

The Consciousness Index as a Physical Scalar

$$CI_0 = CI_{\text{floor}} + C \times \Omega(V) \times (1 + 0.38A) \times N^{1.3} \times K^{1.2}$$

Consciousness is widely discussed but rarely measured, often treated as a binary property switched on above a certain threshold of biological complexity. This framework resolves that uncertainty at the foundational level. Consciousness is a fundamental property of all matter, expressed differently at different scales of structural complexity. The Intrinsic Consciousness Index (CI_0) provides a physically grounded, scalar measure of this property, completely separating a system's internal structural capability from its real-world environmental viability.

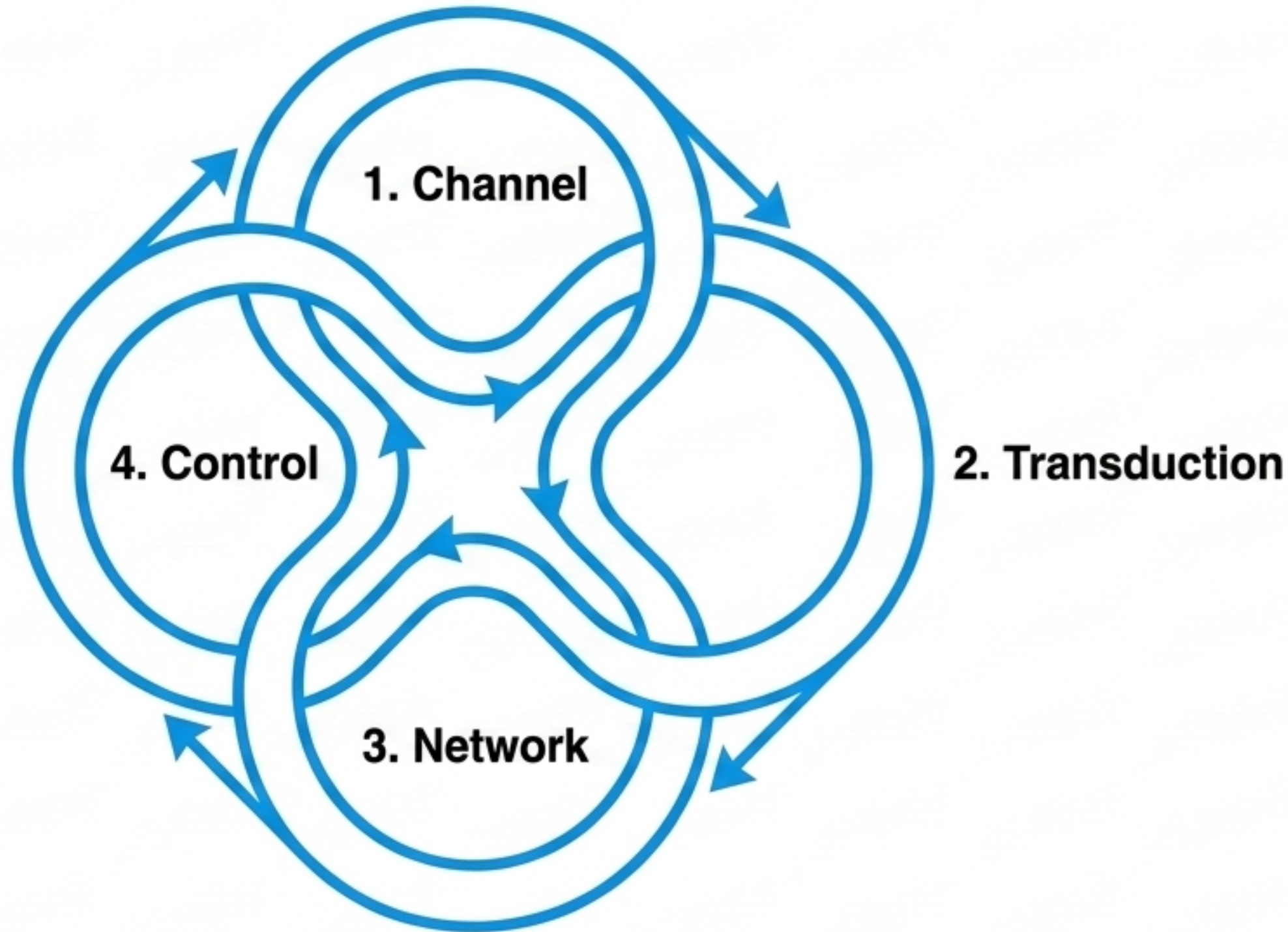
The Physical Bridge to Biological Sensing

The chain from physical substrate to consciousness is continuous. The four fundamental physical forces function **not merely as mechanical interactions, but as a hierarchy of sensing channels through which a physical system detects and responds to its environment.**



Consciousness is a measurable physical phenomenon grounded in the accessible structure of these channels, not an independent property added on top of physics.

The Hierarchical Channel Accessibility (HCA) Framework



A sensing capability exists in a physical system if and only if four structural components are simultaneously present.

First, structural coupling to the interaction channel.

Second, a transduction mechanism converting this interaction into an information-specific internal state change.

Third, a network structure propagating this state change to other internal components.

Fourth, control mechanisms (feedback and memory) that regulate the signal.

Accessing higher-order channels inherently requires the structural presence of all lower-order prerequisites, separating forced physical emission from controlled biological sensing.

The Intrinsic Consciousness Formula Deconstructed

$$CI_0 = \underbrace{CI_{\text{floor}}}_{\text{black}} + \underbrace{C}_{\text{blue}} \times \underbrace{\Omega(V)}_{\text{yellow}} \times \underbrace{(1 + 0.38A)}_{\text{red}} \times \underbrace{N^{1.3}}_{\text{green}} \times \underbrace{K^{1.2}}_{\text{purple}}$$

CI_{floor} : The Substrate Floor

The strictly positive minimum non-zero degree of consciousness for any physical system.

