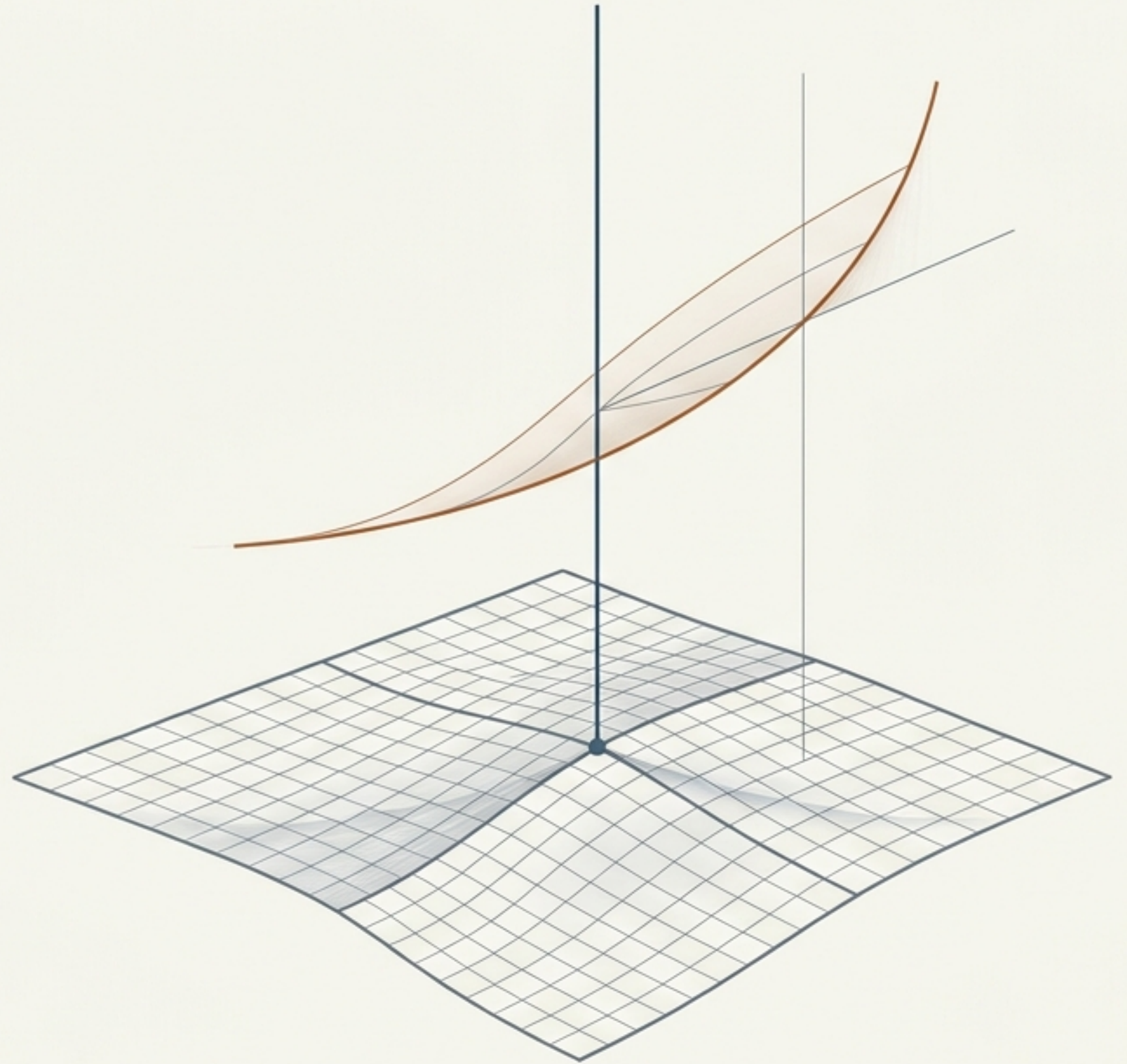


DISTINCTION HOLOMONOMY

A GAUGE THEORY OF
PERSISTENCE, REPAIR,
AND CONTINUATION

FLY'XION



Persistence Precedes Objecthood

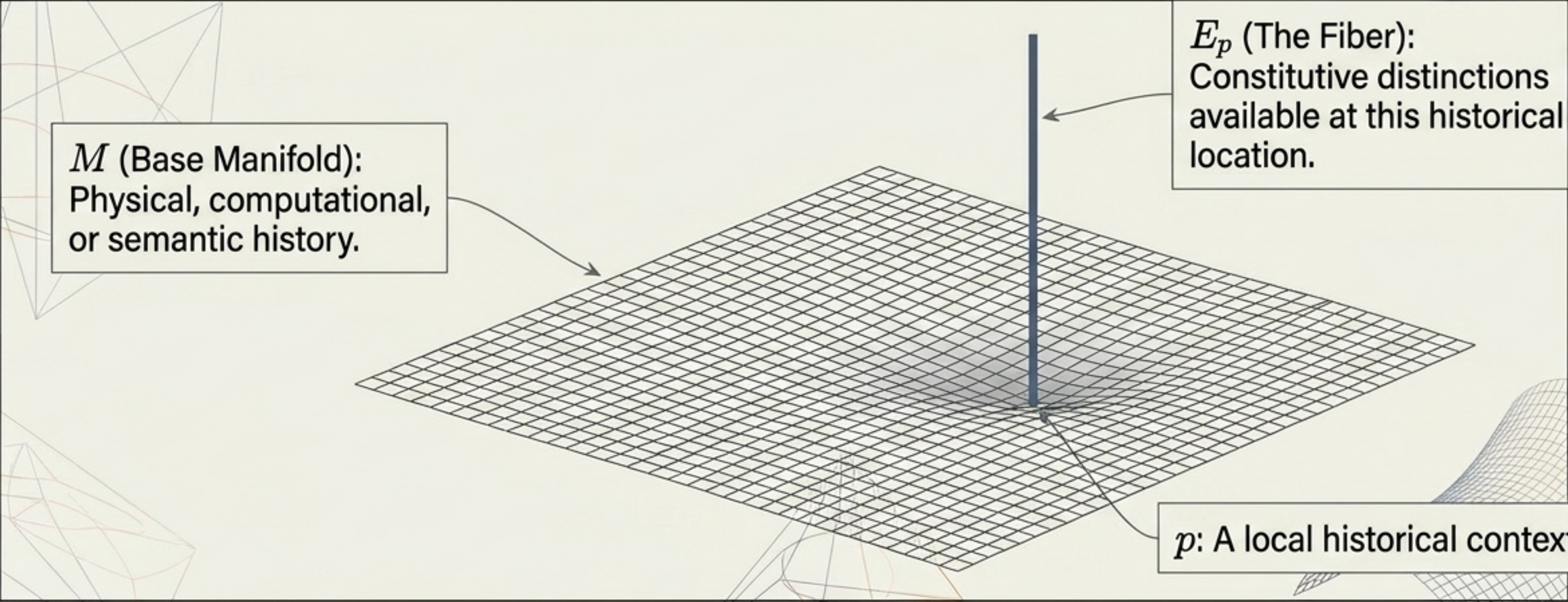
The conventional question—"What is the thing that persists?"—is backwards. An entity persists when its successive states remain mutually continuable, even if the material realization changes.

