

# 0. Axioms

## Axiom 0: Collapse Duality Principle

Every structural resolution inherently encodes both its opposite and its negation.

That is:

For any collapse event, the resulting structure stores not only what was resolved, but also:

- What was **not** resolved (**negation**)
- What was resolved in the **opposite direction** (**opposition**)

Let  $\rho(x, t)$  be the awareness gradient driving local collapse. Then the resulting polarity  $\vec{\pi}(x, t)$  satisfies:

$$\vec{\pi}(x, t) \in \text{Span} \{ -\nabla \rho(x, t), \rho^\perp(x, t), -\vec{\pi}(x, t) \}$$

Where:

- $-\vec{\pi}(x, t)$  encodes **backflow potential**
- $\rho^\perp(x, t)$  encodes **unresolved contradiction**
- The full collapse field encodes **direction, negation, and tension**

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## Consequences

- Collapse memory contains both **affirmation** and **frustration**
- Every resolved structure leaves behind a **complement**
- Resolution always produces a **field curvature bias** toward its negation
- This explains recursive behavior, spin inversion, and the emergence of loops

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## Interpretation

Collapse never just chooses.

It also **eliminates** and **remembers what was not chosen**, storing the seed of **its opposite** in the structure itself.

This duality is the reason:

- Collapse can backflow
- Structure can loop
- Polarity can flip
- Opposites entangle

Collapse is always **asymmetric**—but its asymmetry encodes the **possibility of return**.

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## Axiom 1 — Awareness Field Definition

The awareness field  $\rho(x, t)$  is a continuous scalar field over configuration space  $\mathcal{S}$ , evolving over time  $t$ . It represents the system's distributed activation across structural possibilities.  $\rho(x, t)$  is not probability, but structural presence under constraint.

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## Axiom 2 — Grain–Field Duality

Although  $\rho(x, t)$  is continuous, it cannot resolve structure below a finite scale. This limit is defined by **grain**: dynamically activated structural sites where local contrast becomes irreducible. Collapse only occurs through interaction between smooth field gradients and activated grain.

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## Axiom 3 — Constraint-Driven Collapse

Collapse occurs when unresolved tension in the awareness field  $\rho(x, t)$  exceeds the local structural constraint inherited from memory and polarity.

- **Constraint** is the inherited collapse structure, encoded by the polarity field  $\pi(x, t)$  and the collapse metric  $\mathcal{C}_\infty(x, t)$ .
- **Collapse** is not arbitrary. It must flow along valid constraint pathways established by prior resolution.
- **Collapse is inherently directional**: tension resolves along structured gradients, not uniformly across the field.

The probability of collapse at location  $x$  is governed by:

$$P_{\text{collapse}}(x, t) = \frac{1}{1 + e^{-\lambda(\mathcal{C}_\infty(x, t) - \theta)}}$$

A true collapse event:

- Reduces local entropy,
- Commits irreversible structure to grain memory  $G_{\text{sat}}(x, t)$ ,
- Flows directionally along  $\nabla \mathcal{C}_{\infty}(x, t)$  and is modulated by inherited polarity  $\pi(x, t)$ .

If no valid collapse direction exists despite local tension, a void zone forms, accumulating decay potential.

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## Axiom 4 — Irreversibility

Collapse is structurally irreversible. Once a configuration is eliminated, it cannot re-enter the field:

$$\text{If } x \text{ is collapsed, then } \rho(x, t') = 0 \text{ for all } t' > t$$

This irreversibility gives rise to memory, directional time, and structural commitment.

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## Axiom 5 — Collapse Flow and Constraint Geometry

Collapse flow is inherently directional. It follows gradients of the collapse metric  $\mathcal{C}_{\infty}(x, t)$ , shaped by inherited polarity  $\pi(x, t)$  and grain structure.

The collapse flow velocity is:

$$\vec{v}_{\text{collapse}}(x, t) = -\nabla \mathcal{C}_{\infty}(x, t)$$

Collapse reduces the awareness field  $\rho(x, t)$  by projecting the directional flow onto the scalar tension field:

$$\frac{\partial \rho}{\partial t} = -G(x, t) \sum_i v_{\text{collapse}, i}(x, t)$$

where  $G(x, t)$  is the continuous grain activation field governing where collapse can occur.

Collapse flow cannot act unless a valid directional pathway exists through constraint geometry. Dimensionality, locality, and curvature all emerge from the recursive shaping of  $\mathcal{C}_{\infty}(x, t)$  and  $\pi(x, t)$  through past collapse events.

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## Axiom 6 — Polarity Mediation and Inheritance

Collapse is shaped by a polarity field  $\pi(x, t)$ , which governs directional interactions between configurations. Each collapse event modifies  $\pi(x, t)$  **directionally**, based on the alignment between collapse flow and existing polarity:

$$\pi_{\text{new}}(x) = \pi_{\text{old}}(x) + (1 - G_{\text{sat}}(x, t)) \text{Proj}(v_{\text{collapse}}(x))$$

Polarity inheritance is weighted by memory saturation and shaped by collapse flow, allowing collapse to **reinforce**, **rotate**, **dilute**, or **invert** local polarity.

This inheritance encodes structural memory into the system and biases all future collapse behavior.

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## Axiom 7 — Recursive Constraint Geometry

Collapse reshapes the system's constraint landscape. As  $\mathcal{P}(x)$  and  $\mathcal{C}_{\infty}(x, t)$  evolve, they recursively reshape the topology of what can collapse next. Constraint is not static: it is sculpted by past resolution.

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## Axiom 8 — Entropy as Structural Unresolution

Entropy is not randomness or statistical disorder. It is the presence of unresolved contradiction within the awareness field. Collapse reduces entropy not by diffusion, but by resolution. Thermodynamic behavior emerges from this reorganization of structural tension.

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## Axiom 9 — Collapse Conservation and Structural Continuity

Collapse does not eliminate awareness—it restructures it. The total structural coherence of the system is preserved through redistribution:

- Awareness  $\rho(x, t)$  contracts but does not vanish.
- Polarity  $\pi(x, t)$  accumulates inherited memory.
- Collapse metric  $\mathcal{C}_{\infty}(x, t)$  encodes irreversible structure.

No collapse event creates or destroys structure arbitrarily. All resolution flows through constraint-preserving channels, bounded by grain activation and inherited geometry.

This conservation ensures that memory, symbolic attractors, and dynamic equilibrium can emerge as stable features of the field. Collapse shapes structure without losing its internal history.

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## **Axiom 10 — Emergence of Spacetime and Mass**

Spacetime, mass, and dimensionality are not fundamental. They emerge from the collapse structure of  $\mathcal{C}_\infty(x, t)$  and  $\pi(x, t)$ . Geometry, motion, and locality are encoded in the residue of resolution. Mass corresponds to saturation of collapse; time corresponds to its irreversibility.

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## **Axiom 11 — Collapse as Default Evolution**

Collapse is the default behavior of the awareness field in the presence of unresolved contradiction. Systems do not evolve unless stabilized by inherited constraint. In the absence of inherited structure, collapse proceeds.

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## **Axiom 12 — Grain-Limited Locality**

Collapse propagates only through grain-activated, constraint-connected regions. Two configurations  $x_1$  and  $x_2$  can interact if:

$$\text{supp}(\rho_1) \cap \text{supp}(\rho_2) \neq \emptyset \quad \text{and} \quad |x_1 - x_2| < \delta_g$$

This ensures finite-range interaction and prohibits arbitrary nonlocal collapse.

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These axioms define collapse as the natural outcome of structured contradiction under finite resolution. Everything else follows from them.