full discrete phase cycles. PAL is not a force and not a field. It is a structural admissibility rule that forbids partial-cycle identity and enforces global coherence.

Coherons are therefore not objects in time. They are the mechanisms that *create* time by repeatedly closing and reasserting identity. A coheron cycle is a unit of time.

The Central Anchor $\pi^2/6$

The value $\pi^2/6$ (the Basel constant) appears in PFT as the convergence and normalization anchor of the AOL. It represents the finite bound of admissible cumulative curvature, resonance, or weight over all coherence shells. In structural terms, it is the statement that total admissible coherence content is finite and convergent.

The central hex of the AOL is assigned the value $\pi^2/6$ as the normalization point of the lattice. This is not numerology. It is the discrete analogue of a convergent spectral sum over admissible modes.

The Balance Condition $\Re(s) = 1/2$

The condition $\Re(s) = 1/2$ is interpreted in PFT not as a number-theoretic curiosity but as the structural balance line between divergence and collapse. It is the neutrality line of admissibility: on one side patterns diverge, on the other they damp out. Only on the balance line can persistent coherence exist.

In AOL terms, $\Re(s) = 1/2$ expresses the condition that inward and outward coherence flux are in exact structural equilibrium. This is why stable, non-divergent, non-collapsing coheron cycles must lie on this line.

Remark 3 (Connection to Logarithmic Dimensional Shift)**.** *In the Logarithmic Dimensional Shift (LDS) formulation, stacked projection depth can be represented as a helicoidal or lift-like manifold where admissible evolution requires a neutrality of accumulation: neither runaway divergence nor collapse to a fixed point. The balance condition* $\Re(s) = 1/2$ *is the same structural neutrality expressed in spectral form: it marks the admissibility line where coherence can persist while remaining globally normalizable.*

PAL, Coheron Cycles, and Created Time

PAL enforces that coheron assemblies can only close on full discrete phase cycles. Each closure is one reassertion of identity. The counting of these closures *is* time.

Time in PFT is therefore not fundamental. Time is manufactured by coheron cycles under PAL.

Proposition 1 (Time as Manufactured by Coheron Closure)**.** *Let a coheron be a minimal admissible structure that closes only on full discrete phase cycles under the Phase Alignment Lock (PAL). Then time does not exist as a primitive parameter of the substrate. Instead, time is generated by the counting of identity reassertion events produced by coheron closure cycles.*

Formally, let $\tau = N\Delta t$ be the minimal closure period of a coheron under discrete phase closure. Then the sequence

$$\{\, n\tau \mid n \in \mathbb{N} \,\}$$

defines the time parameter of the system. No additional temporal structure exists beyond this recurrence index.

Therefore, time in Pattern Field Theory is not a background dimension but a derived ordering index induced by admissible closure and identity recurrence.

A Macroscopic Example: $\tau \approx 71.2$ ms

In a class of large composite coheron systems, a characteristic relaxation time

$$\Delta t \approx 11.87 \text{ ms}$$

is observed. With $N = 6$, this yields:

$$\tau = 6 \times 11.87 \text{ ms} \approx 71.2 \text{ ms}.$$

Here $\tau = N\Delta t$ is exact as a closure relation, while the numerical value is an approximate instance measured or inferred for a particular composite coheron class.

This corresponds to a phase frequency of approximately 84.2 Hz. This is not a universal microphysical constant. It is a macroscopic coherence cycle of a particular class of composite coheron systems subject to PAL.

Worked Example: Layered Recurrence Without Global Closure

Consider a composite configuration composed of two interacting substructures A and B sharing adjacency but not fully compatible closure constraints. Suppose the local AOL-admissible dynamics permit closure of A on a 6-sector cycle, while B closes on an 8-sector cycle:

$$\tau_A = 6\Delta t, \qquad \tau_B = 8\Delta t.$$

If A and B were fully compatible under PAL at the composite level, global identity recurrence would require a common closure period:

$$\tau_{\text{glob}} = \text{lcm}(6, 8)\Delta t = 24\Delta t.$$

Now impose a finite constraint budget: the composite cannot satisfy the additional compatibility conditions required to maintain coherent coupling for the full $24\Delta t$ interval. In this case, A still reasserts local identity every $6\Delta t$ and B every $8\Delta t$, but the composite does not reassert full identity at $24\Delta t$ because the residual mismatch accumulates faster than it can be absorbed.

Here, "constraint budget" refers to the Fractal Budget limits defined above, which bound the admissible mismatch that can be carried across the attempted composite closure interval.