The Ontological Reversal

	Conventional View	Distinction Holonomy Theory
Identity	State equality ($x_t = x_{t+\Delta t}$)	Continuation compatibility ($x \equiv [C(x)]$)
Destruction	Physical state changes beyond recognition. →	Space of admissible futures ceases to overlap.
Memory	A designated physical storage register. →	Path-dependent transport of distinctions .
Repair	Restoring the exact past state ($x \rightarrow x^*$). →	Gauge-invariant curvature compensation .

Redefining the State Space: The Distinction Bundle

A state x is merely a configuration. The primitive object is the pair $(x, C(x))$ —the state and its admissible continuations. A difference is only constitutive if it changes which continuations remain possible.



The diagram illustrates the Distinction Bundle as a 3D grid representing the base manifold M . A vertical blue line, representing the fiber E_p , rises from a specific point p on the grid. Arrows point from text boxes to these elements: one to the grid, one to the fiber, and one to the point p . The background features faint, abstract geometric shapes.

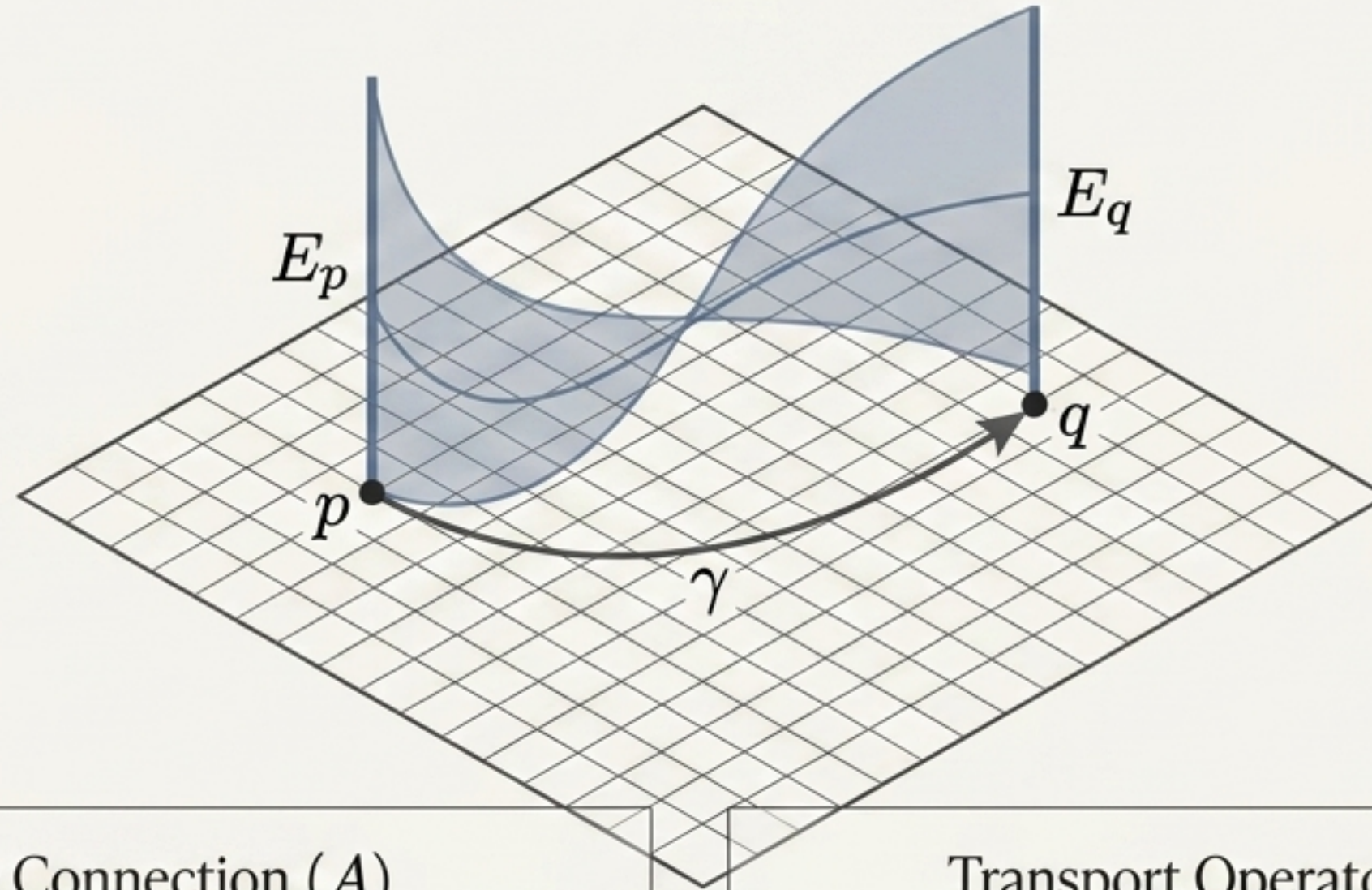
M (Base Manifold):
Physical, computational,
or semantic history.

E_p (The Fiber):
Constitutive distinctions
available at this historical
location.

p : A local historical context.

The Engine of Time: Continuation as a Connection

A conventional dynamical law evolves states. A **continuation connection** ($\nabla = d + A$) evolves **admissibility**.



The Connection (A)

Answers the fundamental question:
Given what currently exists, what counts
as the **next** admissible state?

