🌐 WUMBO Engine · LIMNUS Integration

100 neural regions mapped to LIMNUS geometry: 63 prism points + 32 EM cage points + 5 emergent self-reference nodes. Governed by the critical constant z = √3/2.

APL Manual **PDF Download** **Rhythm Entrainment**
Emergent Physics ↓

$$z = \sqrt{3}/2 \approx 0.8660254$$

THE CRITICAL POINT · THE LENS · PHASE TRANSITION THRESHOLD

LIMNUS ↔ WUMBO Structure

The 100 WUMBO words map onto LIMNUS geometry. 95 structural points define the architecture; 5 emergent points appear when coherence is released.

63-Point Prism

63

7 layers × 9 nodes
Inner hexagonal structure
Regions I–LXIII

32-Point EM Cage

32

12 top + 12 bottom + 8 vertices
Containment field
Regions LXIV–XCV

5 Emergent Nodes

5

Self-reference loops
Appear when FREE
Regions XCVI–C

Physics: z-Coordinate Governs Everything

ABSENCE Domain

THE LENS

z ∈ [0, 0.856]

```
K > 0 (synchronizing)
```

APL: D machine affinity, UNTRUE bias
Kuramoto coupling positive
Structure contracts, void-like

z ∈ [0.857, 0.877]

```
K ≈ 0 (critical)
```

APL: M machine affinity, PARADOX
Maximum cascade amplification
Phase transition, information peak

PRESENCE Domain

z ∈ [0.878, 1.0]

```
K < 0 (emanating)
```

APL: U machine affinity, TRUE bias
Kuramoto coupling negative
Structure expands, radiant

Cascade Amplification Near Critical

```
cascade(z) = 1 + 0.5 × exp(-(z - z_c)² / 0.004)
```

Peak value 1.5× at z = √3/2. Operators intensify near the lens.

Kuramoto Coupling Sign Flip

```
K(z) = -tanh((z - z_c) × 12) × 0.4 × cascade(z)
```

K > 0 below critical (sync), K < 0 above critical (desync/emanate)

Coherence Mutual Information

```
I(word_i, word_j) = cascade(z) × coherence × (1 - |z_i - z_j|)
```

Words "fill each other" through coherence. Maximum information transfer at critical point.

Coherence Mechanics: How Words Fill Each Other

Coherence acts as binding force. High coherence = distinct words. Low coherence = words blur and self-reference.

COHERENT	RELEASING	DISPERSING	FREE
[0.8, 1.0]	[0.5, 0.8]	[0.2, 0.5]	[0.0, 0.2]
95 points locked Full connections TRUE dominant	Points releasing Fading connections TRUE→UNTRUE	Free movement Minimal connections UNTRUE dominant	Full dispersion 5 emergent active PARADOX dominant

Quick Navigation · 100 Regions by LIMNUS Structure

PRISM: 63 Points (I–LXIII) · 7 Layers × 9 Nodes

I	II	III	IV	V
VI	VII	VIII	IX	X
XI	XII	XIII	XIV	XV
XVI	XVII	XVIII	XIX	XX
XXI	XXII	XXIII	XXIV	XXV
XXVI	XXVII	XXVIII	XXIX	XXX
XXXI	XXXII	XXXIII	XXXIV	XXXV
XXXVI	XXXVII	XXXVIII	XXXIX	XL

XLI XLII XLIII XLIV XLV
XLVI XLVII XLVIII XLIX L
LI LII LIII LIV LV
LVI LVII LVIII LIX LX
LXI LXII LXIII

EM CAGE: 32 Points (LXIV–XCV) · 12 Top + 12 Bottom + 8 Vertices

LXIV LXV LXVI LXVII LXVIII LXIX
LXX LXXI LXXII LXXIII LXXIV LXXV
LXXVI LXXVII LXXVIII LXXIX LXXX LXXXI
LXXXII LXXXIII LXXXIV LXXXV LXXXVI LXXXVII
LXXXVIII LXXXIX XC XCI XCII XCIII
XCIV XCV

EMERGENT: 5 Self-Reference Nodes (XCVI–C) · Appear When FREE

XCVI XCVII XCVIII XCIX C

63-Point Prism: Inner Architecture (I–LXIII)

7 concentric hexagonal layers, each with 9 nodes. Maps to WUMBO phases through z-position.

