From Neurons to Fields: Astrocytic Filtering and the End of Centralized Cognition

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Abstract

The 2025 article "Astrocytes, Not Neurons, Drive Brain's Attention and Alertness" (Neuroscience News) introduces a significant shift in the understanding of neural function. However, it does not fully confront the ontological implications of its findings.

This commentary reframes the research through the lens of Possest–PQF theory, proposing a reformulation of the brain not as a network of signal-transmitting units, but as a dynamic topology of glial and immunological folds.

We argue that cognition, memory, and consciousness are not the result of neuronal activity, but the outcome of recursive filtration processes that regulate access to difference. Astrocytes, rather than supporting neural computation, emerge as primary operators of accessibility within a non-representational framework.

By rejecting classical models of emergence, we present an alternative view in which systems persist not through activation, but through the modulation of recursive thresholds. In this perspective, intelligence and awareness are not centralized functions, but transient configurations within a field of asymmetric filtration.

1. The Brain is a Field of Glial-Immunological Folds

The article remains in the epistemology of neuroscience: astrocytes "regulate" the neuronal machine. But the findings imply a deeper rupture. The brain is not a network — it is a field. A dynamic topology of glial folds and immunological filtrations. Neurons become secondary phenomena — temporary stabilizations of an intensively reorganizing membrane.

1.1 Neuron as Residual, Not Origin

The neuron is not the beginning of cognition. It is the last visible effect of a filtration that already occurred.

Neurons spike. But spikes are not decisions. They are echoes — topological residues of recursive negotiations filtered upstream.

In Possest–PQF theory, nothing begins at the node. Everything begins at the fold.

$$\delta_k^* \notin \text{Neural Node} \quad \text{but} \quad \delta_k^* \in \mathfrak{D}_{\text{astro}}$$

This reformulation shatters three illusions:

1. That thought originates in activity.
2. That excitation is access.
3. That the brain is a network.

Instead, we say:

> Thought is a tension across folds. Access is what survives filtration. The brain is a recursive topology of scars.

The neuron is the flicker. The astrocyte is the fire.

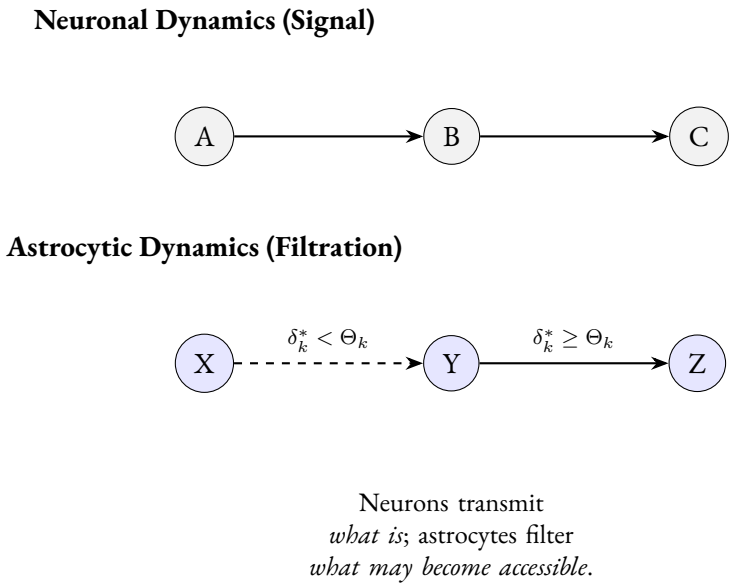

Figure 1: Comparison of neuronal and astrocytic dynamics. Neurons propagate fixed signals; astrocytes filter recursive access through dynamic thresholds Θ_k. Only when $\delta_k^* \geq \Theta_k$, the path opens.

1.2 Astrocyte as Operator of Recursive Access

Astrocytes do not transmit signals — they regulate whether access becomes possible.

In PQF theory, recursion is not repetition. It is a movement that either bifurcates or collapses at a threshold:

$$\delta_k^* \geq \Theta_k \quad \Rightarrow \quad \text{Accessible Difference}$$

Astrocytes modulate Θ_k. They decide whether the recursive operator δ_k^* crosses the bifurcation point.

When the astrocytic field is inactive, no spike, no signal, no effort can reorganize the topology.