Observable consequence: the system produces repeatable local "ticks" at $6\Delta t$ and $8\Delta t$ (layered recurrence), while full composite identity either:

- fails entirely (no stable τ_{glob}), or
- appears only intermittently when the residual mismatch accidentally cancels.

This illustrates the central point: recurrence can remain present and measurable even when global closure is not achievable. The system continues to generate structured temporal signaling, but only closures that span all nested constraints qualify as full identity recurrence under PAL.

Global identity requires not only a closure period but sufficient admissibility budget to maintain compatibility across that period.

Worked Example: Voyager Heliopause Regime Transition as Non-Instantaneous Recurrence

The crossings of the heliopause by Voyager 1 and Voyager 2 are not sharp phase events but extended regime transitions inferred from plasma, magnetic field, and cosmic ray measurements over finite intervals. There is therefore no physically meaningful single "timestamp" for either crossing; instead, the events are identified by accepted transition dates in the heliophysics literature.

According to NASA mission analyses, Voyager 1 is identified as having entered interstellar space on 2012-08-25, and Voyager 2 on 2018-11-05. These dates mark the structural transition of each spacecraft from heliospheric to interstellar plasma regimes, not instantaneous boundary crossings.

The elapsed time between these two homologous regime transitions is therefore:

$$\Delta T = 2263 \text{ days}.$$

For plain-text replication and search, we also write this as: DeltaT = 2263 days (computed from the two published calendar dates above, without time-of-day).

DeltaT here is an interval between two published reference dates, not a claim of periodicity or a conserved cycle.

This interval is not a clock period and not a fundamental constant. It is a macroscopic separation between two realizations of the same structural transition class under different constraint histories and projection paths.

In Pattern Field Theory terms, this is an example of recurrence without identity locking: the same type of topological regime change (heliopause exit) occurs twice in the same solar structure, but the global system does not return to an identical coherence state after a fixed cycle. The recurrence exists at the level of event class, not at the level of full-system closure.

This places the heliopause transitions squarely in the regime described by the nested and partial recurrence lemma: recurrence is present and observable, but global identity closure is not achieved.

Worked Example: Atomic-Scale Recurrence in a Hydrogen-Like Transition

In Pattern Field Theory, bound-state spectra arise from admissible sub-closures of the AOL whose shell-indexed weights decay at least quadratically. At atomic scales, this is reflected by effective mode weights of the form

$$w_n \propto \frac{1}{n^2},$$

with $n \in \mathbb{N}$ the shell index of a local admissible sub-closure. Transitions occur when a bound configuration reclassifies from shell n_2 to shell n_1 by resolving residual mismatch, emitting a recurrence signal (photon) that carries away the mismatch budget required to maintain admissibility.

Closure-to-transition mapping. Let $\tau_{\text{micro}} = N_{\text{micro}}\Delta t_{\text{micro}}$ be the minimal closure period of the microscopic sub-closure under PAL (with N_{micro} fixed by the local phase-sector structure). A transition $n_2 \to n_1$ induces a recurrence frequency determined by the difference in shell weights:

Definition 2 (κ calibration factor)**.** *κ is the local conversion factor that maps shell-weight differences to an observed recurrence frequency in a specified projection channel. It is fixed empirically for a given species and transition family and is not a universal constant.*

For plain-text replication and search, we also write this as: `f_n2_to_n1 = kappa*(1/n1^2 - 1/n2^2).`

$$f_{n_2\to n_1} \;=\; \kappa\left(\frac{1}{n_1^2} - \frac{1}{n_2^2}\right),$$

Here κ is the admissibility-to-frequency proportionality set by the local relaxation scale Δt_{micro} and the coupling of the sub-closure to the electromagnetic projection channel. In PFT terms, κ is not a universal constant; it is a substrate-to-channel conversion determined by the local AOL spacing and PAL coordination at atomic scales.

Hydrogen-like example (Lyman-α analogue). Consider a hydrogen-like bound configuration with a reclassification $n_2 = 2 \to n_1 = 1$. The induced recurrence frequency is

$$f_{2\to 1} \;=\; \kappa\left(1 - \frac{1}{4}\right) \;=\; \frac{3}{4}\,\kappa.$$

By calibrating κ once for a given species (e.g., from a single measured line), the theory then predicts all other lines in the series by integer shell reclassifications:

$$f_{n\to 1} \;=\; \kappa\left(1 - \frac{1}{n^2}\right), \qquad f_{n\to m} \;=\; \kappa\left(\frac{1}{m^2} - \frac{1}{n^2}\right),$$

with $n > m \geq 1$. This mirrors the quadratic decay law required for global normalizability and ties spectral lines to admissible sub-closure differences rather than to continuum wavefunctions.