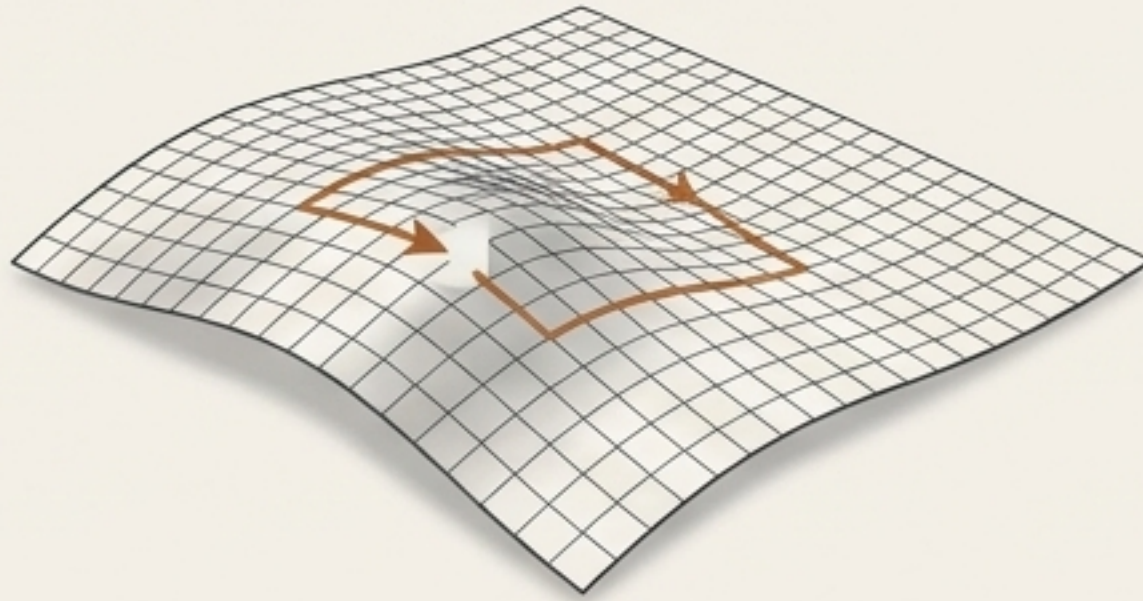
Transport Operator (P_γ)

The functor that transports distinctions along
history path γ . It dictates how available futures
twist and map from p to q .

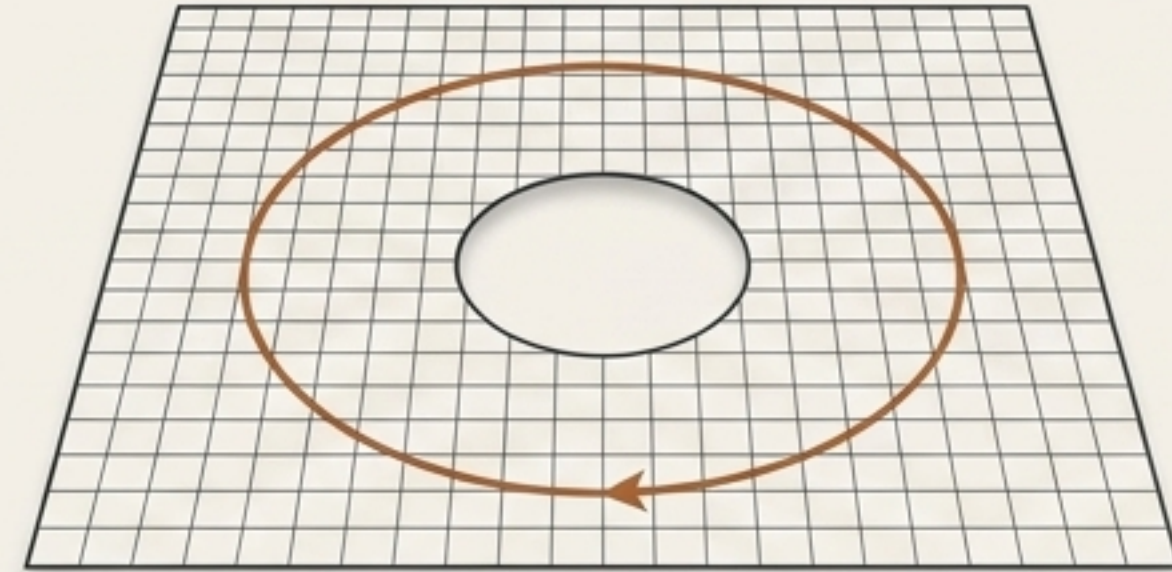
The Nature of Memory: Curvature vs. Holonomy

Memory is operationally detectable path-dependent transport ($P_{\gamma_1} \neq P_{\gamma_2}$). It does not require a discrete storage device.

Local Curvature



Global Holonomy



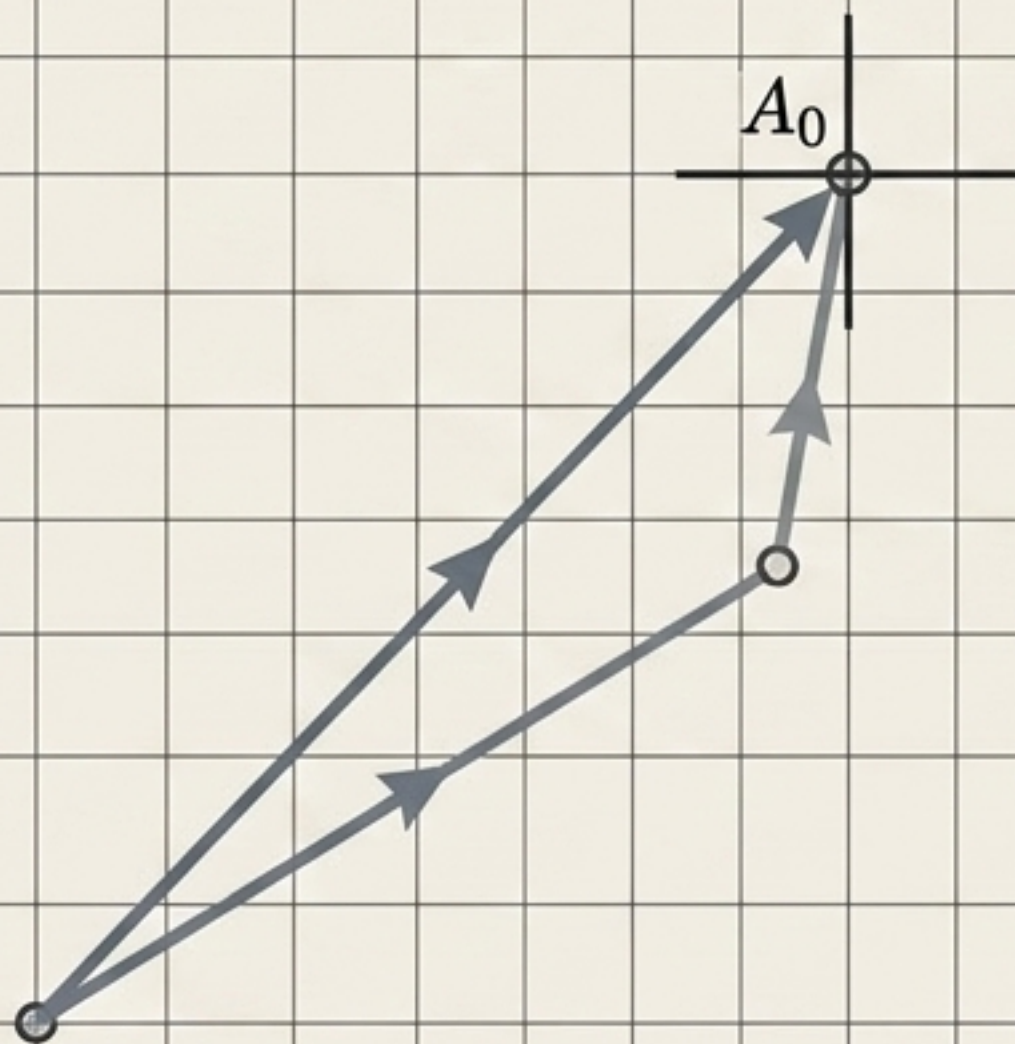
The Geometry of Memory

	Local Curvature (F):	Global Holonomy (Hol_γ):
Origin	$F = dA + A \wedge A \neq 0$	$F = 0$, but $\text{Hol}_\gamma \neq I$ around a noncontractible loop.
Interpretation	Infinitesimal failure of continuation operators to commute.	Topological memory on an otherwise flat connection.
Scale	Infinitesimal, local.	Finite, purely topological.