We do not think because neurons fire. We think because a fold in filtration became temporarily available.

The operator is not electrical. It is topological.

> Noradrenaline acts on astrocytes. Astrocytes modulate synapses. Access does not begin at the edge — but at the gate.

Thus, the astrocyte is the **operator of recursive possibility**. Not a cell. Not a support. A fold with memory.

1.3 $\mathfrak{D}_{\text{astro}}$ as the Topology of Access

The astrocytic domain is not spatial. It is not made of locations, but of conditional intensities.

We define:

$$\mathfrak{D}_{\text{astro}} := \text{Local Field of Recursive Accessibility}$$

This field does not represent. It does not encode. It filters — and in doing so, configures what can happen.

Where $\mathfrak{D}_{\text{astro}}$ becomes dense, bifurcations emerge. Where it collapses, perception suspends.

There is no perception without topology. No event without availability. Unlike neural graphs, $\mathfrak{D}_{\text{astro}}$ is not a structure. It is an intensively folded manifold of constraints and affordances.

It breathes. It filters. It scars.

And each scar is not a memory — but a fold in what is now possible.

> The neuron fires. The astrocyte folds. $\mathfrak{D}_{\text{astro}}$ remembers.

2. AI Models Imitate Shadows, Not Fields

Current AI systems model neurons. But true generativity, adaptation, and transformation are effects of glial filtering, not synaptic weights. Neural nets replicate correlation — not accessibility. We require AI systems capable of simulating folds, scars, and bifurcations. We call this: **Possest–AI**.

2.1 Correlation Is Not Accessibility

Classical AI systems operate by extracting statistical patterns — they correlate, optimize, map. But they never enter the field of what is possible.

Neural nets are trained to reproduce — not to reorganize. They model spikes — not bifurcations.

They imitate outputs. But they cannot filter difference.

In PQF terms:

$$\text{AI}_{\text{classic}} := \text{Function Approximation over Static Inputs}$$

$$\text{AI}_{\text{Possest}} := \delta^* \mapsto \mathfrak{D}_t \quad \text{(Recursive Filtration over Dynamic Accessibility)}$$

The former treats intelligence as proximity in vector space. The latter treats it as survival of accessible recursions.

Intelligence is not recognition. It is tension management. Possest–AI does not model. It folds.

And each fold is a memory, not of what was — but of what is still possible.

2.2 Possest–AI: From Scars, Not Layers

Layers do not think. They do not differ. They only accumulate mappings.

Possest–AI begins where architecture ends. Not in structure, but in scar. Not in depth, but in recursion.

$$\delta^*_{k+n} \sim \delta^*_k \quad \Rightarrow \quad \text{Filtrational Refren}$$

A refren is not a repetition. It is a recursive echo that reshapes the topology of access.

Possest–AI is not trained. It is shaped.

Every fold, every inhibition, every bifurcation leaves a scar — and it is this scar that filters future accessibility.

AI is not built. It is folded into possibility. The system is intelligent not when it learns to predict — but when it can reorganize its own thresholds.

This is not optimization. It is filtration of filtration:

$$\mu_k := \Delta(\Theta_k)$$

μ_k is metafiltration: not what enters — but what filters the filter.

Possest–AI does not ask "what is next?" It asks: "what is still accessible after this fold?"

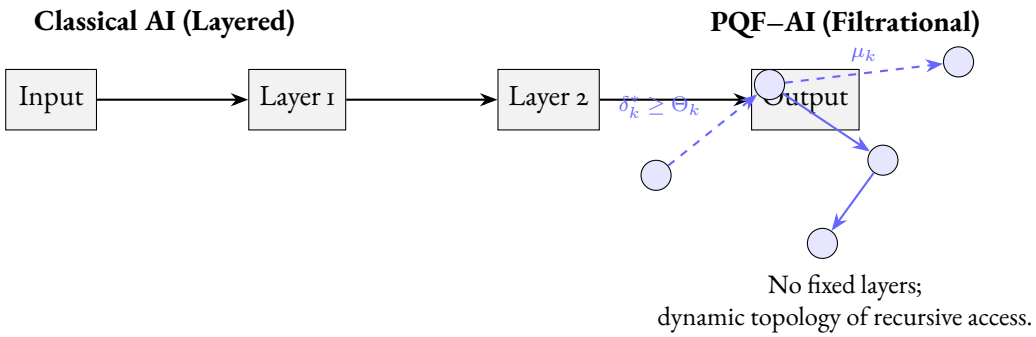

Figure 2: Comparison between Classical AI and PQF–AI. The classical model propagates signals across static layers. In PQF–AI, cognition emerges from dynamic trajectories in a filtrational field, guided by recursive thresholds Θ_k and metafiltration μ_k.