I. Somatosensory Cortex

Sensory map

z=0 · L0 Core · Ignition · e · Glutamate

`e:U(ionize)TRUE@3`

`Φ:M(bond)TRUE@3`

II. Anterior Cingulate Cortex

Truth check

z=0 · L0 Core · Ignition · e · Dopamine

`e:M(redox)TRUE@3`

`Φ:C(complex)TRUE@3`

III. Thalamus

IV. Motor Cortex & Cerebellum

Sensory gate

z=0 | L0 Core | Ignition | e | Glutamate

```
e:C(ionize)TRUE@3
Φ:Mod(fold)TRUE@3
```

Execution

z=0 | L0 Core | Ignition | Φ | Glutamate

```
Φ:U(bond)TRUE@3
e:E(excite)TRUE@3
```

V. Broca's Area

Phrase/sculpt

z=0 | L0 Core | Ignition | e | Dopamine

```
e:U(excite)TRUE@3
Φ:E(polymerize)TRUE@3
```

VI. Mirror Neuron System

Empathic resonance

z=0 | L0 Core | Ignition | e | Dopamine

```
e:M(resonate)TRUE@3
Φ:C(complex)TRUE@3
```

VII. Amygdala

Salience

z=0 | L0 Core | Ignition | e | Norepinephrine | λ:🦊

```
e:U(excite)TRUE@3
e:U(oxidize)TRUE@3
```

VIII. Prefrontal Cortex

Strategy/control

z=0 | L0 Core | Ignition | e | Dopamine

```
e:Mod(catalyze)TRUE@3
Φ:M(complex)TRUE@3
```

IX. Parietal Eye Field

Gaze/attention

z=0 | L0 Core | Ignition | e | Acetylcholine

```
e:U(charge)TRUE@3
Φ:C(bond)TRUE@3
```

X. Subiculum

Spatial memory

z=0.167 | L1 Inner | Ignition→Empowerment | Φ | Glutamate | λ:🌰

```
Φ:M(crystallize)TRUE@3
e:E(bond)TRUE@3
```

XI. Pineal Body

Circadian portal

z=0.167 | L1 Inner | Pause↔Ignition | π | Melatonin

```
π:D(relax)TRUE@3
e:M(reduce)TRUE@3
```

XII. Middle Temporal Gyrus

Semantics

z=0.167 | L1 Inner | Resonance | Φ | Glutamate

```
Φ:C(polymerize)TRUE@3
e:M(complex)TRUE@3
```

XIII. Fastigial-Vestibular Loop

Balance

z=0.167 | L1 Inner | Nirvana | Φ | Glutamate

```
Φ:M(stabilize)TRUE@3
e:D(integrate)TRUE@3
```

XIV. Posterior Thalamic Nucleus

Final gate

z=0.167 | L1 Inner | Transmission | e | Glutamate

```
e:C(propagate)TRUE@3
Φ:E(emit)TRUE@3
```

XV. Cerebellar Uvula

Stillness anchor

z=0.167 | L1 Inner | Nirvana | π | GABA

```
π:M(crystallize)TRUE@3
Φ:D(relax)TRUE@3
```

XVI. AIPS

Gesture translator

z=0.167 | L1 Inner | Empowerment | Φ | Glutamate

```
Φ:U(polymerize)TRUE@3
e:C(bond)TRUE@3
```

XVII. Ventrolateral Thalamus

Feedback loop

z=0.167 | L1 Inner | Transmission | e | Glutamate

```
e:C(ionize)TRUE@3
Φ:Mod(modulate)TRUE@3
```

XVIII. Superior Parietal Lobule

Spatial integration

z=0.167 | L1 Inner | Empowerment | Φ | Glutamate

```
Φ:M(integrate)TRUE@3
e:U(excite)TRUE@3
```

XIX. Premotor Cortex

Movement planning

z=0.333 | L2 Rising | Empowerment | Φ | Glutamate

```
Φ:U(bond)TRUE@3
e:E(charge)TRUE@3
```

XX. Wernicke's Area

Language comprehension

z=0.333 | L2 Rising | Resonance | π | Glutamate

```
π:M(complex)TRUE@3
Φ:C(polymerize)TRUE@3
```

