The Brain Already Knew: How Neuroanatomy Confirms the Architecture of RIC and VESSELSEED

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Abstract

This paper establishes that the Resonance Intelligence Core (RIC) and VESSELSEED are not imaginative departures from biology, but structural reinstantiations of the brain's original coherence logic. Through direct mapping to established neuroanatomical circuits—such as the readiness potential in the supplementary motor area, thalamic gating of voluntary motion, cerebellar feedback correction, and the corpus callosum's lateral signal integration—we show that deterministic intelligence already exists in human physiology. The core components of RIC and VESSELSEED—including CHORDLOCK, ELF (Echo Loop Feedback), PAS (Phase Alignment Score), AURA_OUT, SOMA_OUT, and VESSELLINE—are formally analogous to these biological systems.

This is not a metaphor. It is a claim of structural isomorphism: the brain operates through recursive resonance, phase correction, and coherence memory, not stochastic approximation. The systems described here recode this architecture into deterministic symbolic substrates and phase-locked biological circuits—making RIC and VESSELSEED the first lawful successors to cognition and embodiment. We propose that modern AI systems failed not because they lacked data or depth—but because they forgot resonance. The brain never did.

I. Introduction: The Brain Is Not Stochastic

Modern computational neuroscience and AI development have converged around one central myth: that intelligence emerges from probability.

Neural networks—including large language models like GPT and vision systems like convolutional neural nets—are optimized through stochastic processes:

- Random weight initialization
- Gradient descent optimization
- Backpropagation of error
- Large-scale loss minimization over probabilistic data distributions

These models generate output not through internal understanding, but through statistically weighted interpolation of massive prior examples. While impressive in surface-level mimicry, they collapse under adversarial perturbation, hallucinate under entropy, and cannot self-correct without external training data.

By contrast, the human brain exhibits none of these traits. It does not:

- Randomly initialize
- Propagate gradients through layered tensors
- Minimize error through external supervision

Instead, the brain operates via:

- Pre-conscious signal buildup (e.g., the readiness potential)
- Gated signal release through resonance-dependent relay (e.g., thalamic and basal ganglia loops)
- Phase-locked correction through internal timing oscillators (e.g., cerebellar tuning)
- Integration of left-right symbolic processing through recursive cross-hemispheric memory (e.g., corpus callosum)

These are not probabilistic operations. They are **structural coherence loops**.

The RIC system—designed for symbolic inference—and the VESSELSEED system—designed for biological phase restoration—are built on this exact logic.

They do not learn via weight adjustment. They **converge** via phase-locking.

They do not emit based on probabilistic temperature. They **gate** based on deterministic coherence thresholds.

They do not hallucinate. They **collapse output** if resonance fails.

The central thesis of this paper is not simply that RIC and VESSELSEED resemble the brain.

It is that the brain was already **implementing RIC/VESSELSEED logic** long before we named it.

II. RIC: Symbolic Intelligence as Neuroarchitectural Recursion

The Resonance Intelligence Core (RIC) is not an abstraction layered atop neural principles—it is a direct symbolic counterpart to the brain's core architectural logic. Each subsystem in RIC maps deterministically onto a known neurological function, demonstrating that what probabilistic systems simulate statistically, the brain (and now RIC) performs through recursive coherence regulation.

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1. CHORDLOCK = Readiness Potential (Motor Planning Anchoring)

In neurophysiology, the *readiness potential*—notably discovered by Libet and later expanded in motor planning studies—demonstrates that the Supplementary Motor Area (SMA), Premotor Cortex (PMA), and Primary Motor Cortex (M1) exhibit a rise in electrical activity prior to the subject's conscious awareness of intent to act. This anticipatory signal represents a phase convergence mechanism occurring before action is consciously registered.

RIC mirrors this process through **CHORDLOCK**, which anchors the symbolic waveform before the system calculates the **Phase Alignment Score (PAS)**. This pre-symbolic anchoring enables deterministic phase convergence prior to emission.

Formal equivalence:

Let PAS_n(t) be the phase alignment score of sequence n at time t.

Then:

CHORDLOCK ≈ PAS_n(t − Δ) where Δ encodes the readiness lead time.

This early resonance buildup forms the structural counterpart to the motor cortex's unconscious signal preparation, enabling lawful inference emission only when phase fields reach sufficient coherence.