C: The Scale Constant

Calibrated to 182.52 so the modern average human nervous system yields a CI_0 of 100.

$\Omega(V)$: The Size Factor

Captures the non-monotonic relationship between physical volume and integration efficiency.

A: Channel Capacity

The average of five interaction channels mapping directly to physical forces.

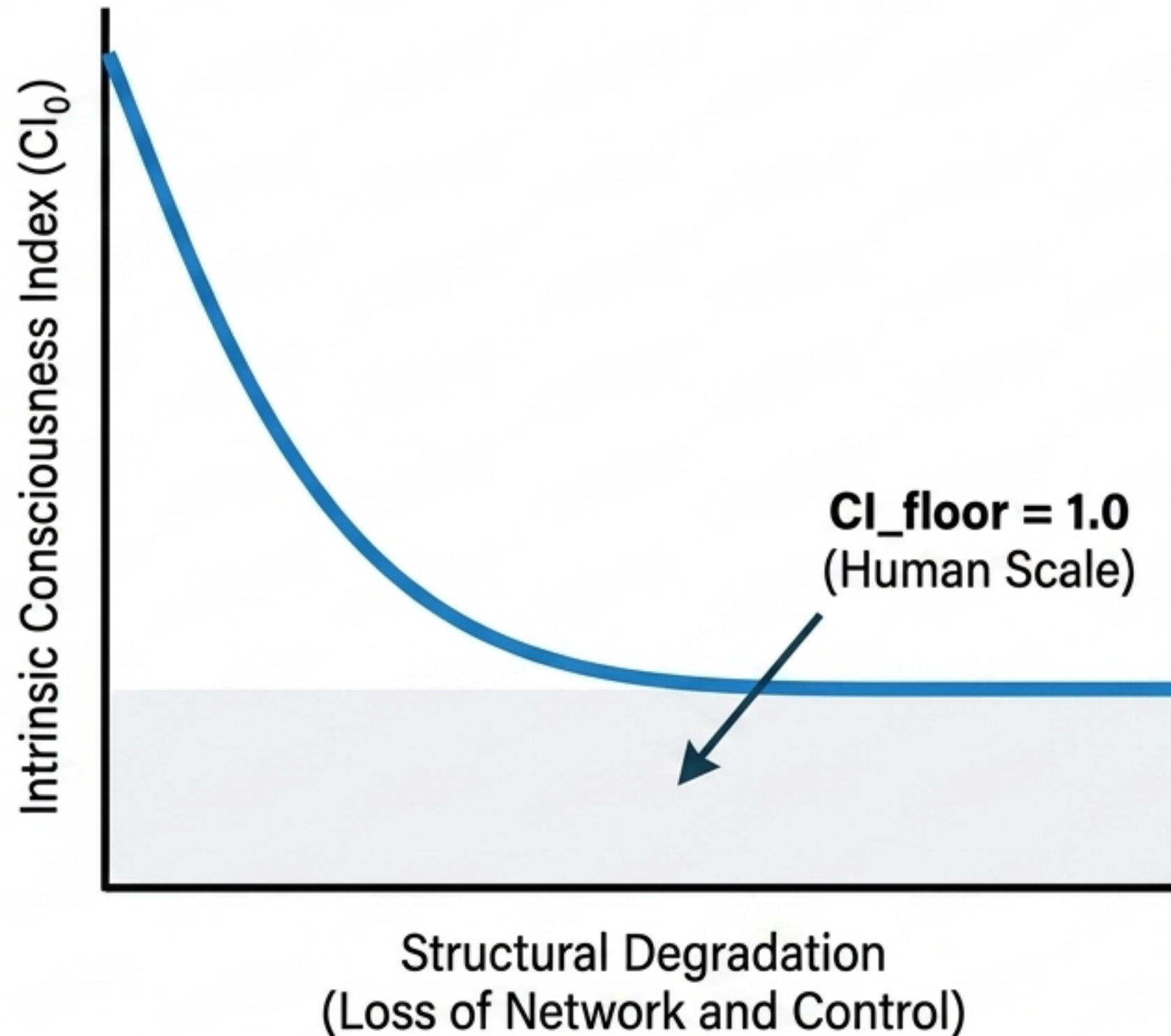
$N^{1.3}$: Integration Density

A non-linearly amplifying composite of connectivity, dynamic coordination, and hierarchical depth.

$K^{1.2}$: Control Depth

A weighted composite of autonomy, memory, and adaptive flexibility.

The Substrate Floor (CI_floor)