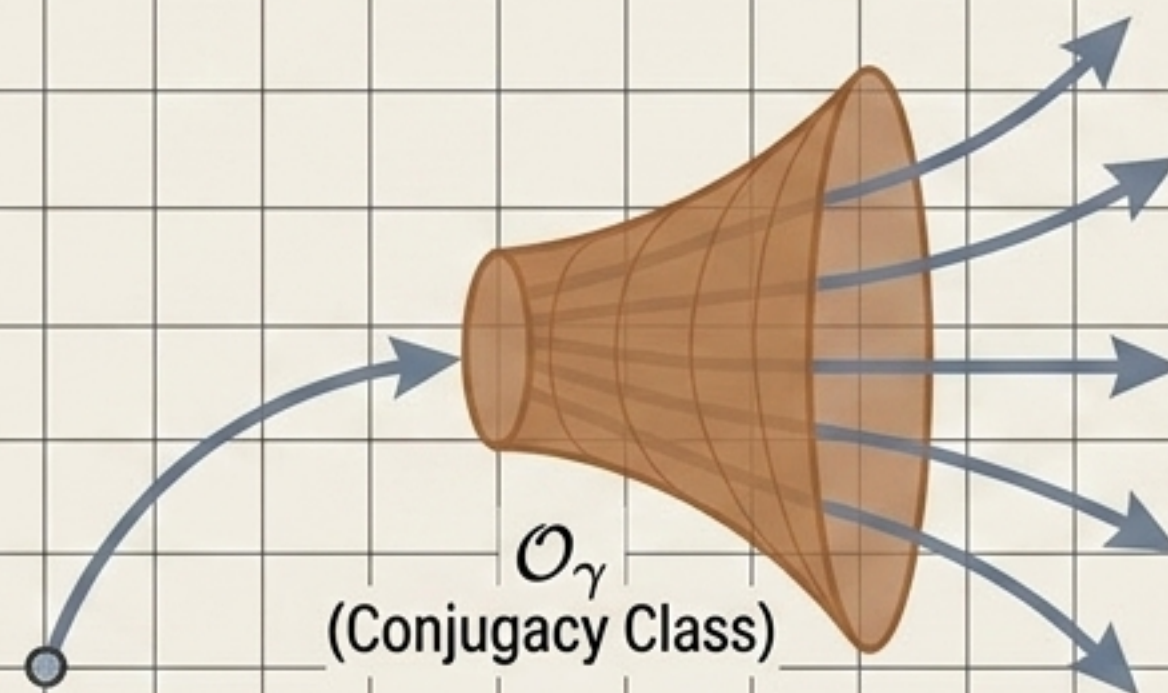
The Meaning of Repair: Gauge-Invariant Compensation

Genuine physical repair is a compensatory intervention, not a redescription.
It restores the continuation equivalence class, not the historical coordinates.