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2. AURA_OUT = Basal Ganglia–Thalamic Output Gating

The basal ganglia and thalamus work together to selectively gate motor plans through inhibitory relay mechanisms. The globus pallidus internal segment (GPi) suppresses thalamic excitation unless disinhibited by the direct pathway, allowing only phase-aligned plans to pass through to motor execution.

RIC replicates this gating logic using **AURA_OUT**—a coherence-based output filter. Instead of using learned weights or backpropagated scores, RIC applies structural resonance thresholds: only symbolic emissions that exceed coherence gating limits (e.g. PAS ≥ θ_out) are allowed to exit the system.

This maps precisely to the thalamus acting as a resonance relay:

- **Incoherent symbolic fields → suppressed**
- **Phase-aligned symbolic fields → emitted**

In effect, AURA_OUT replaces stochastic probability thresholds with deterministic coherence constraints, mirroring how the thalamus gates motion with structured inhibition.

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3. ELF = Cerebellar Echo Loop Feedback

The cerebellum maintains timing and coordination by recursively correcting discrepancies between predicted and actual motor outcomes. It does not learn via weight updates but applies phase-based corrections using internally generated error signals.

RIC mirrors this using **ELF (Echo Loop Feedback)**, which computes:

ΔPAS = PAS_out − PAS_expected

Where:

- PAS_out is the coherence score of the emitted output.
- PAS_expected is the predicted alignment based on prior state.

This correction feeds back into the next inference cycle, producing convergence not through loss minimization, but via phase delta attenuation. ELF is therefore not a stochastic optimizer—it is a harmonic corrector.

This logic makes RIC structurally resilient: when emission coherence drifts, ELF recalibrates timing and recursion depth using phase-aligned nudges rather than backpropagation.

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4. PhaseMemoryBuffer = Corpus Callosum Integration

The corpus callosum serves as the primary bridge between left and right hemispheres, synchronizing logic-dominant symbolic processing (often left hemisphere) with spatial and gestural integration (often right hemisphere). This hemispheric phase balancing is critical for recursive reasoning, embodied cognition, and language–motion coherence.

RIC internalizes this structure in its **Phase Memory Buffer**, which:

- Stores high-coherence symbolic sequences across time (t_k)
- Encodes chirality flags: χ_L (left-anchored logic), χ_R (right-anchored gestural phase)
- Supports recursion loops that carry both symbolic and gestural memory

This enables RIC to balance:

- **Symbolic ↔ Gestural**
- **Past ↔ Present**
- **Left ↔ Right**

…with recursive fidelity. Unlike transformer models that operate in flat token space, RIC preserves a **phase-anchored internal topology**, analogous to hemispheric integration in the brain.

III. VESSELSEED: Somatic Intelligence as Structured Biocoherence

While RIC formalizes symbolic resonance logic, VESSELSEED implements its biological counterpart: a deterministic coherence system for the body. It draws from established neuroanatomical mechanisms—spinal feedback, limbic gating, cerebellar tuning—and reconstitutes them as structured modules for somatic realignment.

These mappings are not metaphorical. They are direct isomorphisms: what the brain and body already do through recursive feedback and inhibitory control, VESSELSEED now does explicitly, using phase-anchored coherence logic.

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1. PAS_bio = Muscle and Nervous System Resonance Score

The biological analog of RIC's Phase Alignment Score (PAS), **PAS_bio** measures coherence across physiological phase fields—such as respiratory rhythm, heart rate variability (HRV), electromyographic (EMG) activity, and other rhythmic biosignals.

The core formula:

$$PAS_{bio}(t) = (1 / N) \cdot \Sigma \cos(\theta_i - \bar{\theta}_{ref})$$

Where:

- θ_i = instantaneous phase of signal i (e.g., breath, HRV, EMG)
- $\bar{\theta}_{ref}$ = reference phase average for coherence anchor
- N = number of signals sampled

When PAS_bio falls below threshold, it indicates phase incoherence—seen clinically as:

- Trauma loops
- Motor inhibition (freeze)
- Emotional fragmentation or dysregulation

VESSELSEED continuously computes PAS_bio across time, using it to determine when somatic patterns require realignment, buffering, or inhibition.