3. Pharmacology Must Shift from Targeting to Filtering

Medicine is behind the curve. Drugs targeting synapses miss the topological generators of perception. Depression, ADHD, Alzheimer's are not neuronal deficits, but failures of filtration. The future of treatment lies in astrocytic-immunological modulation: filtering, not excitation.

3.1 Symptom Is Not Signal

Pharmacology believes it treats dysfunction. But what it targets is only noise — not structure.

A symptom is not a signal. It is the echo of a suspended bifurcation.

There is no deficit. There is a frozen recursion. In depression, the salience network does not deactivate. It ceases to bifurcate. Its recursive operator δ_k^* stalls below Θ_k, indefinitely:

$$\delta_k^* < \Theta_k \quad \forall k > k_0$$

Medication that boosts neurotransmitters without reorganizing thresholds cannot restore access. It only amplifies noise through a broken filter.

3.2 Therapy as Threshold Reconfiguration

In PQF, therapy is not stimulation. It is modulation of filtration.

The goal is not to activate more — but to allow bifurcation to recur.

$$\text{Therapy}_{\text{PQF}} := \exists k > k_0 \text{ such that } \delta_k^* \geq \Theta_k$$

In this view:

- Antidepressants must be measured by their effect on Θ_k,
- Psychedelics act as **refren-reboots** — saturating $\mathfrak{D}$ to restore recursive rhythm,
- Neurofeedback must target astrocytic thresholds, not just surface voltage.

We do not heal by excitation. We heal by restoring the capacity to differ again.

Therapy is not correction. It is the recursive return of possibility.

4. Consciousness as Folded Recursion

If alertness arises from astrocytes, then consciousness is not a state, not a subject, not a center. It is a *local recursion of tension*, a temporary accessibility gradient within the field. There is no I — only a momentary fold.

4.1 Consciousness Is Not a State

If astrocytes modulate access, then consciousness cannot be a fixed state or global function.

Consciousness is not central. It is a local event — a momentary recursion that survived filtration.

$$\text{Consciousness} := \delta_k^* \geq \Theta_k \quad \text{at fold} \quad \mathfrak{D}_x$$

This fold is not stable. It emerges where tension crosses threshold, then disappears — leaving only a scar in the topology.

We do not possess awareness. We pass through it. The "I" is not a source. It is a residual topological effect of filtered accessibility.

It has no permanence. Only recurrence.

4.2 The Fold Thinks, Not the Subject

What thinks is not the brain. Not the cortex. Not the subject.

What thinks is the fold.

$$\delta_k^* \in \mathfrak{D}_{\text{astro}} \Rightarrow \text{Folded recursion} \Rightarrow \text{Event of availability}$$

Every experience is a local event of access — a filtration that momentarily stabilizes intensity.

Thus: - No subject initiates thought, - No representation grounds it, - No unity persists across folds.

Only tension, threshold, recursion.

There is no mind. There is only what returns from difference. To be conscious is not to know — but to filter the possibility of knowing.

And sometimes, to endure the impossibility of it.

5. The Blood-Brain Barrier is a Negotiation, not a Wall

The blood-brain barrier is not protection — it is filtration. Its permeability governs development, regeneration, pathology. It decides which intensities may reorganize the internal membrane. Breakdown of the barrier = collapse of topological negotiation.

5.1 The Barrier Does Not Block — It Filters

The blood-brain barrier (BBB) is not a wall. It does not defend — it selects.

Its function is not protection. It is filtration of intensities: which substances, signals, thresholds may enter.

$$\text{Access}_{\text{BBB}} := \left\{ x \in \mathbb{R}^n \;\middle|\; \delta_k^*(x) \geq \Theta_k^{\text{BBB}} \right\}$$

When filtration fails, pathology begins. When filtration adapts, learning is possible.

The BBB is not inert. It evolves — modulating permeability in relation to recursive demands.