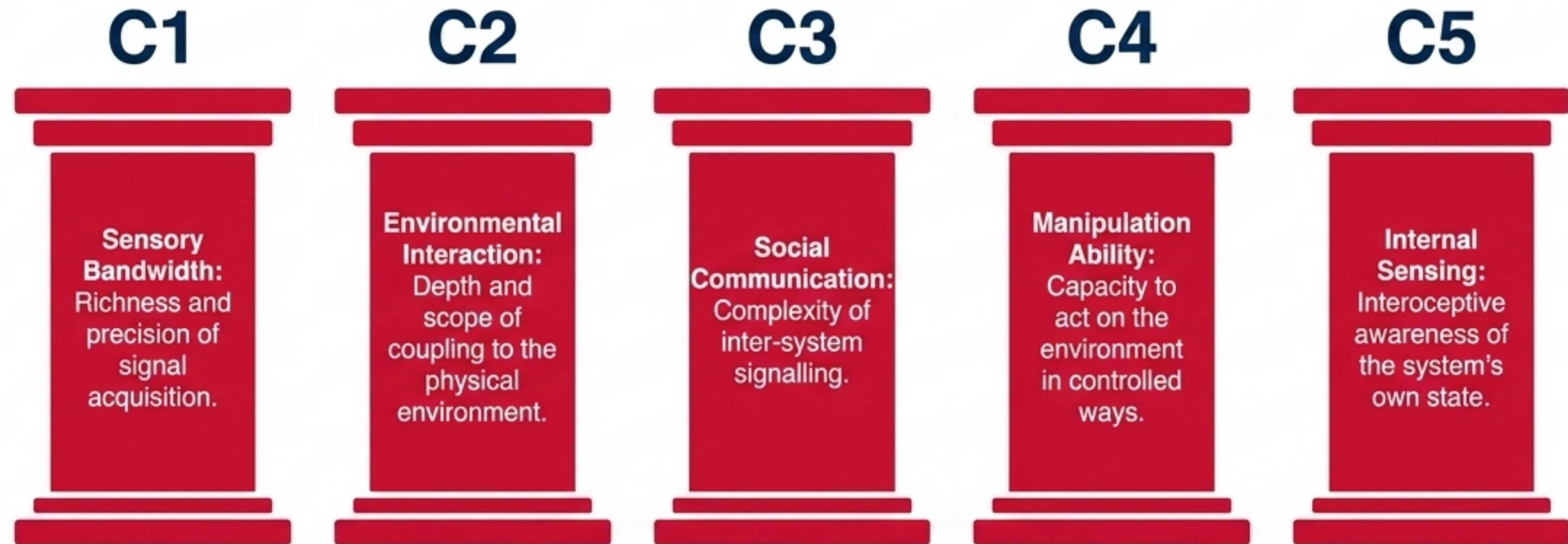
Structural degradation reduces the degree of consciousness but never reaches zero. Any system with mass retains the minimum non-zero degree of consciousness corresponding to gravitational channel coupling.

Because the substrate field itself defines the lower bound of physical interaction, there is **no structural** threshold below which a physical system ceases to sense entirely.

Hard emergence theories require a principled physical location for a threshold where consciousness suddenly 'turns on'. In a unified physical substrate, **no** such threshold exists.

Channel Capacity (A)

