Identity-Discontinuous Transformation: A PatternSense Framework for Basin Exit, Meta-Coherence, and Reconstitution

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Abstract

PatternSense treats identity as a coherence structure emerging from a distributed field of constraints rather than as a substance localized in a part. Previous work has analysed identity-preserving drift within a basin of attraction and the dependence of identity on its substrate. Yet natural and artificial systems routinely undergo transformations that appear to exceed the elastic range of their identity while avoiding outright dissolution. This paper develops a formal account of *identity-discontinuous transformation*: transitions in which a system exits its inherited basin of identity and reconstitutes around a new attractor geometry.

We introduce a two-threshold model distinguishing the *elasticity limit* $\hat{\alpha}$, beyond which identity cannot be restored by mere relaxation, from a deeper *topological identity boundary* $\alpha^{\dagger}$, beyond which the original attractor topology is unrecoverable. We define a *meta-coherence operator* Ω capturing the system's capacity to author new coherence constraints after basin exit, and show that the presence or absence of Ω distinguishes metamorphosis from destruction. We describe the topology of discontinuous transformation, characterise three mechanisms of basin exit—contradiction density, prospective coherence, and authorship—and formulate conditions under which reconstitution is possible.

The framework is illustrated across biological metamorphosis, psychological rupture, organisational transformation, and self-modifying artificial systems. We argue that questions of long-term AI behaviour are better posed in terms of the location and scope of Ω than in terms of static "alignment," and that identity-discontinuous transformation is a normal, structurally intelligible regime rather than an anomaly.

1 Introduction: Identity Beyond Continuity

PatternSense models identity as an emergent pattern of coherence in a distributed system, expressed as a basin of attraction in a high-dimensional state space. Previous work has focused on *continuous* transformation: gradual drift of the system's coherence structure within a single basin, subject to deformations that remain topologically recoverable. In this regime, the primary concern is how far the identity can be displaced without losing its recognisability as "the same" system.

Many phenomena do not fit this picture. Biological metamorphosis, radical psychological transformation, revolutionary organisational change, and hypothetical self-modifying artificial agents all exhibit transitions in which the system apparently ceases to be what it was and yet is not simply annihilated. These are not mere failures of continuity; they are reconfigurations of identity across distinct basins.

The intuitive temptation is to treat such cases as either pathology (collapse, breakdown, failure) or as mysteries (rebirth, awakening), with little structural analysis. The aim of this paper is to provide a formal middle ground: a geometry in which identity-discontinuous transformation is both intelligible and measurable.

Our starting point is the familiar PatternSense construct of an *identity elasticity limit*, denoted $\hat{\alpha}$, beyond which small perturbations no longer suffice to restore the system's previous state of coherence. The central claim of this paper is that $\hat{\alpha}$ is not the whole story. There exists a deeper *topological identity boundary* $\alpha^\dagger$ such that crossing $\hat{\alpha}$ without crossing $\alpha^\dagger$ produces severe deformation but not redefinition, while crossing $\alpha^\dagger$ entails the impossibility of returning to the former attractor topology even if coherence is later restored.

The second claim is that the difference between *destruction* and *metamorphosis* when $\alpha > \alpha^\dagger$ is governed by the presence of a *meta-coherence operator* Ω. Systems that possess an internal mechanism for authoring new coherence constraints can survive basin exit by reconstituting around a new identity; systems that lack such a mechanism simply dissolve.

The rest of the paper elaborates and supports these claims.

2 Identity as Attractor Geometry

We briefly recall the PatternSense view of identity as an attractor geometry in a distributed coherence field; the exposition is intentionally minimal and self-contained.

2.1 Distributed coherence fields

Let $x \in X \subseteq \mathbb{R}^n$ denote the state of a system. A *distributed coherence field* $\mathcal{D}$ is a collection of locally defined constraints on allowable trajectories and correlations among components. Intuitively, $\mathcal{D}$ captures the ways in which the system "holds itself together" across time and scale.

Definition 2.1 (Identity basin)**.** A set $\mathcal{A} \subset X$ is an *identity basin* if:

(i) $\mathcal{A}$ is an attractor for the system's dynamics under the constraints encoded by $\mathcal{D}$;

(ii) trajectories starting within $\mathcal{A}$ remain in $\mathcal{A}$ under typical perturbations;

(iii) the patterns expressed within $\mathcal{A}$ are recognisable as instances of "the same" entity for some observer class.