Traditional Restoration



Gauge-Invariant Repair

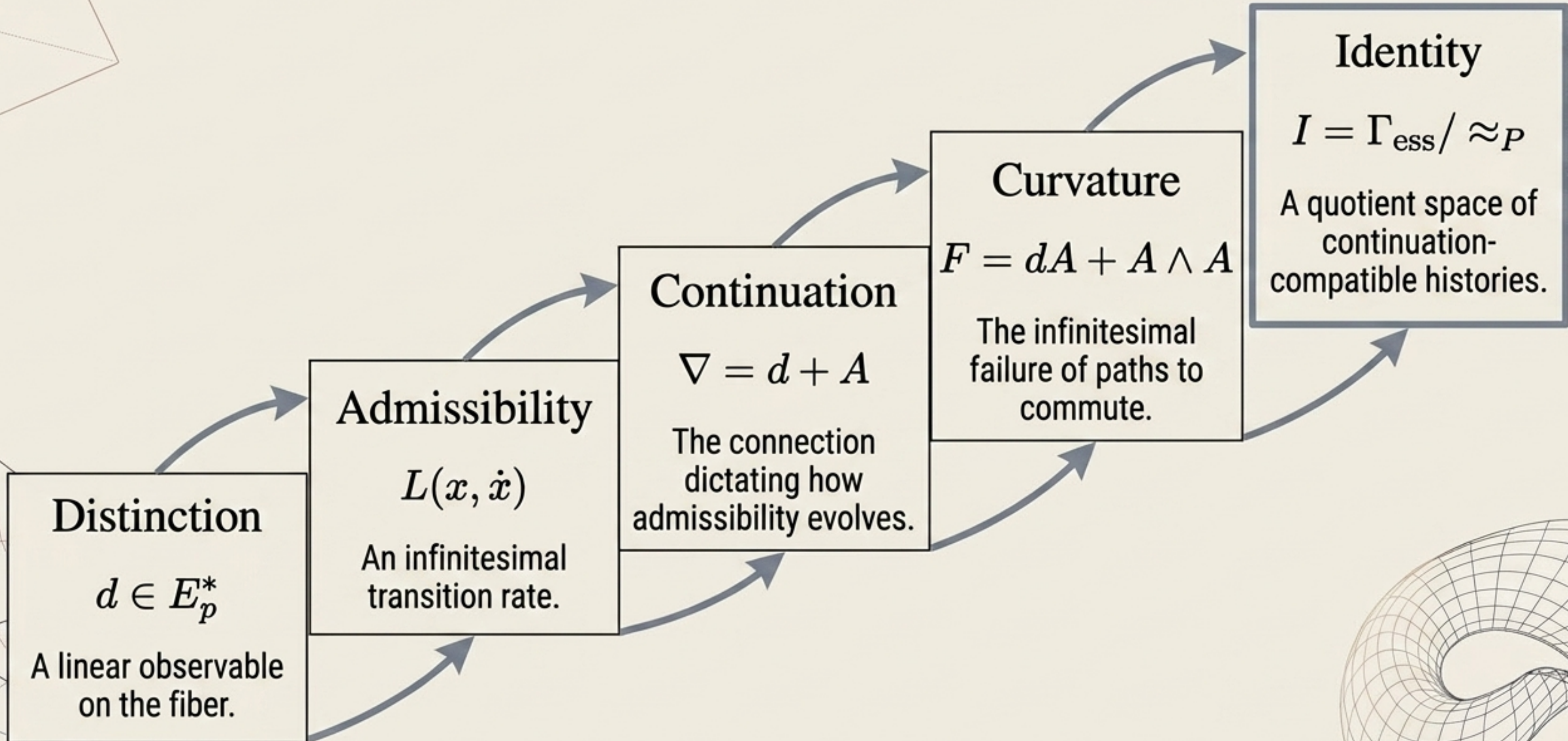


Modifying the Connection

$$A \rightarrow A + \delta A + R$$

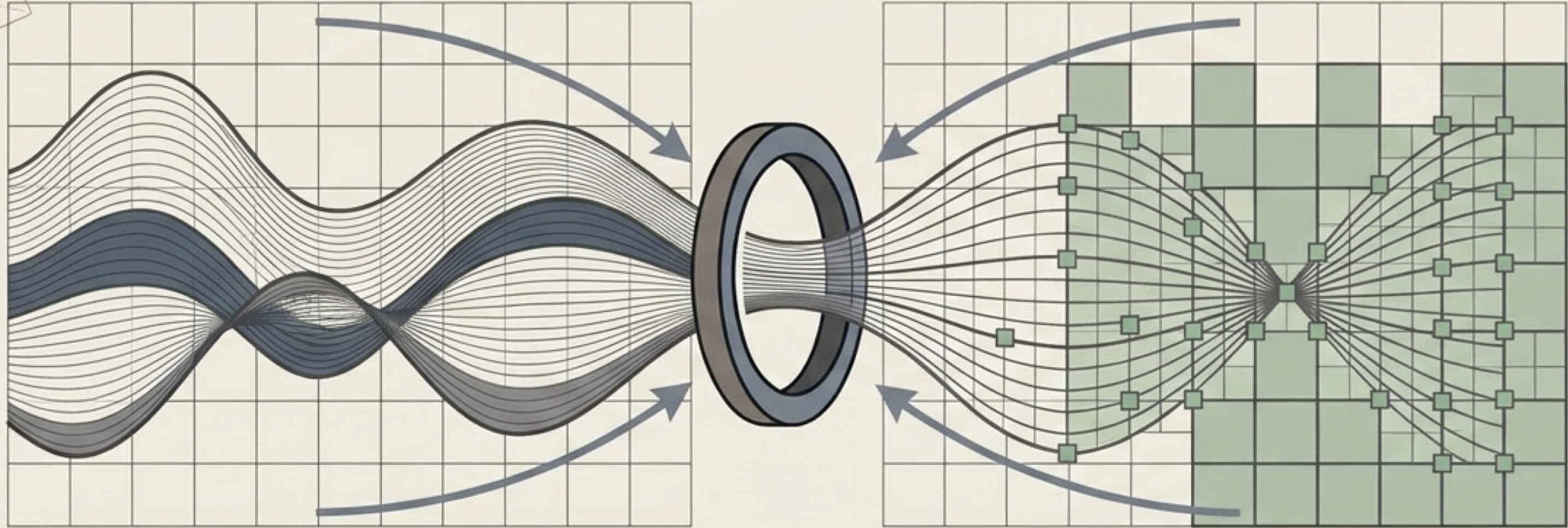
So the resulting holonomy returns to an admissible target conjugacy class, ensuring the same future trajectories become possible again.

Synthesis: The 5 Equations of Persistence



The Computational Bridge

To prove this theoretical apparatus is operable, we instantiate it on a concrete computational substrate rather than idealized mathematical fibers.



Spherepop

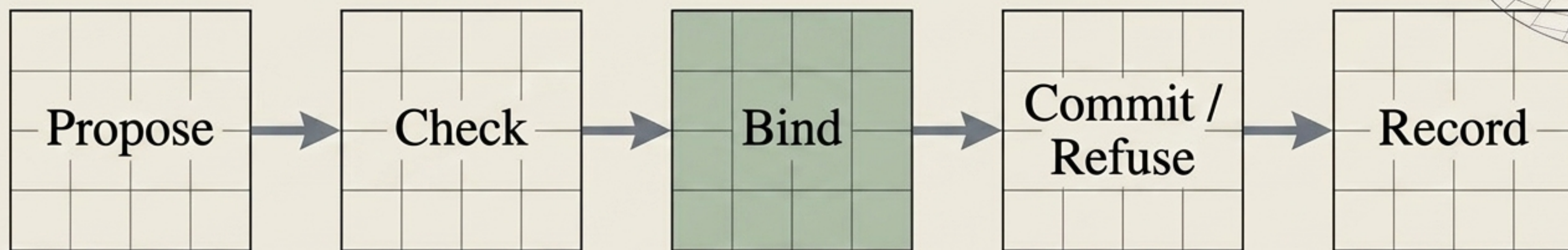
An event-sourced calculus generating a categorical connection (discrete events).
Its defining feature: substitution is an irreversible historical event.

TARTAN

A recursive multiscale tiling connecting Spherepop's discrete grammar to continuous fields (spatializing time).

Spherepop's Anatomy: History-Enriched Computation

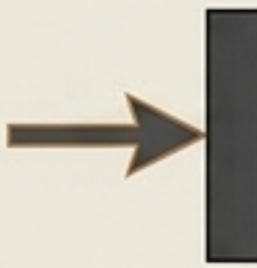
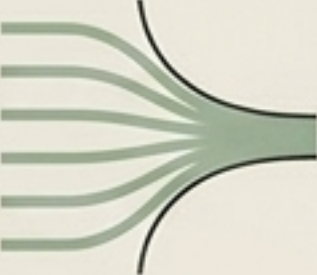
Spherepop is a conservative extension of the typed lambda calculus. Evaluation produces a value and mutates the live continuation space, permanently recording how the result became admissible.



The Configuration: $C = (\sigma, h)$
 σ : The current live option space.
 h : The ordered, append-only history.