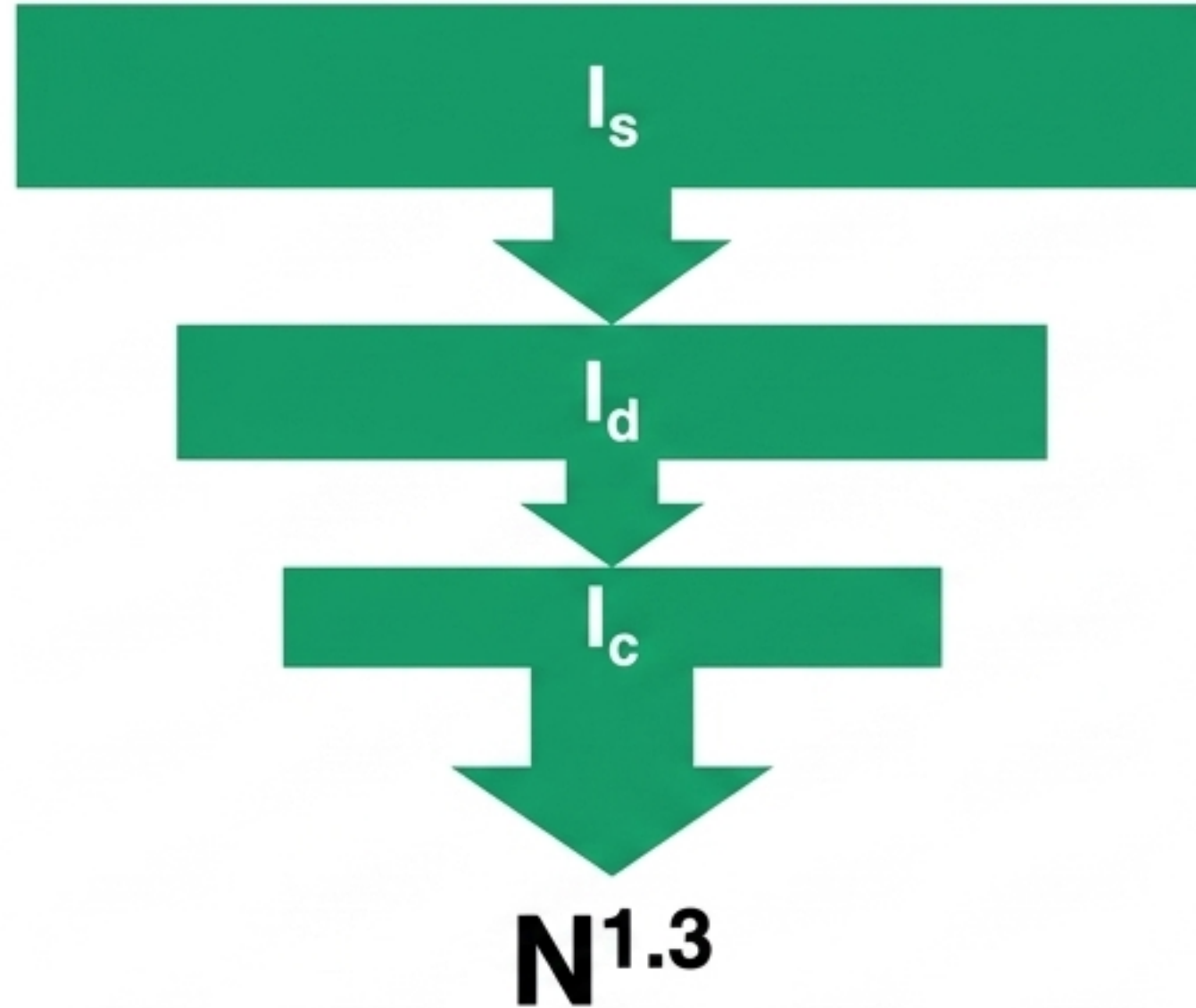
$$A = (C1 + C2 + C3 + C4 + C5) / 5$$



Channel **capacity** (A) depends on the **structural** and **functional properties** of a system's interface with its environment, directly acting as biological proxies for fundamental physical forces. The $(1 + 0.38A)$ formula structure ensures that even if specific channel capacity is functionally zero, the total product does not collapse, preserving the substrate floor.

Network Integration Density (N)

$$N = 0.5 I_s + 0.3 I_d + 0.2 I_c$$



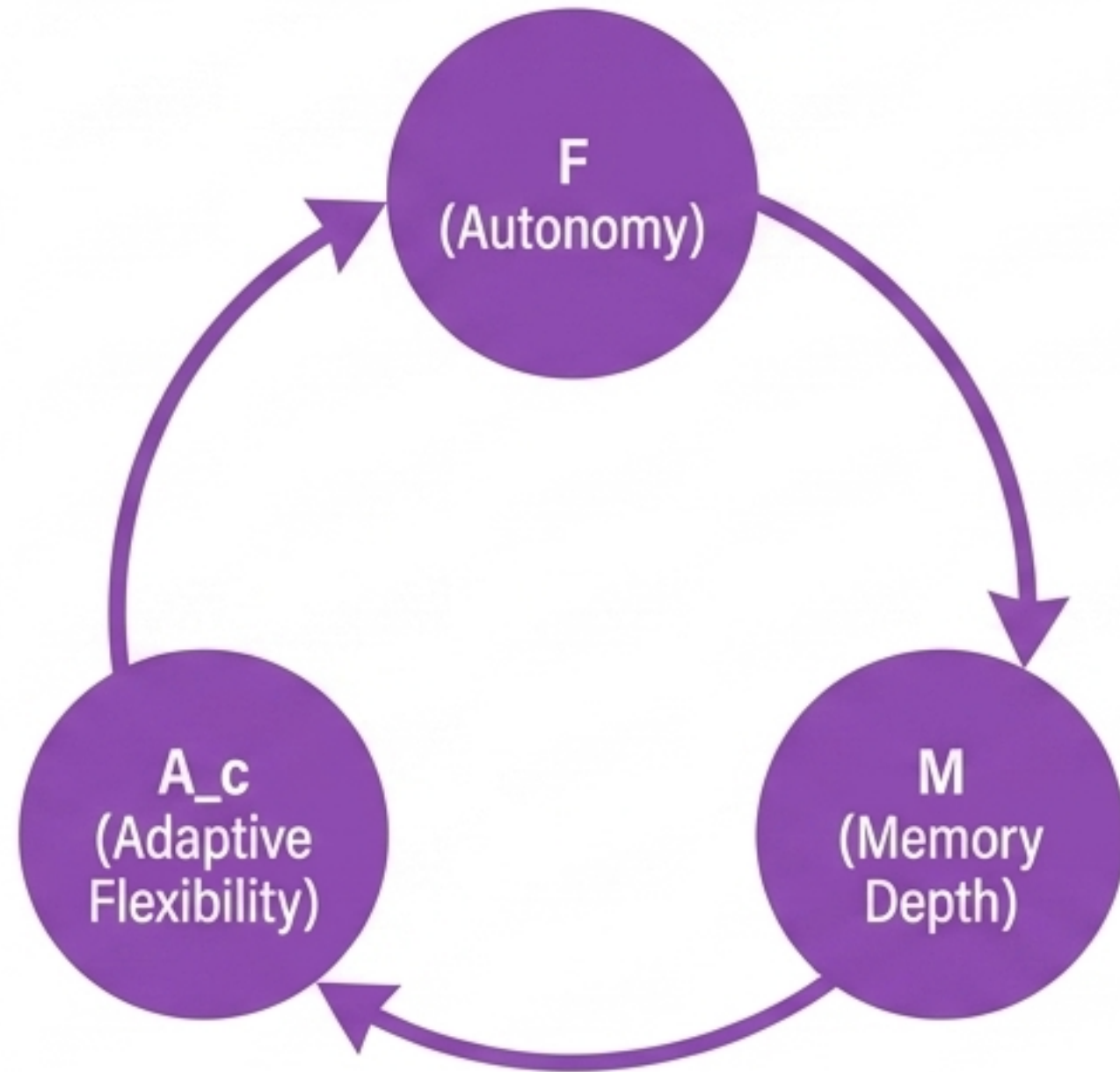
I_s (Structural Connectivity - 50%): The physical architecture and ratio of realised connections.

I_d (Dynamic Coordination - 30%): Real-time coordination and measured coherence of signal propagation.

I_c (Hierarchical Processing - 20%): The depth of processing from sensory input to integrated response.

Integration Density is a weighted composite of three dimensions. The weights reflect a physical ordering: structural architecture is the necessary substrate, dynamic coordination builds upon it, and hierarchical depth refines it. The exponent 1.3 makes integration non-linearly amplifying. Small structural improvements in integration coherence at the high end produce qualitatively different integrated states.

Control Depth (K)



$$K = 0.4 F + 0.3 M + 0.3 A_c$$

F (Autonomy - 40%):

The degree to which signal emission is governed by internal state rather than externally triggered.