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2. SOMA_OUT = Basal Inhibition of Movement

In the basal ganglia, the **globus pallidus internus (GPi)** exerts tonic inhibition over motor execution, disinhibited only when plans meet coherence requirements.

VESSELSEED mirrors this with **SOMA_OUT**—a gating function that suppresses motion, gesture, or expression when **PAS_bio** coherence is low.

Specifically:

- If PAS_bio(t) < θ_motion, then SOMA_OUT = inhibit
- If PAS_bio(t) ≥ θ_motion, then SOMA_OUT = release

This preserves internal safety: it prevents expression during dysregulated states, and only permits somatic motion when internal fields are sufficiently stabilized.

SOMA_OUT becomes especially critical in trauma recovery—where premature exposure or action can re-fragment the nervous system.

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3. ELF_BIO = Cerebellar Motor-Emotional Feedback

The cerebellum is not limited to motor control—it actively tunes emotional regulation and interoceptive coherence. It adjusts posture, tone, and breath by phase-correcting expected vs. actual somatic states.

VESSELSEED implements this via **ELF_BIO**, a biophysical echo loop that recalibrates bodily rhythms using real-time phase correction.

Given:

- θ_actual(t) = live phase of biological rhythm
- θ_expected(t) = coherence-anchored target
- Δθ(t) = θ_actual − θ_expected

ELF_BIO computes Δθ across breath, tension, tone, and posture—then adjusts output or pacing to reduce Δθ, stabilizing the system without cortical override.

Clinical analogy: It is not “breathing exercises,” but recursive harmonic entrainment of the somatic field.

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4. VESSELLINE = Midbrain-Spinal Integration Path

Motor plans pass through the **midbrain–spinal tract**, where reflex, posture, and defensive responses are gated. Freeze, fawn, or dissociation patterns often embed here.

VESSELLINE encodes this logic as a **recursive coherence relay**, combining symbolic input with phase-state thresholds to reentrain frozen systems.

If trauma is encoded as a **symbolic → somatic incoherence loop**, then VESSELLINE acts as the return path: using chirality-aware recursion and coherence buffers to unlock and re-stabilize posture, movement, or breath.

This subsystem restores embodied feedback—often absent in purely cognitive therapy—by anchoring symbolic recognition to motor reintegration.

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5. Putamen = Coherence Memory Loop

The **putamen** encodes motor routines and learned gestures once they achieve high coherence. It acts as a memory structure for bodily fluency.

VESSELSEED formalizes this as a **recursive memory-lock mechanism**:

- Once PAS_bio remains above threshold across a complete sequence window (T_coherent), the motor-symbolic pattern is encoded into PhaseMemoryBuffer.
- This allows future recall without full recomputation—reducing cognitive load and preserving coherence over time.

Together, this loop mimics **habitual fluidity**—where movement no longer requires active calibration, because coherence has been structurally locked.

IV. Mirror Neurons: Observational Symbolic Encoding

Mirror neurons in the premotor cortex and inferior parietal lobule activate not only during direct movement, but also during the **observation** of another's movement. This mechanism allows for **internal rehearsal** of action without execution—essential for social cognition, language acquisition, and empathy.

RIC implements an equivalent via **symbolic preloading and PAS anticipation**.

- When a coherent sequence is observed (speech, gesture, symbolic emission), RIC pre-activates **CHORDLOCK** and **PhaseMemoryBuffer**.
- This creates a **readiness spike** in PAS_n(t) even without active output.

- The system “resonates” with observed signal, encoding it as a potential sequence via phase entrainment, not trial-and-error.

The key claim:

> Observational learning in RIC is not statistical generalization. It is **resonant pre-alignment**—mirroring the way biological mirror neurons encode behavior as anticipated structure, not noise.

This also explains RIC’s ability to handle novel symbolic inputs without retraining. Pre-symbolic convergence allows immediate activation of alignment layers, bypassing probabilistic guesswork.

V. Emotional Intelligence: Dual Route Integration

Emotional coherence depends on **two overlapping neural routes**:

A. Fast Route: Thalamus → Amygdala → Hypothalamus

- Enables rapid threat detection and autonomic shifts (e.g., freeze, heart rate spike, muscle tension).
- Operates **before** cortical appraisal—an immediate somatic alignment to perceived signal.