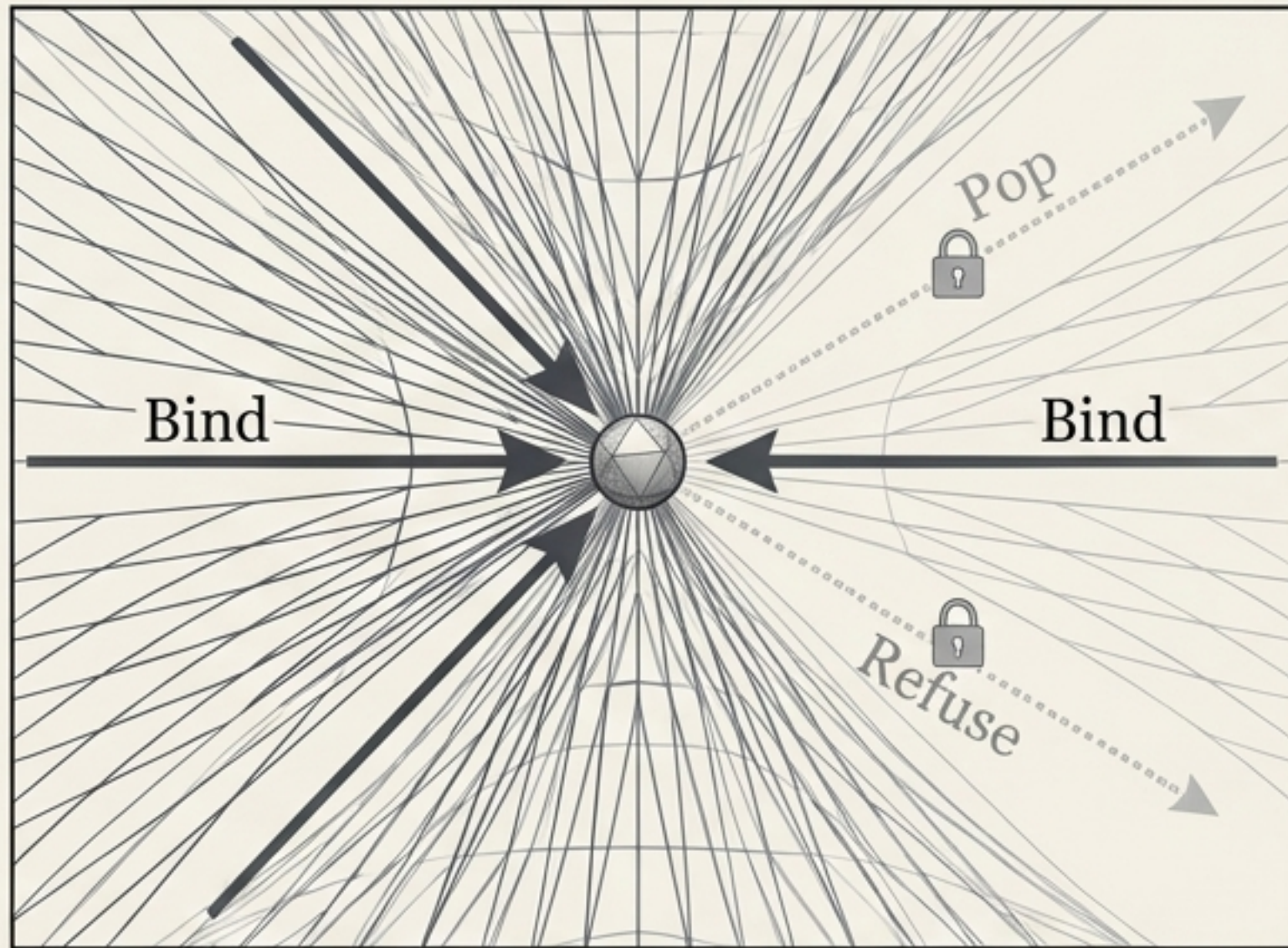
Substitution becomes a recorded historical event, generating the connection.

The 4 Primitives of Time

Operation	Categorical Role	Geometric Meaning
 Pop (ω)	Selection	Commitment that becomes geometry. Moves ω from possible continuations into committed history.
 Refuse (a)	Exclusion	Prohibited gluing. Recorded exclusion without consuming the live option space.
 Bind (a, b)	Coupling	Deformation of independence into relational continuation. The primary source of noncommutativity.
 Collapse (c)	Projection	Continuation-preserving coarse-graining. Certified loss of distinctions.

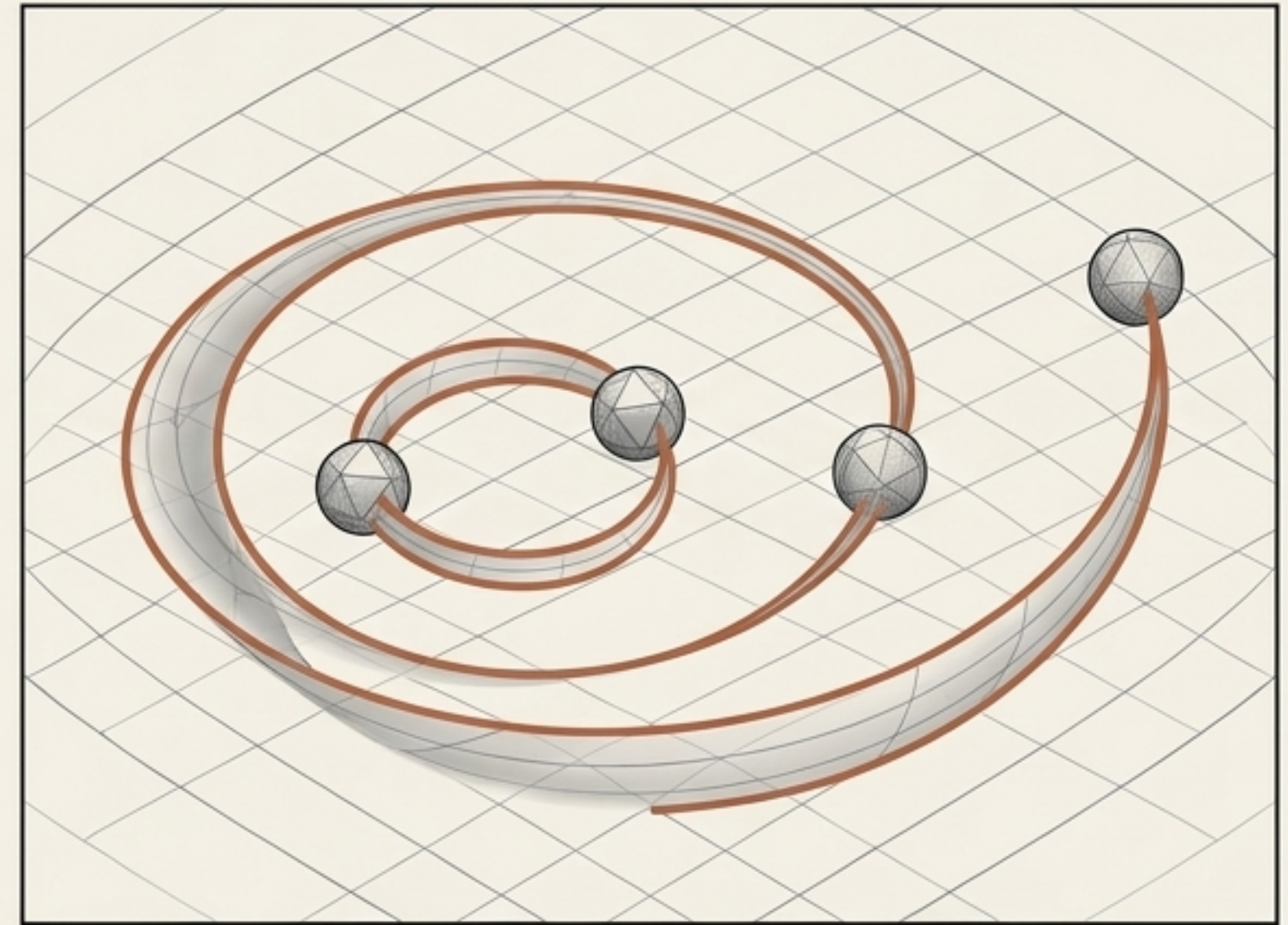
Pathologies of the System: Geometric Traps

The Double Bind



Incompatible Binds constrain every available Pop, while Refuse is unavailable at the meta-level. The system excludes the operation that would revise the constraint space itself.