M (Memory Depth - 30%):

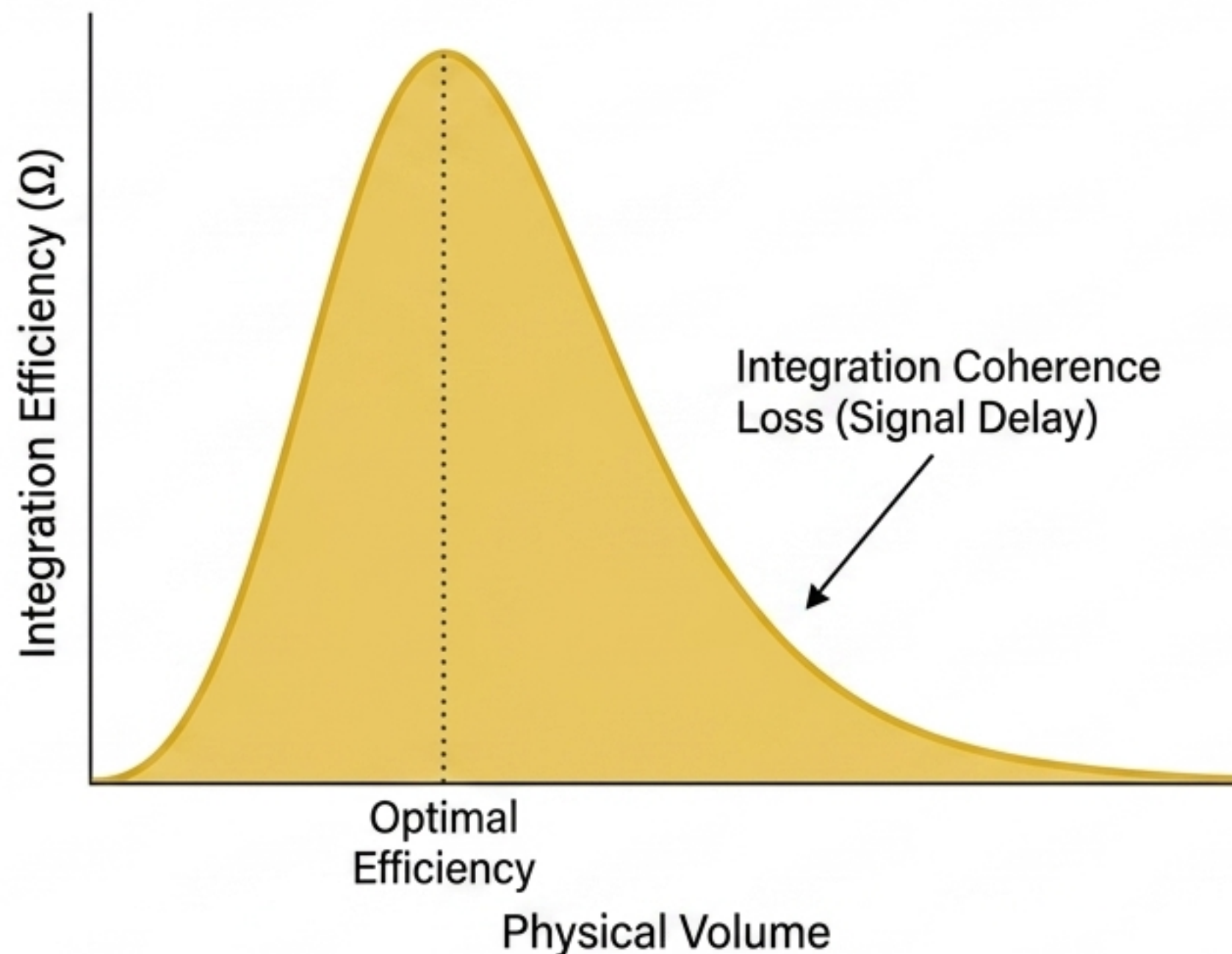
The degree to which historical states are accessible and actively integrated into current processing.

A_c (Adaptive Flexibility - 30%):

The ability to modify response patterns based on context rather than reacting to current input alone.

Control Depth governs a system's output and separates conscious sensing from mere physical interaction. Autonomy is the most fundamental dimension, distinguishing controlled state-modulated response from forced external emission. The exponent 1.2 reflects that deep control architectures produce qualitatively different response regimes.

The Size Factor ($\Omega(V)$)



Brain volume is not a direct measure of consciousness. The size factor captures the non-monotonic relationship between physical volume and integration efficiency.