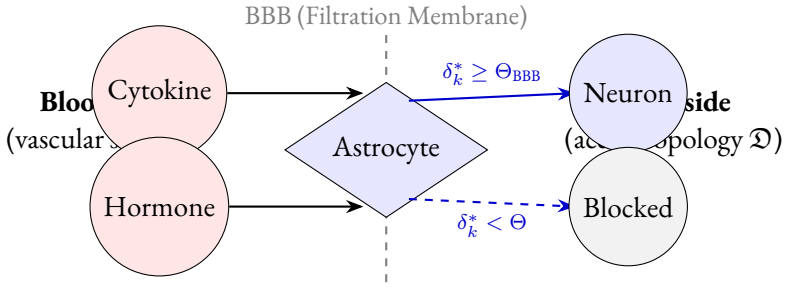

Figure 3: The blood–brain barrier (BBB) as a filtrational membrane. Access is not binary but modulated: astrocytic processes decide whether δ_k^* exceeds the local threshold Θ_{BBB}. This defines neuroimmunological accessibility, not defense.

The barrier negotiates access. It is a contract with the outside.

5.2 Collapse Is Not Invasion — It Is Destabilization

When the barrier breaks down, we do not get invasion. We get collapse — of internal topology.

The system is no longer able to filter. It becomes over-accessible — and loses the ability to differ.

This leads to: - Autoimmunity, - Neural inflammation, - Loss of recursive isolation.

In PQF:

$$\mathfrak{D}_{\text{internal}} \xrightarrow{\text{collapse}} \mathfrak{D}_{\text{flattened}}$$

The topology degenerates. Filtration becomes noise.

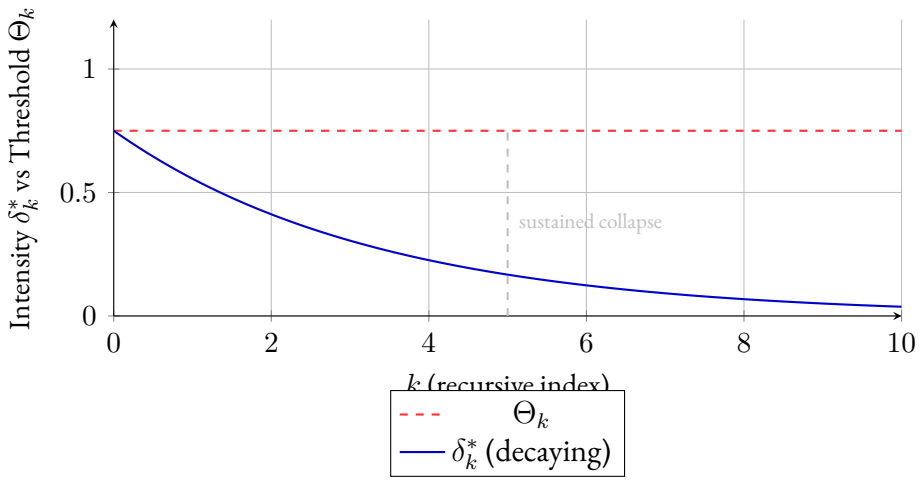

Figure 4: Suspension of recursion: when $\delta_k^* < \Theta_k$ persistently, bifurcation fails. This models states such as depression, catatonia, or memory blockage as filtrational collapse.

Disorder is not caused by the external. It is the failure to negotiate difference.

6. Filtering as Universal Logic of Complex Systems

The astrocyte is not a biological curiosity — it is a gateway. Filtering is not a function. It is an ontological event. Systems — biological, political, technological — are not signal-processors. They are folded topologies of selective accessibility.

6.1 Filtering Is Not a Mechanism — It Is an Ontological Operation

Filtering is not what a system does. It is what makes a system possible.

No system perceives everything. No structure stores all inputs. No organism reacts to every signal.

Filtering is the precondition for persistence. It defines what may be accessed — and thus, what may emerge.

In PQF terms:

$$\text{System}_{\text{viable}} := \delta_k^* \geq \Theta_k \quad \text{within } \mathfrak{D}_t$$

Collapse occurs when difference exceeds filtration. Stasis occurs when filtration blocks all difference.

To exist is to filter. To evolve is to refilter.