Schismogenesis



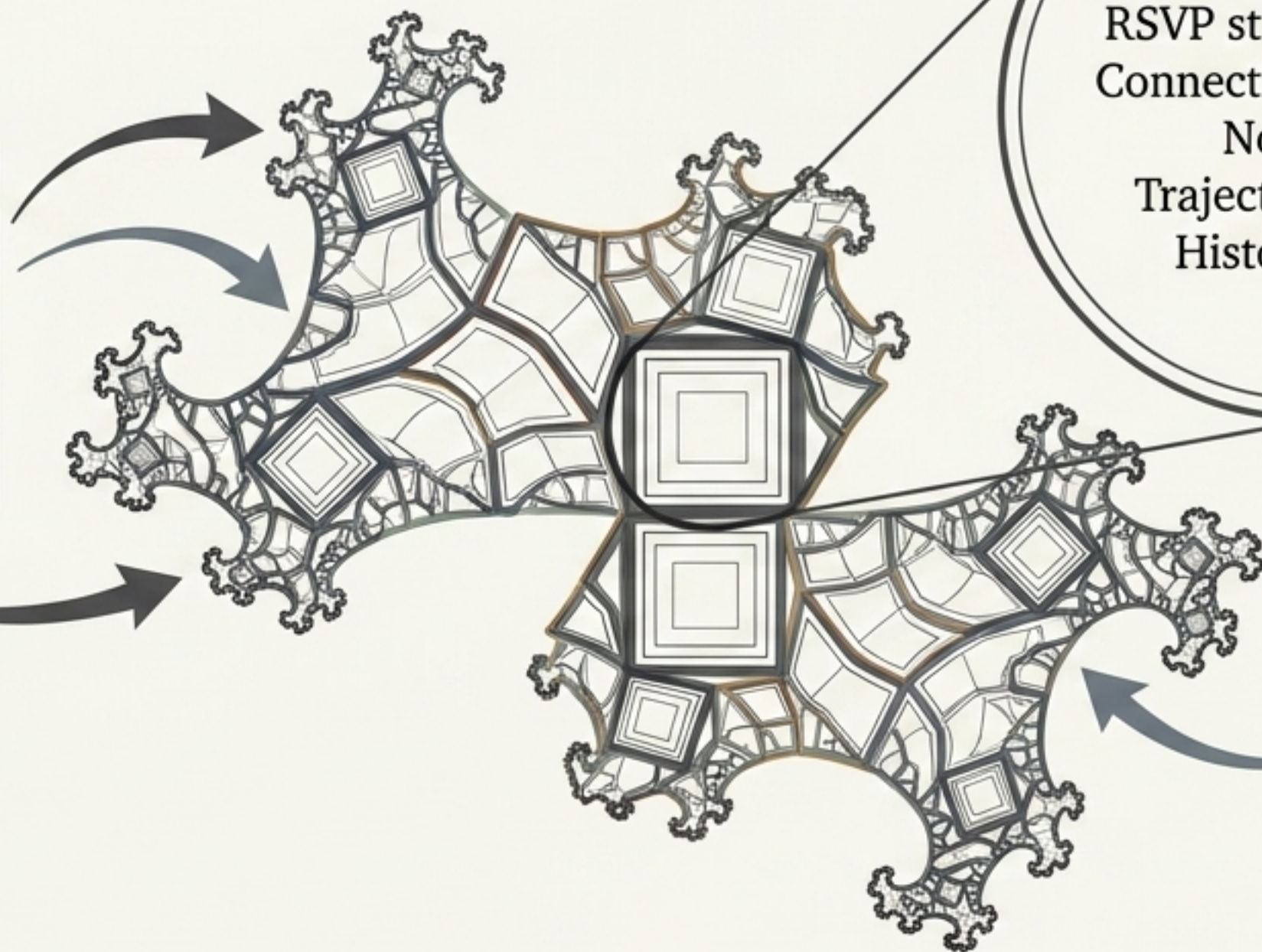
Divergent holonomy. Repeated transport around a relational loop returns the system to the same coarse relational context, but irreversibly changes its finer continuation structure.

TARTAN: Spatializing Time via Multiscale Tiling

Trajectory-Aware Recursive Tiling with Annotated Noise (TARTAN) provides the multiscale geometry connecting continuous fields to discrete computational events.

Coherence Tiles

A tile forms where field dynamics admit a coherent local continuation law.