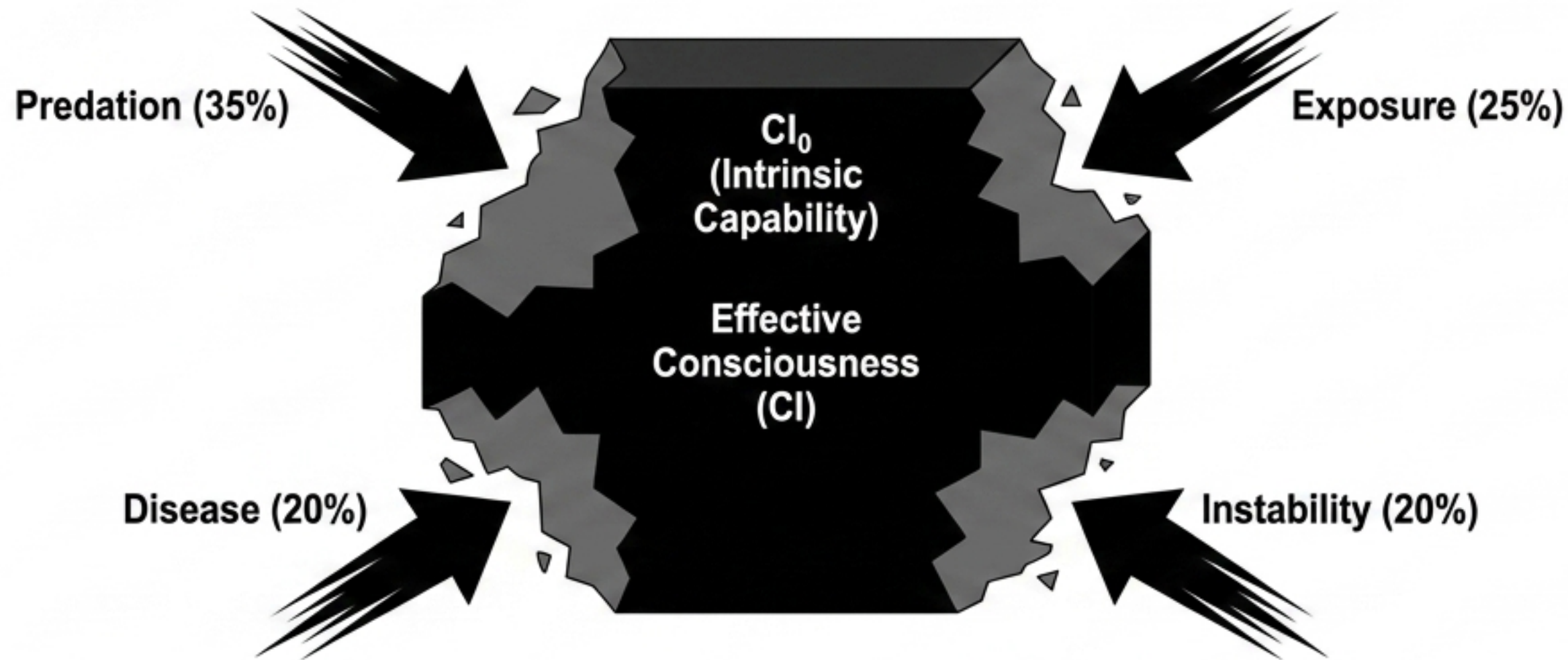
Systems that are too large suffer from integration coherence degradation; the signal propagation time increases relative to the strict coherence requirements of integrated processing. Conversely, systems smaller than the optimal volume can compensate through intense architectural density.

This physical constraint definitively limits the upper bounds of biological consciousness absent qualitative structural changes.

Effective Consciousness and the Survival Factor (S)

$$CI = CI_0 \times S$$

$$S = 0.35(1-P) + 0.25(1-E) + 0.20(1-D) + 0.20(I)$$



The central architectural decision of the CI framework is separating intrinsic capability from effective sustained consciousness. Intrinsic consciousness (CI_0) measures what a system is structurally capable of perceiving and integrating. Effective consciousness (CI) measures how well that consciousness persists in reality. The Survival Factor (S) acts as a multiplicative bridge ranging from 0 to 1.0.