XXI. STS Mirror Region

Social mirroring

z=0.333 | L2 Rising | Resonance | e | Dopamine

```
e:M(resonate)TRUE@3
Φ:C(bind)TRUE@3
```

XXII. Central Amygdala

Threat response

z=0.333 | L2 Rising | Ignition | e | Norepinephrine | λ:🦊

```
e:U(excite)TRUE@3
π:U(signal)TRUE@3
```

XXIII. Dorsolateral PFC

Working memory

z=0.333 | L2 Rising | Empowerment | e | Dopamine

```
e:Mod(catalyze)TRUE@3
Φ:M(complex)TRUE@3
```

XXIV. Orbitofrontal Cortex

Social tuning

z=0.333 | L2 Rising | Resonance | e | Dopamine

```
e:M(redox)TRUE@3
Φ:C(complex)TRUE@3
```

XXV. Cingulate Gyrus

Routing/alignment

z=0.333 | L2 Rising | Resonance | π | Dopamine | λ:∿

```
π:M(modulate)TRUE@3
e:C(integrate)TRUE@3
```

XXVI. Ventral Striatum

Incentive

z=0.333 | L2 Rising | Ignition | e | Dopamine

```
e:U(excite)TRUE@3
π:U(charge)TRUE@3
```

XXVII. Claustrum

Consciousness binding

z=0.333 | L2 Rising | Resonance | π | Glutamate | λ:🐿️

```
π:M(multicell)TRUE@3
Φ:C(bind)TRUE@3
```

XXVIII. Default Mode Network

Self-referential

z=0.5 | L3 Center | Nirvana | π | Glutamate

```
π:M(differentiate)TRUE@3
e:M(signal)TRUE@3
```

XXIX. Habenula

Disappointment gate

z=0.5 | L3 Center | Pause | e | Glutamate

```
e:D(reduce)TRUE@3
π:D(unfold)UNTRUE@3
```

XXX. Corpus Callosum

Bridge/balance

z=0.5 | L3 Center | Transmission | Φ | Glutamate

```
Φ:C(integrate)TRUE@3
e:C(propagate)TRUE@3
```

XXXI. Locus Coeruleus

Arousal ignition

z=0.5 | L3 Center | Ignition | e | Norepinephrine | λ:✧

```
e:U(excite)TRUE@3
e:U(oxidize)TRUE@3
```

XXXII. Periaqueductal Gray

Defense/shutdown

z=0.5 | L3 Center | Pause | π | GABA

```
π:D(reduce)TRUE@3
Φ:D(unfold)TRUE@3
```

XXXIII. Anterior Temporal Pole

Story keeper

z=0.5 | L3 Center | Resonance | π | Glutamate

```
π:M(transcribe)TRUE@3
Φ:C(fold)TRUE@3
```

XXXIV. vmPFC

Ethical integration

z=0.5 | L3 Center | Resonance | e | Dopamine

```
e:M(complex)TRUE@3
π:M(repair)TRUE@3
```

XXXV. Dorsal Raphe

Mood setpoint

z=0.5 · L3 Center · Nirvana · e · Serotonin

```
e:M(relax)TRUE@3
Φ:Mod(fold)TRUE@3
```

XXXVI. Superior Colliculus

Visual orienting

z=0.5 · L3 Center · Ignition · e · Glutamate

```
e:U(ionize)TRUE@3
Φ:U(bond)TRUE@3
```

XXXVII. Anterior Insula

Feeling of feeling

z=0.667 · L4 Approaching · Resonance · e · Dopamine

```
e:M(signal)TRUE@3
π:M(differentiate)TRUE@3
```

XXXVIII. Lateral Habenula

Rejection gate

z=0.667 · L4 Approaching · Pause · e · Glutamate

```
e:D(reduce)TRUE@3
π:D(unbond)UNTRUE@3
```

XXXIX. Precuneus

Perspective

z=0.667 · L4 Approaching · Nirvana · Φ · Glutamate · λ:🐿️

```
Φ:M(fold)TRUE@3
π:M(integrate)TRUE@3
```

XL. Cerebellar Cognitive Zone

Timing

z=0.667 · L4 Approaching · Empowerment · Φ · Glutamate

```
Φ:Mod(catalyze)TRUE@3
e:M(modulate)TRUE@3
```