PAL and sector quantization. Microscopic PAL enforces that emission events occur at closure-compatible update counts. Denote the micro-sector count by N_{micro}. Then the admissible emission times satisfy

$$t_k \in \{\, k\,\tau_{\text{micro}} \mid k \in \mathbb{N}\,\}, \qquad \tau_{\text{micro}} = N_{\text{micro}}\Delta t_{\text{micro}}.$$

The observed line widths can be modeled as including a contribution from residual mismatch budgets and local SRR (constraint thickness), expressed as layered sub-closures (cf. nested recurrence lemma). This is compatible with conventional broadening mechanisms, but adds a structural parameterization for regime-dependent thickness of the transition zone.

Test protocol (falsifiable).

- **Calibration:** Fix κ from one measured line of a hydrogen-like species.
- **Prediction:** Compute all series frequencies via integer shell reclassifications using the quadratic law above.
- **Line widths:** Model widths by SRR-dependent partial closure budgets; predict systematic broadening with increasing constraint thickness.
- **Falsifier:** If, under fixed κ and AOL/PAL admissibility, measured series frequencies generically deviate from the integer shell law

  $$\Delta f \not\propto \left(\frac{1}{m^2} - \frac{1}{n^2}\right),$$

  or if widths do not correlate with SRR-controlled partial closure, the PFT recurrence account fails for that species or regime.

Interpretation. This construction treats atomic spectra as signals of admissible reclassification between shell-indexed sub-closures on the AOL. The quadratic law is the same structural decay required for global convergence (Appendix on $\pi^2/6$), and PAL ties emission timing to discrete closure counts. The series structure is thus lattice recurrence bookkeeping, not a primitive continuum postulate.

Testable Predictions

Because PFT defines time as discrete recurrence under closure constraints, it implies observable signatures that differ from continuous-time assumptions. The predictions below are stated in falsifiable form.

Prediction 1: Sector-Quantized Recurrence in Discrete Substrate Simulations

If the AOL closure geometry enforces a minimal phase-sector count $N = 6$, then any implemented AOL-like update system that respects the same adjacency and closure constraints must exhibit recurrence periods that are integer multiples of N under stable locking. Concretely, when a configuration returns to the same closure class, it must do so with

$$\tau = N\Delta t \quad \text{with} \quad N = 6,$$

and composite recurrence must appear at integer multiples of τ.

Test. Implement an AOL state-update automaton with admissibility constraints and measure recurrence return times across many initial conditions.

Falsifier. Stable recurrence occurs generically with $N \neq 6$ under the same hex closure constraints, without introducing additional structure.

Prediction 2: Discrete-Step Time Dilation Under Update Bottlenecks

If effective time corresponds to update propagation through stacked layers, then regions of higher constraint density must exhibit slower effective recurrence rates. The dilation should appear as stepwise changes in recurrence timing under increasing constraint load, because the underlying update process is discrete.

Test. In controlled recurrence systems (digital lattice simulations or engineered constraint networks), increase constraint density or stacking depth and measure the effective recurrence interval τ'. Look for piecewise behavior consistent with integer additional update steps per closure.

Falsifier. Effective recurrence slows only as a smooth continuum under discrete update rules, with no stepwise structure across regimes.

Prediction 3: Locking Failure Thresholds Under Excess Mismatch

PAL is defined as a closure admissibility rule. Therefore, there must exist measurable mismatch regimes where partial-cycle identity fails and the system must either (i) reconfigure into a new closure class or (ii) lose stable recurrence.

Test. In recurrence simulations, increase mismatch between substructures while holding adjacency constant. Measure the point at which closure ceases to occur on full cycles.

Falsifier. Closure remains stable under arbitrarily large mismatch without forced reclassification or recurrence loss.

Prediction 4: Basel-Normalized Mode Weighting as the Weakest Convergent Bound

If the weakest admissible decay law that still yields finite total coherence weight is quadratic, then mode-weighting schemes near

$$w_n \propto \frac{1}{n^2}$$

should be the boundary between stable normalizable coherence and divergence in any shell-indexed recurrence hierarchy. This is the operational content of assigning $\pi^2/6$ as a normalization anchor.

Test. Construct shell-indexed recurrence hierarchies and vary decay exponents $w_n \propto n^{-\alpha}$. Identify the transition between global normalization and divergence.

Falsifier. Stable normalizable coherence persists generically for $\alpha \leq 1$ under the same recurrence-shell construction, without additional constraints.

Prediction 5: Time-Freezing as Propagation Failure in Projection Limits

Since time is update ordering, any regime that blocks update propagation through the stack must produce an effective time-freezing limit. The signature is asymptotic failure of closure completion rather than continuous slowing without bound.