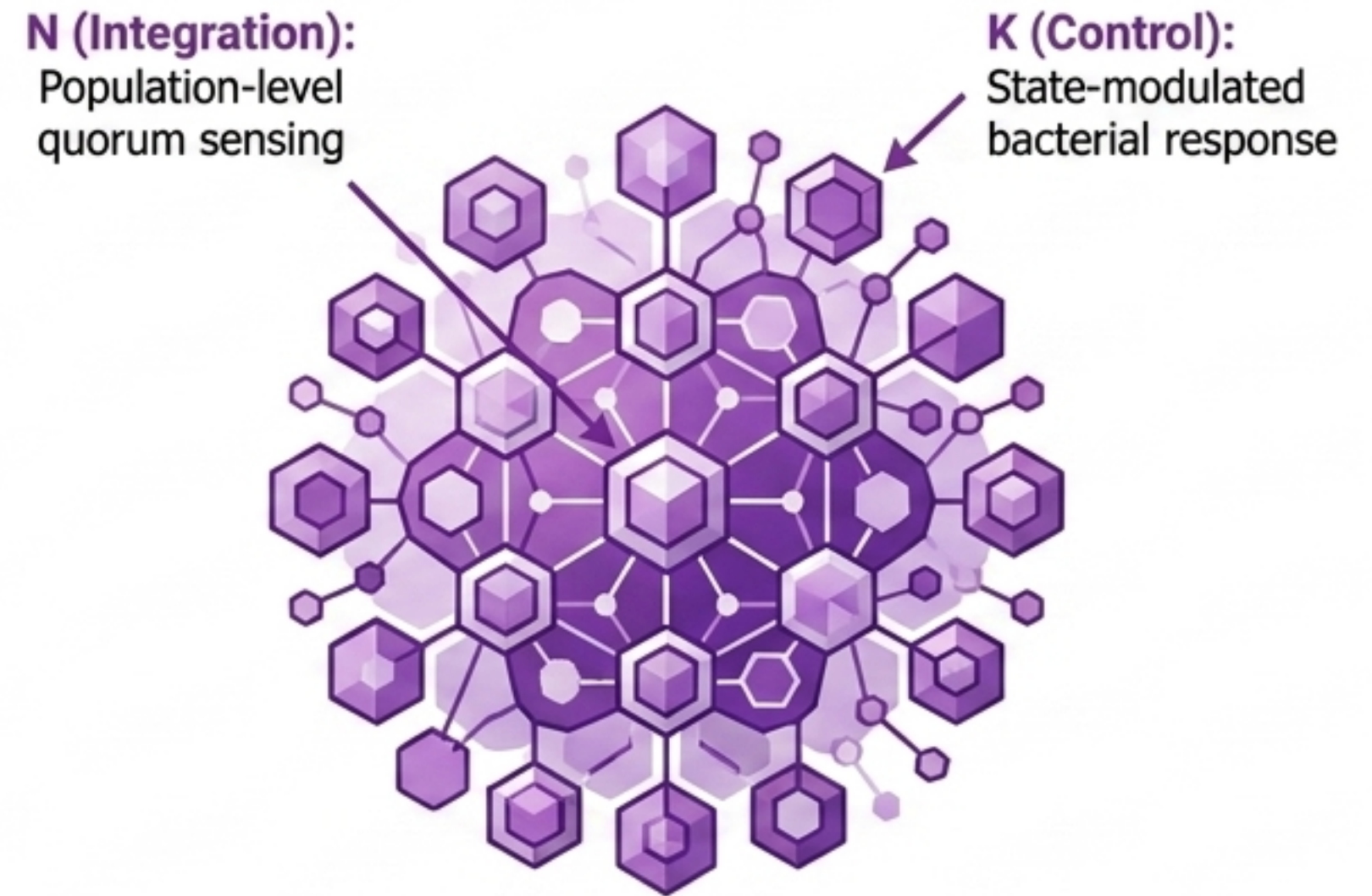
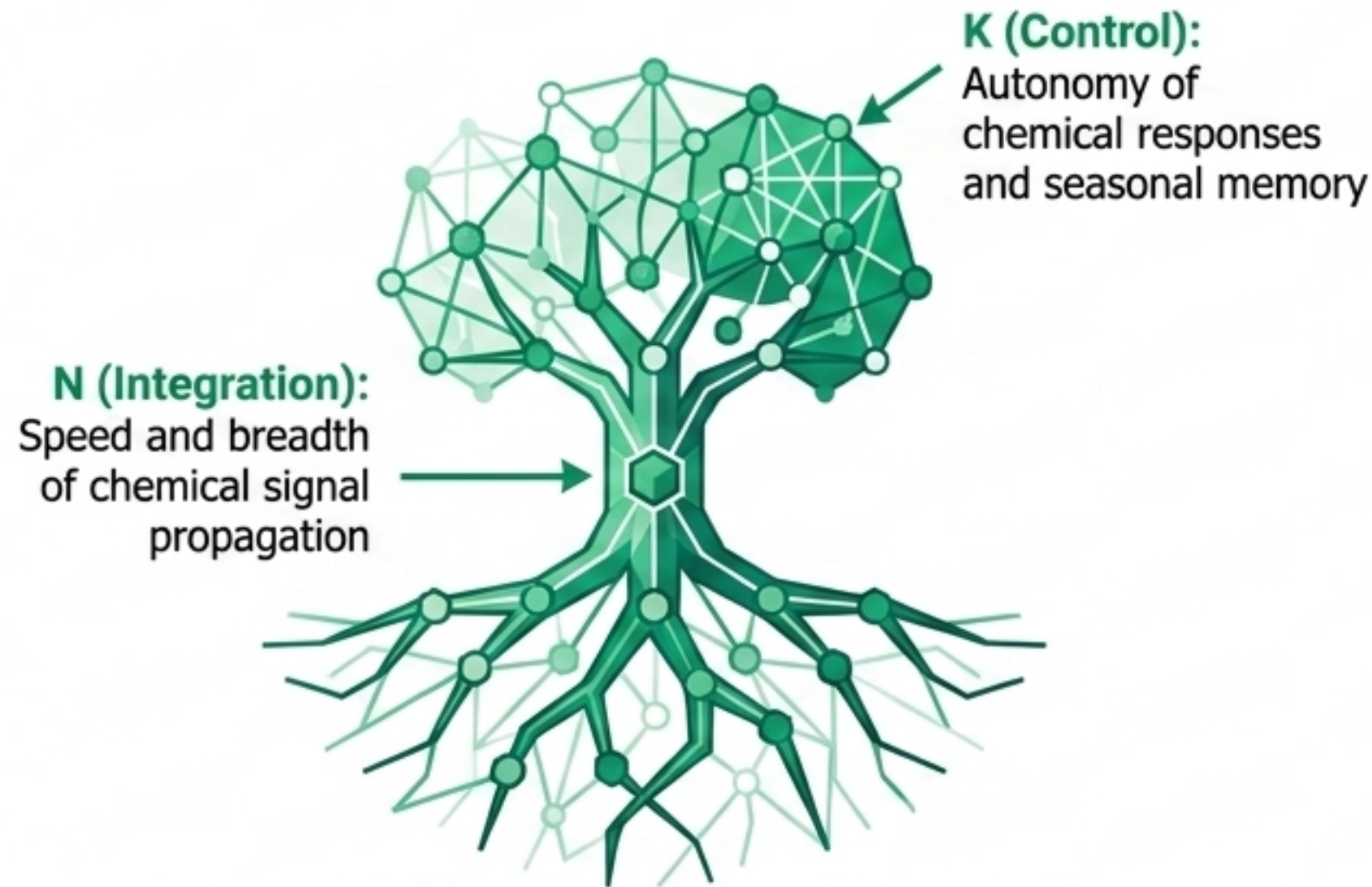
Orthogonality and Component Independence

Wild Octopus		Captive Octopus
• High Predation (Low S)	$\neq$	• Zero Predation (High S)
• High Intrinsic Capability (CI_0)	$=$	• High Intrinsic Capability (CI_0)

The four parameters A, N, K, and Ω are **independently modifiable structural realities**. Furthermore, the Survival factor (S) is strictly **orthogonal** to intrinsic capability (CI_0). A change in survival conditions does not alter intrinsic structural capability.