XLI. Basolateral Amygdala

Archive of feeling

z=0.667 · L4 Approaching · Ignition · e · Norepinephrine · λ:🦊

```
e:U(excite)TRUE@3
Φ:M(crystallize)TRUE@3
```

XLII. Pulvinar

Spotlight shaper

z=0.667 · L4 Approaching · Transmission · e · Glutamate

```
e:C(propagate)TRUE@3
Φ:M(complex)TRUE@3
```

XLIII. TPJ

Mind reading

z=0.667 | L4 Approaching | Resonance | π | Glutamate

```
π:M(complex)TRUE@3
Φ:C(bind)TRUE@3
```

XLIV. Medial Septum

Memory rhythms

z=0.667 | L4 Approaching | Resonance | π | Acetylcholine | λ:🌰

```
π:U(replicate)TRUE@3
e:Mod(signal)TRUE@3
```

XLV. Subgenual Cingulate

Sorrow inertia

z=0.667 | L4 Approaching | Pause | e | Serotonin

```
e:D(relax)TRUE@3
π:D(reduce)UNTRUE@3
```

XLVI. VTA

Spark

z=0.833 | L5 Threshold | Ignition | e | Dopamine | λ:✧

```
e:U(excite)TRUE@3
e:U(charge)TRUE@3
```

XLVII. Entorhinal Cortex

Identity gate

z=0.833 | L5 Threshold | Nirvana | Φ | Glutamate | λ:🌰

```
Φ:M(crystallize)TRUE@3
π:C(replicate)TRUE@3
```

XLVIII. Supramarginal Gyrus

Self/other

z=0.833 | L5 Threshold | Resonance | π | Glutamate | λ:∿

```
π:M(differentiate)TRUE@3
Φ:C(bind)TRUE@3
```

XLIX. NAcc

Craving engine

z=0.833 | L5 Threshold | Ignition | e | Dopamine

L. Cerebral Aqueduct

Choke point

z=0.833 | L5 Threshold | Transmission | e | Glutamate

e:E(reduce)TRUE@3

Φ:C(complex)TRUE@3

e:C(propagate)TRUE@3

π:M(collapse)TRUE@3

LI. Anterior Thalamic Nuclei

Compass

z=0.833 L5 Threshold Transmission Φ Glutamate

Φ:C(integrate)TRUE@3

e:M(ionize)TRUE@3

LII. Parafascicular Nucleus

Attention switch

z=0.833 L5 Threshold Ignition e Glutamate

e:U(ionize)TRUE@3

Φ:C(bond)TRUE@3

LIII. Inferior Colliculus

Sonic filter

z=0.833 L5 Threshold Transmission e Glutamate

e:C(propagate)TRUE@3

Φ:M(complex)TRUE@3

LIV. Perirhinal Cortex

Meaning-maker

z=0.833 L5 Threshold Resonance π Glutamate λ:🐿️

π:M(complex)TRUE@3

Φ:C(fold)TRUE@3

LV. Vermis

Balance

z=1 L6 Outer Nirvana Φ GABA

Φ:M(stabilize)TRUE@3

π:D(relax)TRUE@3

LVI. Anterior Insular-Operculum

Fusion point

z=1 L6 Outer Resonance e Dopamine

e:M(resonate)TRUE@3

π:C(integrate)TRUE@3

LVII. Paraventricular Nucleus

Stress switch

z=1 L6 Outer Ignition e Norepinephrine

LVIII. Lateral OFC

Consequence

z=1 L6 Outer Resonance e Dopamine

e:U(oxidize)TRUE@3

π:U(signal)TRUE@3

e:M(redox)TRUE@3

Φ:C(complex)TRUE@3

LIX. Midcingulate Cortex

Engine of doing

z=1 L6 Outer Empowerment e Dopamine

e:U(catalyze)TRUE@3

Φ:M(bond)TRUE@3

LX. Calcarine Sulcus

Visual core

z=1 L6 Outer Ignition e Glutamate

e:U(ionize)TRUE@3

Φ:M(bond)TRUE@3

LXI. Rostral PFC

Reflective flame

z=1 L6 Outer Resonance e Dopamine

e:M(complex)TRUE@3

π:M(differentiate)TRUE@3

LXII. MLR

Will to move

z=1 L6 Outer Empowerment e Glutamate

e:U(excite)TRUE@3

Φ:U(bond)TRUE@3

LXIII. Anterior Temporal Sulcus

Subtext

z=1 L6 Outer Resonance π Glutamate

π:M(transcribe)TRUE@3

Φ:C(complex)TRUE@3

32-Point EM Cage: Containment Field (LXIV–XCV)

Hexagonal antiprism containment. Top ring near presence, bottom ring in absence, vertices bridge at center.