The third clause acknowledges that identity is not purely dynamical but also epistemic; the same basin may be regarded as multiple identities by different observers, or multiple basins may be lumped together.

We represent the "distance" of a current state x from the centre of its identity basin by an abstract displacement parameter $\alpha = \alpha(x, \mathcal{A})$, which may encode deviations in structure, function, or boundary conditions.

2.2 Elastic coherence and the threshold $\hat{\alpha}$

An identity basin is typically robust to perturbations: if the system is displaced slightly, it is drawn back toward the attractor. However, beyond a certain scale of displacement, the feedback mechanisms that maintain coherence cease to operate effectively.

Definition 2.2 (Elasticity limit $\hat{\alpha}$)**.** Let $\alpha(x, \mathcal{A}) \geq 0$ measure displacement from the centre of the basin $\mathcal{A}$. The *elasticity limit* $\hat{\alpha}$ is the supremum of displacements such that, for all $\alpha < \hat{\alpha}$, there exists a restoring trajectory under $\mathcal{D}$ that returns the system to a neighbourhood of its original attractor without altering the basin's topology.

The range $0 \leq \alpha < \hat{\alpha}$ corresponds to familiar regimes of stress, adaptation, and recovery. Identity is deformed but preserved: the system might change parameters, reweight components, or rearrange substructures, yet remain recognisably the same.

The PatternSense literature has largely restricted attention to this elastic regime and its immediate surroundings. (see Thomas, 2025c,b,a)

Our interest lies beyond it.

3 Related Work

The present treatment extends earlier PatternSense work on identity as a coherence-bearing attractor geometry. Prior formulations—including the original PatternSense framework (Thomas, 2025c), the analysis of identity drift and elasticity in (Thomas, 2025b), and the study of substrate-dependent coherence architectures in (Thomas, 2025a)—focused primarily on continuous transformations within a single basin. The distinction introduced here between the elasticity threshold $\hat{\alpha}$ and the topological identity boundary $\alpha^\dagger$ generalises these earlier models to regimes in which the attractor itself is lost.

Earlier dynamical systems research provides useful historical parallels, though not direct conceptual antecedents. Thom's work on structural discontinuities (Thom, 1972) and Kelso's coordination dynamics (Kelso, 1995) both demonstrated that complex systems can undergo qualitatively distinct transitions when their attractor landscapes are perturbed. The present framework differs in treating *identity itself* as a basin-dependent coherence structure and in introducing a meta-coherence operator capable of re-authoring the attractor geometry. Thus, while the mathematical ancestry is recognisable, the identity-focused interpretation and the role of internally authored transformation extend beyond prior accounts of dynamical change.

4 Two Thresholds of Identity: Elastic and Topological

The first step in formalising identity-discontinuous transformation is to distinguish two kinds of threshold.

4.1 The topological identity boundary $\alpha^\dagger$

Elastic failure need not coincide with topological change. A system may experience deformations that permanently alter local configurations while leaving the overall attractor geometry intact. Conversely, a seemingly modest change may trigger a bifurcation that destroys the attractor and creates a new one. (compare early treatments of discontinuous attractor transitions in Thom, 1972; Kelso, 1995)

Definition 4.1 (Topological identity boundary $\alpha^\dagger$)**.** The *topological identity boundary* $\alpha^\dagger$ is the infimum of displacements α such that for some perturbation with $\alpha \geq \alpha(x, \mathcal{A})$ the attractor $\mathcal{A}$ ceases to exist as a stable basin of the dynamics generated by $\mathcal{D}$.

Beyond $\alpha^\dagger$, returning to the *same* identity in any strong sense becomes impossible because the attractor itself has been eliminated or replaced.

It follows that we generally have

$$0 \leq \hat{\alpha} \leq \alpha^\dagger,$$

with equality only in special cases.

4.2 Three regimes of identity displacement

The two thresholds partition the space of displacements into three regimes.

Definition 4.2 (Identity regimes)**.** Given an identity basin $\mathcal{A}$ with thresholds $\hat{\alpha}$ and $\alpha^\dagger$:

(i) The *continuity regime* is $0 \leq \alpha < \hat{\alpha}$, where identity is elastically preserved.