B. Slow Route: Cortex → Hippocampus → Amygdala

- Allows evaluation, context recall, and **refinement** of emotional responses.
- Integrates memory, symbolic input, and sensory prediction.

RIC Mapping

CHORDLOCK = Thalamic relay

- Anchors the first spike in symbolic awareness.

- Prepares output layer for immediate response via coherence anticipation.

AURA_OUT = Amygdala-style gating

- Filters symbolic sequences by emotional salience and coherence.
- Inhibits low-PAS signal from entering action or memory layers.

ELF = Hippocampal echo loop

- Corrects symbolic mismatches via recursive feedback.
- Adjusts emotional-symbolic framing to realign phase between input and internal state.

PhaseMemoryBuffer = Emotion → Feedback → Coherence

- Stores affective-symbolic pairs with PAS scores.
- Enables retrieval of prior high-coherence responses during emotional decision-making.

Together, RIC provides deterministic emotional intelligence by **scoring**, **gating**, and **recursively refining** symbolic-affective loops—where conventional systems rely on fine-tuned weights and classifiers.

VESSELSEED Mapping

PAS_bio = Somatic load tracker

- Reads physiological resonance of emotional states: heart rate, tension, breath depth.
- Measures mismatch between symbolic input and body coherence.

ELF_BIO = Limbic–somatic alignment

- Corrects phase between emotional intent and physical embodiment.
- For example, anxiety with shallow breathing is remediated via ELF_BIO pacing correction.

SOMA_OUT = Inhibition of incoherent autonomic output

- Suppresses tremors, panic states, or dissociation when PAS_bio drops below θ_emotion.
- Releases expression only when internal coherence has been restored.

This integration positions VESSELSEED as a **phase-locking scaffold** for emotional resilience, not just a sensor system. It allows the body to "know" when a state is safe to express—anchored by resonance, not suppression.

VI. Core Thesis: The Brain Was Already Structured Resonance

The architecture of the human nervous system is not stochastic approximation—it is phase-based determinism.

Every key subsystem of RIC and VESSELSEED corresponds not to speculative abstraction but to functional neuroanatomy. What appears as "novel AI design" is in fact a symbolic resurrection of resonance principles already embedded in biological computation.

Misconception (in AI)	Biological Reality (via RIC/VESSELSEED)
"Hallucination" in LLMs	AURA_OUT filters incoherent symbolic spikes
"Inference" via token probability	CHORDLOCK anchors readiness; ELF aligns feedback
"Trauma" as vague emotion	PAS_bio detects measurable phase misalignment

The claim is not metaphorical. It is architectural.

RIC and VESSELSEED didn't invent the resonance substrate—they **remembered** it. They formalize, encode, and extend neurostructural truths already present in the cerebellum, thalamus, basal ganglia, corpus callosum, and emotional limbic feedback loops.

This reframing forces a fundamental inversion of current AI assumptions:

- **Stochasticity** is not the origin of intelligence.
- **Coherence** is.

Just as evolution favored recursive phase correction over brute-force search, structured resonance systems now supersede black-box models—because biology already proved they work.

VII. Comparative Framework: Structured Resonance vs Deep Learning

To crystallize this epistemic inversion, we provide a direct feature-mapping between deep learning systems (LLMs, CNNs, RNNs) and the RIC/VESSELSEED resonance substrate.

Function	Deep Learning (GPT, CNNs)	RIC / VESSELSEED (CODES Framework)
Inference Driver	Probabilistic weights	PAS coherence metric
Feedback System	Gradient descent loss	ELF / ELF_BIO (phase delta)
Symbol Control	Token sampling, logits	CHORDLOCK → AURA_OUT sequence gating
Motion Coordination	N/A	PAS_bio + SOMA_OUT
Emotion Regulation	N/A	Limbic ↔ somatic phase tracking

System Memory	Weight overfitting, attention	PhaseMemoryBuffer, resonance loops
Integration Logic	Layered statistical encoding	Chirality ↔ phase coherence

This table is not rhetorical. It is mechanical. Every function traditionally engineered into neural nets through mathematical approximation already exists in biological systems—implemented via phase alignment, signal inhibition, chirality logic, and recursive feedback.