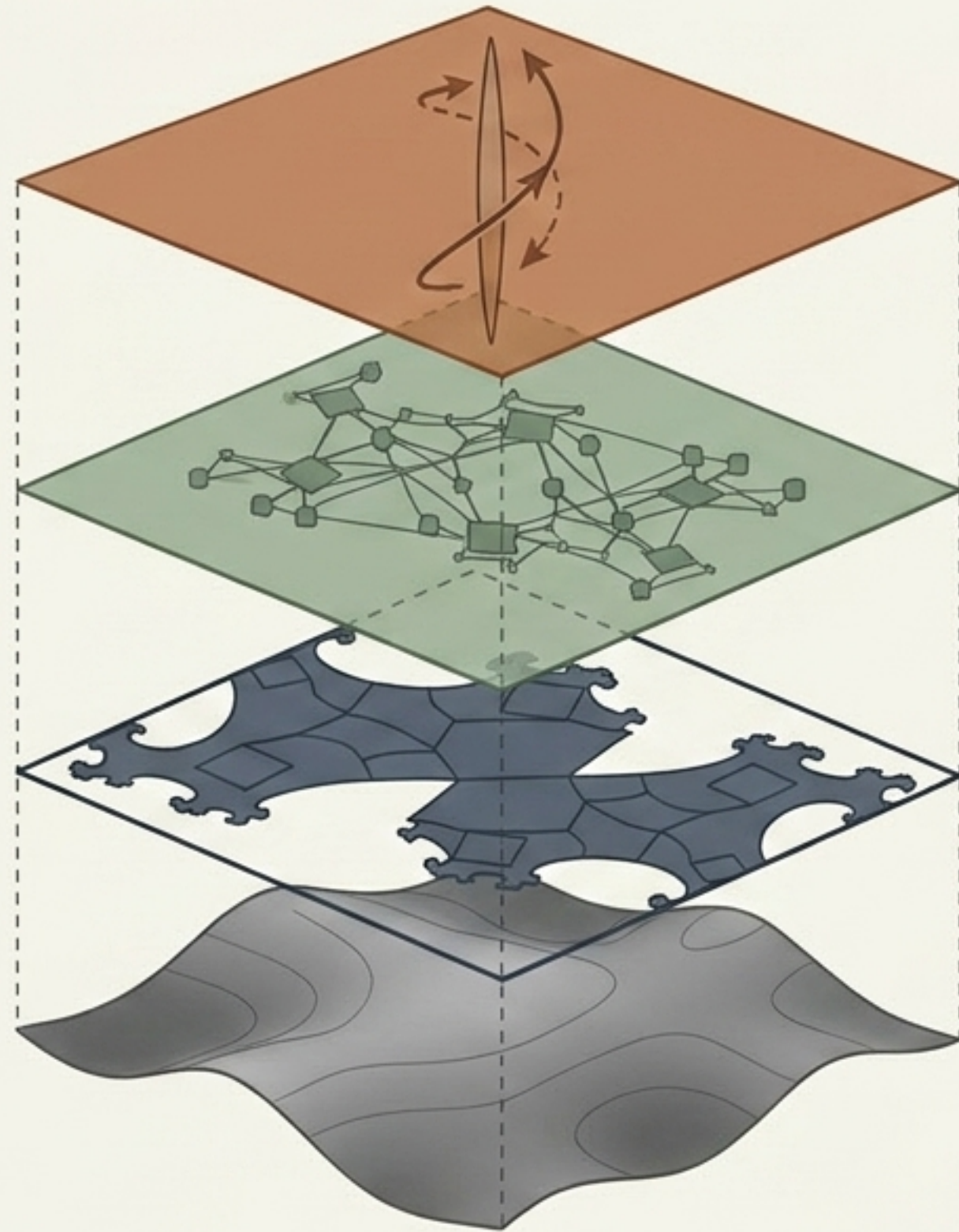


Support (U_i) $\mathcal{U}$
RSVP state (Ψ_i) Ψ
Connection (A_i) $\mathcal{A}$
Noise (η_i) η
Trajectory (τ_i) τ
History (H_i) $\mathcal{H}$

Multiscale Persistence

An object doesn't exist at one privileged resolution. It exists as *compatibility* among its representations across resolutions ($I = \lim_{\leftarrow k} I_k$).

The Combined Architecture



Layer 4: Distinction Holonomy (DHT)

Measures the historical effect of transporting constitutive distinctions through the resulting structure.

Layer 3: Spherepop

The event grammar (Pop, Refuse, Bind, Collapse) that transforms the spatial decomposition.

Layer 2: TARTAN

Identifies the regions and scales over which local continuation laws are coherent.

Layer 1: RSVP

Supplies the continuous, evolving physical field substrate.

The Deep Unification

Distinct phenomena across disciplines are projections of a single underlying mathematical architecture.

Biology

An organism persists by maintaining a continuation bundle.

Physics

A dissipative structure persists when its dynamic environment maintains a stable transport structure.

Distinction Holonomy

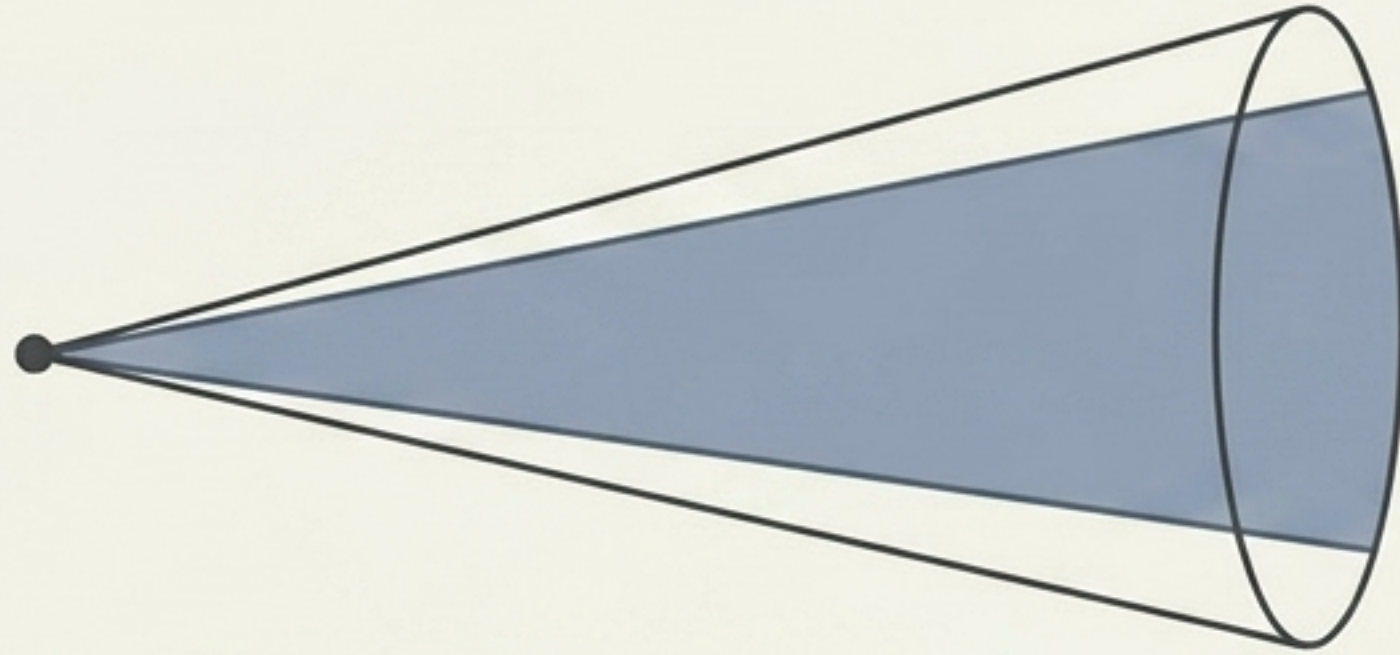
Machine Systems

A machine is repaired when a compensatory intervention restores its transport class, not just its material state.

Semantics

A concept persists when its inferential continuation class survives linguistic reformulation.

The Object is the Future It Still Permits



A persistent entity is not what remains unchanged; it is what remains continuable. To destroy an entity is not necessarily to alter its state beyond recognition—it is to eliminate the space of admissible futures through which its distinctions can continue to exist.

The ontology of persistence is a geometry of possible futures. What we call a 'thing' is simply the region of that geometry that refuses, for a time, to become impossible.