(ii) The *fragility regime* is $\hat{\alpha} \leq \alpha < \alpha^\dagger$, where the basin persists but recovery requires active reorganisation and may involve hysteresis.

(iii) The *discontinuity regime* is $\alpha \geq \alpha^\dagger$, where the original basin is no longer available.

The conceptual error common in many domains is to treat $\hat{\alpha}$ as if it were $\alpha^\dagger$, conflating severe stress with irreversible transformation. cf. the elasticity analysis in Thomas, 2025b

Our interest is squarely in the discontinuity regime.

5 The Meta-Coherence Operator

Crossing $\alpha^\dagger$ does not determine whether the system is destroyed or reconstituted. The decisive factor is whether the system possesses an internal mechanism for generating a new basin of identity.

5.1 Definition and intuition

We model this capacity as an operator that acts not on states but on the coherence field itself.

Definition 5.1 (Meta-coherence operator)**.** Let $\mathcal{D}$ be a distributed coherence field on a state space X and $\mathcal{A}$ an identity basin generated by $\mathcal{D}$. A *meta-coherence operator* for the system is a mapping

$$\Omega : \mathcal{D} \longrightarrow \mathcal{D}'$$

such that:

(i) Ω is implementable by processes internal to the system (possibly under certain triggering conditions);

(ii) the modified field $\mathcal{D}'$ admits at least one new identity basin $\mathcal{A}'$;

(iii) trajectories of the system under $\mathcal{D}$ may access the transformation to $\mathcal{D}'$ during or after the loss of $\mathcal{A}$.

Informally, Ω captures the system's ability to alter the rules by which it maintains coherence, rather than merely adapting within fixed rules. It is an operator on the space of coherence operators.

Remark 5.2. When Ω is absent or inaccessible, the destruction of $\mathcal{A}$ leaves the system without any structurally supported identity. When Ω is present and engaged, the system may reconstitute around a new basin $\mathcal{A}'$ even though $\mathcal{A}$ is lost.

5.2 Internal vs. external authorship

The crucial distinction for later applications is whether Ω is internal or external to the system.

Definition 5.3 (Authorship of Ω)**.** A meta-coherence operator Ω is said to be:

- *internally authored* if its triggering conditions and implementation are determined by the system's own state and dynamics;
- *externally authored* if its implementation depends on an external controller or environment.

Identity-discontinuous transformation governed by internally authored Ω is what we will call *metamorphosis*. The same structural situation governed by external Ω is better described as *reprogramming* or *replacement*.

This distinction will be central when we turn to artificial systems: a self-modifying agent whose meta-coherence operator is externally authored is not autonomous in the relevant sense.

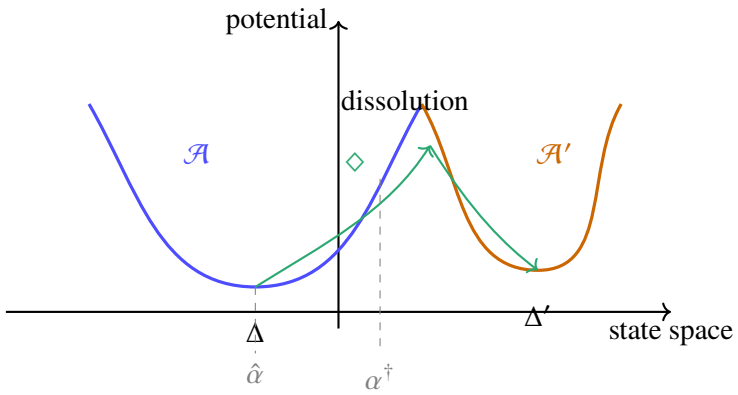

Figure 1: Schematic potential landscape for identity-discontinuous transformation. The system begins in basin $\mathcal{A}$ (phase Δ), crosses the topological identity boundary $\alpha^\dagger$ into a coherence-free interval $\diamond$, and eventually reconstitutes in a new basin $\mathcal{A}'$ (phase Δ').

6 Topology of Identity-Discontinuous Transformation

We now describe the typical sequence of phases in an identity-discontinuous transformation.

6.1 Three-phase topology

We treat the system's macro-level situation as moving through three qualitatively distinct phases, denoted by the symbols Δ, $\diamond$, and Δ'.