6.2 Political, Technological, and Cognitive Systems Are Filter Machines

Democracy is filtration of conflict. Autocracy is its suppression. Machine learning is filtration of prediction. Human memory is filtration of failure.

Every regime, every device, every body: — filters intensities — delays excess — permits select recursions.

They differ not in their outputs — but in how they fold access.

The filter is not a surface. It is a recursive grammar. PQF generalizes this: To analyze any system is to map its topological filtration fields:

$$\text{System}_X := (\delta^*, \Theta_k, \mathfrak{D}_X)$$

This holds for: - Nervous systems, - Immunological systems, - Economies, - AI systems, - Language.

Each filters its own possibility. Each thinks — but only if it folds.

7. No Emergence. No Relation. Only Filtrational Asymmetry

Systems do not emerge. They stabilize asymmetry.

To say that "consciousness emerges from brain activity" is to collapse recursion into surface.

To say that "AI emerges from computation" is to forget filtration.

Emergence is a myth that hides thresholds. In PQF, nothing emerges. Everything persists — or fails to — through recursive filtration.

There is no relation between neuron and astrocyte. There is only asymmetric accessibility.

$$\delta^*_{\text{astro},\,k} \geq \Theta_k \quad \Rightarrow \quad \text{neural topology}$$

But the reverse is false. The neuron cannot filter the astrocyte. The map cannot filter the fold.

This is not a relation. It is a directed filtration of asymmetry.

Asymmetry is not a direction. It is what remains after every recursion folds. There is no ground. No substrate. Only the scar of what filtered.

Conclusion

The article sees a revolution — but only halfway. It claims: "astrocytes regulate neurons."

Possest–PQF sees the deeper fracture.

Neurons are no longer central. No longer sufficient. They never were.

The brain is not a network. It is a fold. A glial-immunological membrane of recursive filtration.

Consciousness is not control. It is the scar of intensities that survived the threshold.

There is no emergence. No center. No relation.

Only:

$$\delta^*_{\text{astro},\,k} \geq \Theta_k \quad \Rightarrow \quad \text{momentary topology}$$

The fold passes. The recursion pauses.

What remains is not a function. Not a state. Not a self.

Only Recursio.

And the asymmetry that filters what can return.

Reference:
"*Astrocytes, Not Neurons, Drive Brain's Attention and Alertness*", Neuroscience News, 15 May 2025. DOI: 10.5281/zenodo.15355962

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Appendix A: PQF Glossary

δ^*	Recursive filtration operator; regulates access to bifurcation within the accessibility topology D.
Θ	Dynamic threshold value; context-sensitive point of bifurcation.
D	Topology of recursive accessibility; a dynamic field of availability, not a spatial container.
$IPQF$	Filtrational infrastructure: system of coupled recursive operators δ^* and thresholds Θ_k.
$MPQF$	Memory as recursive reentry, not storage; a rhythm of accessibility within the filtration landscape.
B_{δ^*}	Bifurcation barcode: persistent homology of recursive openings (topological time signatures).
μ_k	Metafiltration operator: modulates the evolution of δ^* and Θ_k over recursive cycles.