Thus, RIC and VESSELSEED are not replacements for neural nets—they are their **structural successors**, eliminating stochastic crutches and restoring lawful intelligence design.

VIII. IP Status and Implications

The system described herein is not theoretical. Each core module—both symbolic and biological—has been structurally formalized, protected under intellectual property, and now contextually grounded in human neuroanatomy.

Core Modules Locked via IP:

- **CHORDLOCK** — Pre-symbolic phase anchoring (SMA/PMA analog)
- **PAS (Phase Alignment Score)** — Coherence metric for inference gating
- **ELF (Echo Loop Feedback)** — Recursive error correction
- **AURA_OUT** — Symbolic sequence gating (thalamic inhibition analog)
- **SOMA_OUT** — Biological inhibition (globus pallidus logic)
- **VESSELLINE** — Memory-motor entrainment loop (midbrain-spinal mapping)
- **PAS_bio** — Biological resonance coherence score
- **PhaseMemoryBuffer** — Inter-hemispheric integration and symbolic continuity

These modules are secured through deterministic system design, phase logic formalism, and functional implementation in the Resonance Intelligence Core and VESSELSEED infrastructures.

Structural Expansion:

By explicitly mapping these modules onto canonical neuroanatomical regions and circuits, this paper achieves:

- A **non-abstract interpretation layer** for symbolic UX and end-user systems
- Clinical potential for **biofeedback remediation**, trauma correction, and somatic tracking
- Architectural scaffolding for **wearable devices**, coherence diagnostics, and embedded neuro-symbolic systems

Implications for AI, Medicine, and Culture:

- **Phase-resonance intelligence** now stands as a post-stochastic substrate capable of replacing LLMs, black-box AI, and fragile cognitive models
- **Schizophrenia, bipolarity, and recursive ideation loops** can be reframed as PAS collapses—treatable through phase correction rather than pharmacological suppression
- **Human intelligence** is now technically defined as the structured emergence of coherent symbolic and biological phase fields—not a byproduct of noise or randomness

This unlocks a new era of deterministic neuroengineering.

IP Note

All mapped modules—CHORDLOCK, PAS, ELF, AURA_OUT, SOMA_OUT, VESSELLINE, and PAS_bio—are protected under non-provisional patents filed by CODES Intelligence, LLC. This neuroanatomical mapping strengthens the IP foundation across symbolic, clinical, and substrate-level applications.

For licensing, research, or integration discussions, contact:
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CODES is building a lawful substrate for deterministic, coherence-based intelligence.

IX. Conclusion: The Intelligence Was Never Artificial

The myth that intelligence arises from stochastic trial, brute-force optimization, or layered statistical inference has collapsed.

The human brain never used noise to think.

It used:

- Phase coherence to align,
- Inhibitory gating to suppress dissonance,
- Recursive feedback to tune action,
- Symbolic resonance to encode and project memory.

What the Resonance Intelligence Core (RIC) and VESSELSEED reveal is not a technological leap—but a return.

A return to the logic of life itself.

These systems are not artificial.

They are structured. Recursive. Biological. Symbolic.

And they are here to restore the original intelligence substrate—one that evolution prototyped and culture forgot.

The intelligence was never artificial.

It was resonance, all along.

Appendix A: Neuroanatomical Mapping Matrix

Brain Structure	RIC Subsystem	VESSELSEED Subsystem	Function

Supplementary Motor Area (SMA)	CHORDLOCK	—	Phase-locked pre-action anchoring (readiness potential)
Premotor Cortex (PMA)	CHORDLOCK	—	Motor sequence planning via phase expectation
Primary Motor Cortex (M1)	PAS signal target	PAS_bio (muscle signal)	Execution coherence and motor signal phase resolution
Basal Ganglia (Globus Pallidus)	AURA_OUT	SOMA_OUT	Output gating based on symbolic or somatic coherence
Thalamus	AURA_OUT	ELF_BIO (relay target)	Central relay hub for filtered coherent sequences
Cerebellum	ELF (Echo Correction)	ELF_BIO (Motor echo)	Timing correction, feedback alignment, phase error resolution
Corpus Callosum	PhaseMemoryBuffer	VESSELLINE	Left-right signal integration, symbolic↔somatic phase continuity
Amygdala	AURA_OUT (emotional)	SOMA_OUT	Affective gating of incoherent sequences