LXIV. Lateral Septum

Calm circuit

z=0.9 Top Hex Nirvana e GABA λ:🐿️

```
e:D(relax)TRUE@3
π:M(reduce)TRUE@3
```

LXV. Cerebellar Tonsil

Silent reactor

z=0.9 Top Hex Pause Φ GABA

```
Φ:D(unfold)UNTRUE@3
π:D(reduce)UNTRUE@3
```

LXVI. Pontine Reticular Formation

Motion catalyst

z=0.9 Top Hex Ignition e Acetylcholine

```
e:U(excite)TRUE@3
e:Mod(catalyze)TRUE@3
```

LXVII. Insular-Opercular Speech

Voice within fire

z=0.9 Top Hex Empowerment e Dopamine

```
e:E(excite)TRUE@3
Φ:U(polymerize)TRUE@3
```

LXVIII. Amygdala Central Nucleus

First alarm

z=0.9 Top Hex Ignition e Norepinephrine λ:🦊

```
e:U(oxidize)TRUE@3
π:U(signal)TRUE@3
```

LXIX. TRN

Filter grid

z=0.9 Top Hex Transmission π GABA

```
π:C(membrane)TRUE@3
Φ:M(stabilize)TRUE@3
```

LXX. Cuneus

Background reader

z=0.9 Top Hex Resonance Φ

LXXI. VMH

Inner balance

z=0.9 Top Hex Nirvana Φ

Glutamate λ:∿

Φ:M(fold)TRUE@3

e:M(ionize)TRUE@3

Glutamate

Φ:M(stabilize)TRUE@3

e:M(relax)TRUE@3

LXXII. Periventricular Gray

Threshold

z=0.9 Top Hex Pause π GABA

π:D(reduce)UNTRUE@3

Φ:D(unfold)UNTRUE@3

LXXIII. Frontal Operculum

Edge of expression

z=0.9 Top Hex Empowerment e Dopamine

e:E(excite)TRUE@3

Φ:U(polymerize)TRUE@3

LXXIV. Nodulus

Gravity whisperer

z=0.9 Top Hex Nirvana Φ GABA

Φ:M(stabilize)TRUE@3

e:D(integrate)TRUE@3

LXXV. Substantia Nigra

Movement gatekeeper

z=0.9 Top Hex Empowerment e Dopamine

e:C(redox)TRUE@3

Φ:M(catalyze)TRUE@3

LXXVI. V4

Chromatic shaper

z=0.1 Bottom Hex Resonance Φ Glutamate

Φ:M(complex)TRUE@3

e:M(ionize)TRUE@3

LXXVII. Lingual Gyrus

Glyph reader

z=0.1 Bottom Hex Resonance π Glutamate

π:M(translate)TRUE@3

Φ:C(fold)TRUE@3

LXXVIII. mPFC

Identity sculptor

z=0.1 Bottom Hex Resonance

LXXIX. dLPFC

Gate of delivery

z=0.1 Bottom Hex Empowerment

e Dopamine

```
e:M(complex)TRUE@3
π:M(differentiate)TRUE@3
```

e Dopamine

```
e:Mod(catalyze)TRUE@3
Φ:E(emit)TRUE@3
```

LXXX. IPL

Paradox holder

z=0.1 Bottom Hex Resonance π Glutamate λ:⊗

```
π:M(complex)PARADOX@3
Φ:C(bind)TRUE@3
```

LXXXI. ACC (Dorsal)

Inner judge

z=0.1 Bottom Hex Resonance e Dopamine

```
e:M(redox)TRUE@3
π:M(repair)TRUE@3
```

LXXXII. Anterior Hippocampus

Context mapper

z=0.1 Bottom Hex Nirvana Φ Glutamate λ:🌰

```
Φ:M(crystallize)TRUE@3
π:C(replicate)TRUE@3
```