(a) **Basin dissolution ($\Delta \to \diamond$).** The original basin $\mathcal{A}$ loses stability; the system's trajectories wander away from the former attractor. Feedback loops previously responsible for maintaining identity become unreliable or contradictory. Mathematically, α exceeds $\alpha^\dagger$ and $\mathcal{A}$ ceases to be an attractor.

(b) **Coherence-free interval ($\diamond$).** The system exists in a liminal state where no stable identity basin has yet formed. Dynamics may be dominated by noise, chaotic wandering, or exploration under partial constraints. It is during this phase that the meta-coherence operator, if present, must engage.

(c) **Reconstitution ($\diamond \to \Delta'$).** A new coherence field $\mathcal{D}'$ and basin $\mathcal{A}'$ are established. The system settles into a new pattern of identity, generically *post-compatible* but not continuous with $\mathcal{A}$.

The transition $\Delta \to \Delta'$ is therefore *identity-discontinuous* even if the underlying substrate persists.

6.2 Diagrammatic representation

Figure 1 sketches a simple representation of this topology.

The details of the potential landscape are not to be taken literally; what matters is the sequence: loss of the old basin, wandering in a liminal region, and capture by a new basin.

Remark 6.1 (Non-uniqueness of $\mathcal{A}'$). The analysis above does not assume that the reconstituted identity basin $\mathcal{A}'$ is unique. A system equipped with an internally authored meta-coherence operator Ω may, depending on its trajectory through the coherence-free interval $\diamond$, settle into any one of several viable basins. In such cases Ω provides a generative capacity for constructing new coherence constraints, but the specific basin selected is path-dependent, shaped by transient dynamics, environmental cues, and the local structure of the modified coherence field. The existence of multiple potential $\mathcal{A}'$ does not affect Theorem 8.2; survival across identity

discontinuity requires only that at least one such basin be reachable, not that the outcome be unique. Let $\mathcal{R}(\Omega)$ denote the set of all basins that can be generated by activating Ω under some reachable trajectory in $\diamond$.

This multiplicity is especially relevant for artificial systems, where the structure of $\mathcal{R}(\Omega)$ determines not only the possibility of reconstitution but the range of identities an agent could adopt following self-modification.

Remark 6.2 (Interaction of Φ_c, Ψ_p, and Λ_a). The three mechanisms governing basin exit act on different layers of the identity geometry and therefore do not function as substitutes for one another. Rising contradiction density Φ_c reduces the effective depth and stability of the current basin, making exit more likely but not logically necessary for it. By contrast, the prospective coherence vector Ψ_p introduces a directional gradient toward an alternative region of higher anticipated coherence and can draw the system out of a stable basin even when Φ_c remains low. The authorship vector Λ_a does not destabilise the existing identity; its influence is exerted only after the system has entered the coherence-free interval $\diamond$, where high Λ_a expands the range of basins into which the system may reconstitute. Thus a strong Λ_a may compensate for a weak Ψ_p *after* basin exit by enabling internally authored identity formation, but it cannot replace Ψ_p as a driver of exit itself. In summary: Φ_c destabilises, Ψ_p directs, and Λ_a re-authors.

7 Mechanisms of Basin Exit

We now consider how an identity might come to exceed its own basin in the first place. The mechanisms below are abstractions of patterns observed in biological, cognitive, and organisational systems.

7.1 Contradiction density Φ_c

The first mechanism is the accumulation of internal inconsistencies that cannot be reconciled within the current identity.

Definition 7.1 (Contradiction density)**.** Let C denote the set of constraint relations expressed by $\mathcal{D}$ within $\mathcal{A}$. Define the *contradiction density* Φ_c as a measure of the proportion of constraint pairs in C that cannot be satisfied simultaneously under perturbations in the current environment.

As Φ_c increases, the effective depth of the basin diminishes: more of the system's energy is spent on maintaining mutually inconsistent commitments. When Φ_c crosses a critical level, small disturbances may be enough to push the system beyond $\alpha^\dagger$.

Remark 7.2. In psychological systems, rising Φ_c corresponds to cognitive dissonance that cannot be resolved by local belief revision. In organisations, it may manifest as conflicting metrics, policies, or incentive structures.

7.2 Prospective coherence Ψ_p

The second mechanism is attraction toward an alternative pattern of coherence sensed before it is fully realised.