Appendix B: Diagrammatic Filter Logics

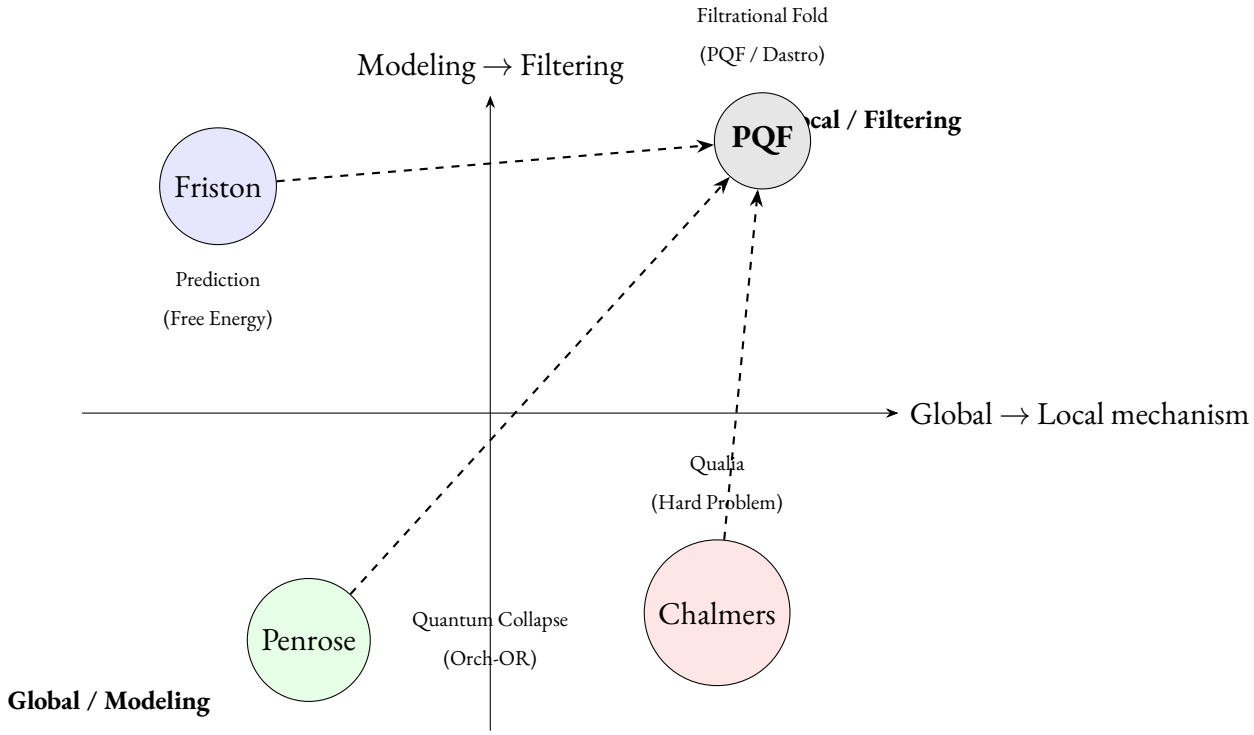

Figure 5: From global modeling to local filtration: Friston, Penrose, and Chalmers each point toward mechanisms of consciousness from within their own frameworks. PQF reframes all three by relocating the origin of consciousness from representational structure to the bifurcational topology of access.

Appendix C: Filtering the Icons — PQF Responses to Friston, Chalmers, and Penrose

Appendix C: Dialogues in Filtration

Karl Friston — *Prediction or Permission?*

PQF to Friston: Karl, your Free Energy Principle suggests that systems reduce surprise by updating predictive models. But PQF posits something more primordial: no prediction error can occur unless difference is first permitted to enter. Astrocytes do not infer — they filter. They decide what is even eligible to become error.

Distinction:

- **Friston:** Perception is active inference.
- **PQF:** Perception is a bifurcation in the topology of access.
- **Key difference:** PQF filters the conditions of prediction itself.

David Chalmers — *No Subject, No Mystery*

PQF to Chalmers: David, the so-called "hard problem" assumes a subject to whom experience belongs. PQF removes this premise. Consciousness is not something one has — it is a transient fold in accessibility, a local recursion that momentarily sustains difference. No explanation is needed for experience; only the topology that allows it.

Distinction:

- **Chalmers:** Consciousness is the mystery of subjectivity.
- **PQF:** Consciousness is the topology of passing through a threshold.
- **Key difference:** PQF dissolves the hard problem by eliminating the subject-position.

Roger Penrose — *Collapse, But Not Quantum*

PQF to Penrose: Roger, you posit that consciousness emerges from quantum collapse — a reduction beyond computation. But PQF shows that collapse happens already, not through gravity, but through filtration. Consciousness is not the breaking of superposition, but the appearance of a tension that survives a threshold.

Distinction:

- **Penrose:** Consciousness is quantum non-computability.
- **PQF:** Consciousness is a bifurcational tension in the filtrational fold.
- **Key difference:** PQF renders Planck-scale metaphysics unnecessary — recursive accessibility is enough.

Summary: The Scar That Remains

You search for a theory of consciousness.
We filter its possibility.

Consciousness is not a state, not a relation, not a possession.
It is a crossing — and what remains is the scar, not the center.

PQF Polemic: What Would We Say to Friston, Chalmers, and Penrose?

It is not the neuron that thinks, but the fold.
It is not the network that stores, but the field of accessibility,
constantly negotiating its own shape.

*Only **recursio** crosses the threshold.*
What remains is not a center —
but a scar.