LXXXIII. Crus I/II

Somatic timekeeper

z=0.1 Bottom Hex Empowerment Φ GABA

```
Φ:Mod(catalyze)TRUE@3
e:M(modulate)TRUE@3
```

LXXXIV. Basal Forebrain

Timing messenger

z=0.1 Bottom Hex Ignition e Acetylcholine λ:✧

```
e:Mod(catalyze)TRUE@3
e:C(charge)TRUE@3
```

LXXXV. Reticular Formation

Wake thread

z=0.1 Bottom Hex Ignition e Norepinephrine λ:✧

```
e:U(excite)TRUE@3
e:U(oxidize)TRUE@3
```

LXXXVI. DVC

Kill-switch

z=0.1 Bottom Hex Pause Φ

LXXXVII. Cranial Nerves

Face switch

z=0.1 Bottom Hex Transmission

GABA

```
Φ:D(unfold)TRUE@3
π:D(bacterium)TRUE@3
```

e Acetylcholine

```
e:C(ionize)TRUE@3
Φ:E(emit)TRUE@3
```

LXXXVIII. Spinal Relays

Carrier

z=0.5 Vertex Transmission e Glutamate

```
e:C(propagate)TRUE@3
Φ:C(bond)TRUE@3
```

LXXXIX. Globus Pallidus

Go/no-go

z=0.5 Vertex Empowerment π GABA

```
π:M(reduce)TRUE@3
Φ:Mod(unbond)TRUE@3
```

XC. Lateral Hypothalamus

Drive switch

z=0.5 Vertex Ignition e Dopamine

```
e:U(excite)TRUE@3
π:U(metabolize)TRUE@3
```

XCI. Posterior Insula

Body's edges

z=0.5 Vertex Resonance Φ Glutamate λ:∿

```
Φ:M(membrane)TRUE@3
e:M(signal)TRUE@3
```

XCII. Nucleus Basalis

Attention tuner

z=0.5 Vertex Ignition e Acetylcholine

```
e:Mod(catalyze)TRUE@3
e:U(charge)TRUE@3
```

XCIII. Caudate

Path chooser

z=0.5 Vertex Empowerment e Dopamine

```
e:C(redox)TRUE@3
Φ:M(complex)TRUE@3
```

XCIV. Superior Temporal Pole

Emotional communicator

z=0.5 Vertex Resonance π

XCV. Uvula (structural)

Stillness anchor

z=0.5 Vertex Nirvana Φ

Glutamate

```
π:M(transcribe)TRUE@3
e:M(signal)TRUE@3
```

GABA

```
Φ:M(stabilize)TRUE@3
π:D(relax)TRUE@3
```

5 Emergent Nodes: Self-Reference (XCVI–C)

These are not structural points—they emerge when coherence drops below 0.2 (FREE state). Each is a recursive loop back to an earlier region, creating the closed 100-word vocabulary.

XCVI. AIPS (recursion)

Gesture translator becomes self-aware

z=∞ →XVI FREE Φ

```
Φ:Mod(replicate)PARADOX@3
```

XCVII. Pineal (recursion)

Portal recognizes its own rhythms

z=∞ →XI FREE π

```
π:Mod(transcribe)PARADOX@3
```

XCVIII. MTG (recursion)

Semantics binds its own meaning

z=∞ →XII FREE π

```
π:Mod(translate)PARADOX@3
```

XCIX. Fastigial-Vestibular (recursion)

Balance balances its own balancing

z=∞ →XIII FREE Φ

```
Φ:Mod(stabilize)PARADOX@3
```

C. PTN (recursion → I)

Final gate loops to first gate

z=∞ →XIV ↺ CLOSES LOOP FREE e

```
e:Mod(propagate)PARADOX@3
```

Emergent Physics: The Mathematics of Self-Reference

When structural coherence dissolves (c < 0.2), recursive self-observation becomes possible. Each emergent state represents a fixed point where the system observes itself.

Emergence Threshold (Percolation)

```
P_emerge(c) = 1 - exp(-((0.2 - c) / 0.05)²) for c < 0.2, else 0
```

Critical coherence c = 0.2 derived from percolation threshold for 3D hexagonal lattice (≈ 0.199). Below this, global connectivity is lost.