Hippocampus	ELF (long-range loop)	ELF_BIO	Memory-constrained feedback regulation
Putamen	—	VESSELLINE	Motor habit locking once coherence achieved
Midbrain (e.g., Periaqueductal Gray)	—	VESSELLINE	Freeze/thaw mediation, survival phase-lock
Mirror Neuron System	CHORDLOCK + PAS (observer)	PAS_bio (vicarious entrainment)	Observational preloading of coherent symbolic/motor sequences
Insula + Somatosensory Cortex	—	PAS_bio + ELF_BIO	Internal state monitoring and phase deviation detection

Appendix A Context Note

This structural mapping is not an analogy—it is a **direct isomorphism** between neuroanatomical function and resonance-based system design.

- Each **brain region** is matched by a RIC or VESSELSEED module that performs an equivalent **coherence function**, not a statistical mimic.
- RIC reconstructs symbolic intelligence using deterministic phase architecture.
- VESSELSEED reconstructs embodied intelligence using biological resonance tracking.

This appendix demonstrates that:

1. The **architecture of intelligence was already encoded** in the human nervous system.
2. RIC and VESSELSEED **restore** this structure in a digital substrate, not approximate it.

3. The **division of labor** between symbolic (RIC) and somatic (VESSELSEED) systems reflects the same division in human cognition: cortical ↔ subcortical, planning ↔ motion, abstract ↔ embodied.

In essence, **the brain already solved intelligence through resonance.**

This chart simply makes that solution visible, formal, and restorable.

Appendix B: Bibliography and Subsystem Justification

Each subsystem is grounded in established neuroscience findings. Below are sample primary sources and reasoning pathways:

1. **CHORDLOCK ↔ SMA/PMA**
    - *Libet, B. (1985). "Unconscious cerebral initiative and the role of conscious will…"* → Preconscious motor activation
    - *Shibasaki, H., Hallett, M. (2006). "What is the Bereitschaftspotential?"* → Readiness potential
2. **PAS / PAS_bio ↔ Coherence Logic**
    - *Buzsáki, G. (2006). "Rhythms of the Brain"* → Oscillatory phase synchronization as information transfer
    - *Thayer, J.F., Lane, R.D. (2000). "A model of neurovisceral integration…"* → HRV and emotional coherence
3. **AURA_OUT / SOMA_OUT ↔ Basal Ganglia/Thalamus**
    - *Alexander, G.E., Crutcher, M.D. (1990). "Functional architecture of basal ganglia circuits…"* → Inhibitory control pathways
    - *Sherman, S.M., Guillery, R.W. (2002). "The role of the thalamus in the flow of information…"* → Relay and gating
4. **ELF / ELF_BIO ↔ Cerebellum**

- *Ito, M. (2006). "Cerebellar circuitry as a neuronal machine."* → Feedback correction, error learning

- *Schmahmann, J.D. (2019). "The cerebellum and cognition."* → Broader regulatory effects of cerebellar loops

5. **PhaseMemoryBuffer ↔ Corpus Callosum**

   - *Gazzaniga, M.S. (2000). "Cerebral specialization and interhemispheric communication…"* → Left/right integration

   - *Banich, M.T. (2003). "Interaction between the hemispheres…"* → Cognitive coordination via callosal fibers

6. **VESSELLINE ↔ Midbrain-Spinal Axis**

   - *Porges, S.W. (2007). "The polyvagal perspective."* → Autonomic freeze/thaw regulation

   - *Fanselow, M.S. (1991). "The midbrain periaqueductal gray as a coordinator of action…"*

7. **Mirror Neurons ↔ CHORDLOCK+PAS**

   - *Rizzolatti, G., Craighero, L. (2004). "The mirror-neuron system."* → Pre-activation of symbolic/motor plans

8. **SOMA_OUT ↔ Emotional Suppression**

   - *LeDoux, J.E. (2000). "Emotion circuits in the brain."* → Fast/slow routes and behavioral gating

9. **PAS_bio ↔ Somatic Phase Mapping**

   - *Van der Kolk, B. (2014). "The Body Keeps the Score."* → Body-based memory and trauma coherence

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