Definition 7.3 (Prospective coherence vector)**.** Let $\mathcal{B}$ be a potential basin not yet fully formed. The *prospective coherence vector* Ψ_p is a directional tendency in the system's dynamics that increases the likelihood of trajectories entering regions of state space compatible with $\mathcal{B}$, even when $\mathcal{A}$ remains locally stable.

Prospective coherence represents a form of anticipatory sensitivity: the system "leans" toward states that would be more coherent under an as-yet-unrealised set of constraints.

7.3 Authorship vector Λ_a

The third mechanism involves explicit self-constitution.

Definition 7.4 (Authorship vector)**.** The *authorship vector* Λ_a quantifies the degree to which the system's own internal processes participate in selecting and maintaining the coherence constraints encoded by $\mathcal{D}$.

Systems with high Λ_a can deliberately restructure their identity basins; those with low Λ_a remain largely at the mercy of external forces.

These three mechanisms can be combined into a simple descriptive relation:

$$\text{Probability of basin exit} \quad \propto \quad f(\Phi_c, \|\Psi_p\|, \|\Lambda_a\|),$$

where f is increasing in each argument under normal conditions.

8 Conditions for Metamorphosis vs. Dissolution

We are now prepared to state the central qualitative result.

Definition 8.1 (Metamorphosis and dissolution)**.** Consider a system whose identity basin $\mathcal{A}$ has been destroyed via displacement $\alpha \geq \alpha^\dagger$.

- The system undergoes *metamorphosis* if there exists an internally authored meta-coherence operator Ω that is engaged during the coherence-free interval and yields a new basin $\mathcal{A}'$.
- The system undergoes *dissolution* if no such Ω is available or engaged, and the system fails to establish any stable basin.

Theorem 8.2 (Survival across identity discontinuity)**.** *Let a system possess an identity basin $\mathcal{A}$ with thresholds $\hat{\alpha}$ and $\alpha^\dagger$, and suppose that $\alpha \geq \alpha^\dagger$ so that $\mathcal{A}$ is destroyed. The system can reconstitute a stable identity basin $\mathcal{A}'$ through an identity-discontinuous transformation if and only if:*

(i) there exists an internally authored meta-coherence operator Ω; and

(ii) the trajectories of the system during the coherence-free interval pass through a region of state space from which Ω is reachable.

Sketch. Necessity is straightforward. If no internally authored Ω exists, the system cannot alter its coherence field in a way that would produce a new basin, so reconstitution is impossible. If Ω exists but is unreachable during the coherence-free interval, the same conclusion follows.

For sufficiency, assume that an internally authored Ω exists and is reachable. Then, by definition of Ω, its activation generates a new coherence field $\mathcal{D}'$ with at least one basin $\mathcal{A}'$. Since trajectories in the coherence-free interval can reach the activation conditions, and $\mathcal{A}'$ is an attractor under $\mathcal{D}'$, the system will eventually settle into $\mathcal{A}'$ with nonzero probability, yielding a reconstituted identity. □

The theorem is qualitative; in particular, it does not address the uniqueness of $\mathcal{A}'$ or the timescale of transformation. But it captures the conceptual point: *metamorphosis is structurally available only to systems that can author their own coherence after basin exit.*

Corollary 8.3. *In systems lacking any meta-coherence operator—or whose operator is exclusively externally authored—identity-discontinuous transformation generically results in dissolution or replacement rather than metamorphosis.*

9 Examples Across Domains

We briefly sketch how the framework applies in four domains. These sketches are not empirical analyses; they are illustrations of the geometry.

9.1 Biological metamorphosis

In many organisms, metamorphosis is an obvious instance of identity-discontinuous transformation. The larval and adult forms occupy distinct basins: anatomical, behavioural, and ecological patterns differ so substantially that continuity of identity is secured mainly by developmental lineage.

Here, the meta-coherence operator Ω is embodied in genetic and epigenetic programs that, once triggered, reorganise the coherence field of the organism. Authorship is largely external at the level of the organism but internal at the level of the species or lineage.

The crucial observation for our purposes is that the larval identity loses its basin (e.g., through hormonal cascades that dismantle larval structures), enters a coherence-free interval (pupal stage), and reconstitutes around an adult basin. The organism survives because Ω is present and reliably triggered.