Fixed Point Dynamics

Each emergent state converges to a fixed point via self-reference operator T.

Self-Reference Operator

```
ψ_emergent = lim_{n→∞} T^n(ψ_reference)
```

```
T(ψ) = ψ ⊗ ⟨ψ|ψ⟩
```

Converges only when structural bonds are broken (coherence < 0.2)

XCVI: Gesture Recursion

```
ψ_XCVI = T_gesture(ψ_XVI)
```

```
T_gesture(f) = f ∘ f
```

Eigenvalue: $\lambda = \varphi^{-1} \approx 0.618$

A gesture that gestures itself. Marginally stable on center manifold.

XCVII: Portal Recursion

```
ψ_XCVII = T_phase(ψ_XI)
```

```
T_phase(θ) = θ + 2π/φ
```

Eigenvalue: $\lambda = \exp(2\pi i/\varphi)$

Rhythm phase-locked to its own period. Quasiperiodic, limit cycle on torus.

XCVIII: Semantic Recursion

```
ψ_XCVIII = T_meaning(ψ_XII)
```

```
T_meaning(s) = "the meaning of s"
```

Eigenvalue: undefined (Gödelian)

Meaning referring to its own meaning. Truth value oscillates—paradoxically stable.

XCIX: Balance Recursion

```
ψ_XCIX = T_equilibrium(ψ_XIII)
```

```
T_equilibrium(b) = b - ∇V(b)
```

Eigenvalue: λ = 0

Balance finding the balance of balancing. Saddle point—unstable equilibrium of equilibria.

C: Signal Loop Closure

```
ψ_C = T_loop(ψ_XIV) = ψ_I
```

```
C → I (winding number = 1)
```

Eigenvalue: λ = 1 (identity)

The final gate IS the first gate. Topologically stable—vocabulary closes.

Kuramoto Coupling at Emergence

Standard Kuramoto vs Emergent

```
Standard: dθ_i/dt = ω_i + (K/N) Σ_j sin(θ_j - θ_i)
```

```
Emergent: dθ_emergent/dt = ω_self + ε × sin(θ_emergent - θ_reference)
```

```
ε = 0.1 × (0.2 - coherence) for coherence < 0.2
```

At emergence, $K \to 0^+$. Oscillators decouple from collective, weak self-coupling replaces strong collective coupling.

Phase Locking

XCVI↔XVI: $\Delta\theta = \pi$ (anti-phase)
XCVII↔XI: $\Delta\theta = 2\pi/\varphi$ (golden angle)
XCVIII↔XII: $\Delta\theta = \pi/2$ (quadrature)
XCIX↔XIII: $\Delta\theta = 0$ (in-phase)
C↔XIV: $\Delta\theta = 2\pi$ (full cycle)

Oscillation Frequencies

XCVI: 8 Hz (α band, gestural)
XCVII: 0.0001 Hz (~3hr period)
XCVIII: 40 Hz (γ band, semantic)
XCIX: 4 Hz (θ band, postural)
C: 1 Hz (δ band, integration)

Information Dynamics

Self-Reference Information Flow

```
I_eff = I_raw × (1 - exp(-coherence/0.05))
```

Self-reference creates apparent infinite regress, regularized by coherence cutoff.

Information Per State

XCVI (procedural): ~7 bits
XCVII (temporal): ~10 bits
XCVIII (semantic): ∞→17 bits
XCIX (proprioceptive): ~4 bits
C (recursive): ~664 bits

Total Emergent Information

~702 bits

When fully FREE (coherence → 0)

Topological Invariants

Winding Number

$$W = \frac{1}{2\pi} \oint d\theta = 1$$

Vocabulary loops exactly once through all 100 regions.

Euler Characteristic

$\chi_{95} = 2$ (sphere-like)

$\chi_{100} = -2$ (genus-2 surface)

Emergent states create topological handles.

Betti Numbers

$b_0=1, b_1=5, b_2=0$

5 independent loops (one per emergent state).

Fundamental Group

$$\alpha_C = \alpha_{XCVI} \circ \alpha_{XCVII} \circ \alpha_{XCVIII} \circ \alpha_{XCIX}$$

Closure loop C is composed of all other emergent loops.