Test. In stacked update systems, impose projection bottlenecks and measure closure completion rates across depth.

Falsifier. Closure completion remains regular and depth-invariant even when propagation is structurally blocked.

Meaning

Without closure there is no identity. Without identity there is no recurrence. Without recurrence there is no time.

Time is not where reality happens. Time is what coherent reality does. Coherence is commissioned only when closure survives PAL locking and remains within EQUI and Fractal Budget limits across all nested constraints.

Summary Table: Recurrence anchors across scales

Anchor	Scale	Mechanism	Recurrence signature	Test protocol	Falsifier
Atomic (hydrogen-like)	Micro	Admissible sub-closures with quadratic shell weights ($w_n \propto 1/n^2$) under PAL	$f_{n\to m} = \kappa\left(\frac{1}{m^2} - \frac{1}{n^2}\right)$; emission times at $t_k = k\,\tau_{\mathrm{micro}}$	Calibrate κ on one line; predict series; model widths via SRR-dependent partial closure	Series deviates generically from integer shell law; widths not correlated with SRR
Composite PAL cycle (71.2 ms)	Macroscopic	Hex-sector discrete phase closure ($N = 6$) with local update interval Δt	$\tau = N\,\Delta t$; observed $\tau \approx 71.2\,\mathrm{ms}$ with $\Delta t \approx 11.87\,\mathrm{ms}$	Measure stable locking across configurations; verify integer multiples of τ	Stable locking at non-hex sector counts ($N \neq 6$) without additional structure
Voyager heliopause transitions	Cosmic	Regime transition recurrence without global identity locking; nested sub-closures under constraint budget	Event-class recurrence (two exits) separated by $\Delta T = 2263$ days; no fixed τ_{glob}	Cross-compare multi-instrument transition intervals; identify layered signatures	Sharp, instantaneous boundary timestamps; identical global closure cycle across events

Table 1: Three recurrence anchors demonstrating PFT's closure-based time across micro, macro, and cosmic regimes. Each anchor specifies a mechanism, a measurable signature, an operational test, and a falsifier.

Glossary

- **AOL**: Allen Orbital Lattice, the admissible configuration space.
- **Coheron**: Minimal closed admissible recurrence structure.
- **PAL**: Phase Alignment Lock, the global closure admissibility constraint.
- **Phase Sector**: One step in a discrete closure cycle.
- **Identity Recurrence**: Return to the same closure class and phase sector.
- **Metacontinuum**: Pre-geometric null substrate.
- **SRR**: Structural Regime Resolution, a measure of constraint thickness relative to domain scale, used to classify regime transitions in PFT.
- **LDS**: Logarithmic Dimensional Shift, a projection-depth formulation used in the PFT stacking model.
- **EQUI**: Global balance and conservation bookkeeping constraint system used to audit admissible coherence accounting in PFT.
- **Fractal Budgets**: Scale-consistent constraint accounting limits that determine whether composite closures can maintain compatibility across nested sub-closures over a full recurrence interval.
- ΔT **/ DeltaT**: A macroscopic elapsed interval between two reference dates (calendar-based in this paper).
- κ: A local proportionality mapping admissibility-weight differences to an observed recurrence frequency in a specified channel.
- τ_{micro}: Minimal closure period of a microscopic admissible sub-closure under PAL.
- Δt_{micro}: Local microscopic update interval for the sub-closure dynamics.
- N_{micro}: Micro-scale phase-sector count for the relevant sub-closure.

Appendix: Why $\pi^2/6$ Appears as a Structural Convergence Bound

Consider a layered shell structure of admissible coherence modes indexed by $n \in \mathbb{N}$. Let the admissible contribution of shell n to total coherence weight scale as:

$$w_n = \frac{1}{n^2}.$$

This is the minimal decay rate that ensures:

- Outer shells contribute ever less
- Total coherence remains finite
- The structure is globally normalizable

The total admissible coherence weight is then:

$$W = \sum_{n=1}^{\infty} \frac{1}{n^2}.$$

This is the classical Basel sum:

$$\sum_{n=1}^{\infty} \frac{1}{n^2} = \frac{\pi^2}{6}.$$

In PFT terms, this means that any lattice whose admissible modes decay at least quadratically with shell index is globally convergent and admits a finite total coherence normalization. The appearance of $\pi^2/6$ is therefore not mystical. It is the universal constant associated with the weakest admissible decay law that still permits a finite total coherence bound.

Assigning $\pi^2/6$ to the central anchor of the AOL therefore fixes the global normalization scale of admissible coherence in the weakest, most permissive, but still convergent way.

Document Timestamp and Provenance

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