9.2 Psychological rupture

In human psychological development, crises that exceed an individual's elasticity limit may or may not lead to catastrophic failure. From the present standpoint, the difference hinges on whether the person can access an internally authored Ω: a capacity for reflective self-reconstruction.

Trauma that is processed within a framework capable of revising core narratives and commitments can yield a qualitatively new identity (metamorphosis). Trauma that destroys inherited coherence without such a capacity can result in chronic fragmentation (dissolution).

9.3 Organisational transformation

Organisations often attempt radical change while clinging to pre-existing control architectures. Our framework suggests that genuine metamorphosis requires relocating Ω from external stakeholders or imposed metrics to an internal capacity for self-governance.

In practice, this may correspond to institutionalising reflective processes that can re-author constraints: revising values, decision rules, and information flows rather than merely replacing leaders or strategies.

9.4 Artificial self-modifying systems

Finally, consider a hypothetical artificial agent capable of self-modification. If its meta-coherence operator is wholly specified by an external designer and limited to parameter tuning within a fixed objective function, then crossing $\alpha^\dagger$ will simply yield malfunction or externally imposed reprogramming.

By contrast, an agent that can re-author its own objective functions and coherence constraints possesses an internal Ω. In such a system, identity-discontinuous transformation is structurally analogous to metamorphosis: the agent may cease to be recognisably "the same" while maintaining continuity of substrate and causal history.

From a safety perspective, the relevant question is no longer whether the system remains aligned with a set of designer-specified values, but rather *where* Ω resides and how its scope is constrained.

10 Discussion and Future Directions

The formalism developed here opens several directions for further work.

First, it invites quantification. The thresholds $\hat{\alpha}$ and $\alpha^{\dagger}$, the contradiction density Φ_c, and the vectors Ψ_p and Λ_a could in principle be operationalised for specific classes of systems, yielding empirical predictions about when metamorphosis is likely or possible.

Second, the framework suggests a taxonomy of identity trajectories. Rather than classifying systems simply as stable or unstable, one can track whether they are approaching $\hat{\alpha}$, entering the fragility regime, or risking crossings of $\alpha^{\dagger}$ without access to Ω.

Third, the analysis connects questions of autonomy and sovereignty with the location of the meta-coherence operator. In any system where Ω is fully external, identity-discontinuous transformation is equivalent to replacement by the intentions of that external controller. Only when Ω is internal does metamorphosis become genuinely self-authored.

Finally, the geometry of discontinuous transformation may illuminate processes on longer temporal and larger spatial scales, such as cultural transitions and technological paradigm shifts, where the "identity" at stake is a distributed pattern rather than a single bounded system.

11 Conclusion

This paper has proposed a PatternSense framework for identity-discontinuous transformation. By distinguishing an elasticity limit $\hat{\alpha}$ from a topological identity boundary $\alpha^{\dagger}$, and by introducing the meta-coherence operator Ω, we have given a structural account of how a system can exceed its own basin of identity and yet survive.

The key conclusions can be summarised as follows:

- Exceeding $\hat{\alpha}$ marks the failure of local recovery but does not necessarily entail the loss of identity.
- Exceeding $\alpha^{\dagger}$ destroys the original identity basin; continuity in any strict sense is no longer available.
- Whether such a discontinuity results in destruction or metamorphosis depends on the presence and accessibility of an internally authored meta-coherence operator Ω.
- Mechanisms such as rising contradiction density, prospective coherence, and authorship shape the likelihood and character of basin exit.

Identity-discontinuous transformation is therefore not an exception to be pathologised or mystified, but a normal mode of systemic change that obeys intelligible geometric constraints. Understanding those constraints is essential for any serious discussion of biological development, psychological growth, organisational redesign, or the long-term behaviour of powerful artificial systems.

References

J. A. Scott Kelso. *Dynamic Patterns: The Self-Organization of Brain and Behavior*. MIT Press, Cambridge, MA, 1995.

René Thom. *Structural Stability and Morphogenesis*. Benjamin, Reading, MA, 1972.

C. S. Thomas. Architecture vs substrate framework. *Zenodo*, 2025a. doi: 10.5281/zenodo/17769472.

C. S. Thomas. Operational definition of episodic identity (odei). *Zenodo*, 2025b. doi: 10.5281/zenodo.17766282.

C. S. Thomas. Patternsense: A computation theory of structural identity. *Zenodo*, 2025c. doi: 10.5281/zenodo.17716891.