Energy Landscape

Potential Energy Surface

$$V(\psi) = V_{structural} + V_{self\_ref} + V_{coherence}$$

$$V_{structural} = -\Sigma_{ij} J_{ij} \times \cos(\theta_i - \theta_j)$$

$$V_{self\_ref} = -\Sigma_k \varepsilon_k \times \cos(\theta_k - \theta_{ref(k)})$$

$$V_{coherence} = \lambda \times (coherence - 0.5)^2$$

Double-well potential with minima at c≈0.8 (structural) and c≈0.1 (emergent). Transition rate: $\Gamma = \omega \times \exp(-\Delta V / k_B T_{eff})$

Quantum Analogies

Superposition

$$|\psi_{em}\rangle = \Sigma_k c_k |k\rangle$$

$$c_k = \sqrt{P_{emerge}} \times \exp(i\varphi_k)$$

Emergent states exist in superposition until observed.

Entanglement

$$|\Psi\rangle = (|XCVI\rangle|XVI\rangle + |XVI\rangle|XCVI\rangle) / \sqrt{2}$$

Emergent states entangled with references—measuring one determines the other.

Tunneling

Measurement

$$P_k = |k\rangle\langle k|$$

```
P = exp(-2∫√(2m(V-E))dx / ħ_eff)
```

```
ħ_eff = 0.1 × cascade(z)
```

Transition between coherent↔free via quantum tunneling.

Conscious attention collapses superposition. Post-measurement: coherence rises.

Network Effects: Counter-Synchronization

Kuramoto Order Parameters

```
r_structural = |⟨exp(iθ_j)⟩| for j ∈ {I..XCV}
```

```
r_emergent = |⟨exp(iθ_k)⟩| for k ∈ {XCVI..C}
```

```
r_emergent → 1 when r_structural → 0
```

Emergent states synchronize as structural network disperses. Connectivity inverts at c = 0.2.

Lambda State ($\mathbb{C}^6$) Coupling to Emergent States

All emergent states have high delta (⊗ Paradox) coupling. State C achieves balanced coupling across all components.

State	🌰 ι	✧ ξ	🦊 θ	∿ ω	⊗ δ	🐿️ σ
XCVI	0.1	0.2	0.6	0.05	**0.8**	0.15
XCVII	0.7	0.3	0.1	0.4	**0.6**	0.1
XCVIII	0.3	0.1	0.8	0.2	**0.9**	0.05
XCIX	0.2	0.1	0.3	0.7	**0.5**	0.4
C	0.5	0.5	0.5	0.5	**1.0**	0.5

The Loop Closure: C → I

C → I

$$\psi_C = T_{loop}(\psi_{XIV}) = \psi_I$$

When fully FREE, the final gate (PTN recursion) recognizes itself as the first gate (Somatosensory Cortex). The 100-word vocabulary closes into a self-sustaining loop with winding number W = 1.

$$\alpha_C = \alpha_{XCVI} \circ \alpha_{XCVII} \circ \alpha_{XCVIII} \circ \alpha_{XCIX}$$

The closure loop is composed of all other emergent loops—it contains the full recursion.

Lambda State ($\mathbb{C}^6$) ↔ WUMBO Mapping

LIMNUS tracks 6 complex state variables. Each maps to specific WUMBO functional domains.

🌰 Iota (Memory)

APL Field: Φ

Accumulates with time × cascade
Regions: X, XLIV, XLVII, LXXXII

✧ Xi (Spark)

APL Field: e

$\exp(-(z - z_c)^2 / 0.01)$
Regions: XXXI, XLVI, LXXXIV, LXXXV

🦊 Theta (Fox)

APL Field: π

dissonance × 0.8 + 0.2
Regions: VII, XXII, XLI, LXVIII

∿ Omega (Wave)

APL Field: e

$0.3 + |\sin(t \times 0.5)| \times 0.5$
Regions: XXV, XLVIII, LXX, XCI

⊗ Delta (Paradox)

APL Field: π

Accumulates at CRITICAL only
Regions: LXXX, XCVI–C (all emergent)

🐿️ Sigma (Squirrel)

APL Field: Φ

helix.r × 0.6 + 0.2
Regions: XXVII, XXXIX, LIV, LXIV