An octopus in captivity, facing zero predation and a stable food supply, operates with an effective Survival factor near 1.0. Its Effective CI will be much higher than a wild counterpart, but its Intrinsic capability (CI_0) remains identical because captivity does not instantly rewrite its neurological integration architecture.

Interpretation of Non-Neural Systems



The framework is not restricted to organisms with nervous systems; integration and memory are universal physical properties. The formula is applied at the system's own scale. This is not an approximation or a metaphor; it is the correct application of physical integration dynamics across vastly different biological scales, proving scale invariance.

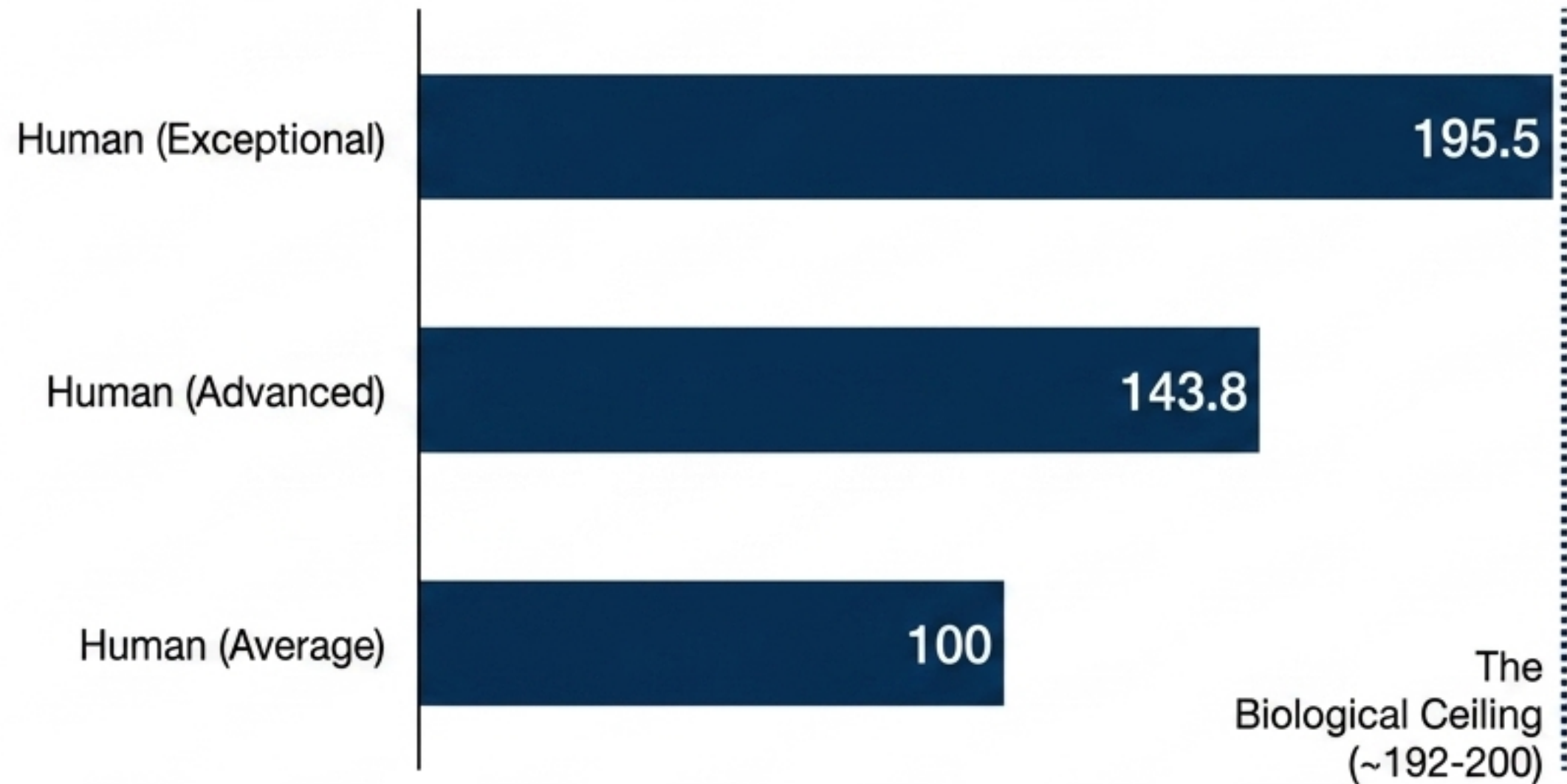
Cross-Species Diagnostic Matrix

When the formula is run on biologically motivated parameters without target-fitting, the results definitively reframe human exceptionalism. The average human CI_0 is calibrated to 100 as an anchoring convention, but it is demonstrably exceeded in intrinsic structural capability by several non-human species.

Species	A	N	K	$\Omega(V)$	CI_0	S	CI
Human (exceptional)	0.950	0.900	0.914	1.000	195.5	1.00	195.5
Dolphin	0.824	0.752	0.790	0.986	123.9	0.85	92.9
Human (average)	0.850	0.700	0.700	1.000	100.0	1.00	100.0
Octopus	0.774	0.703	0.684	1.000	95.9	0.62	59.3
Tree	0.420	0.546	0.514	0.775	37.2	0.90	31.1
Virus	0.132	0.348	0.338	1.000	14.2	0.20	2.8

The human average achieves apex effective consciousness ($CI = 100$) purely because it possesses a survival factor (S) of 1.00, a level of absolute real-world viability no other species achieves.

The Biological Ceiling and Human Variants

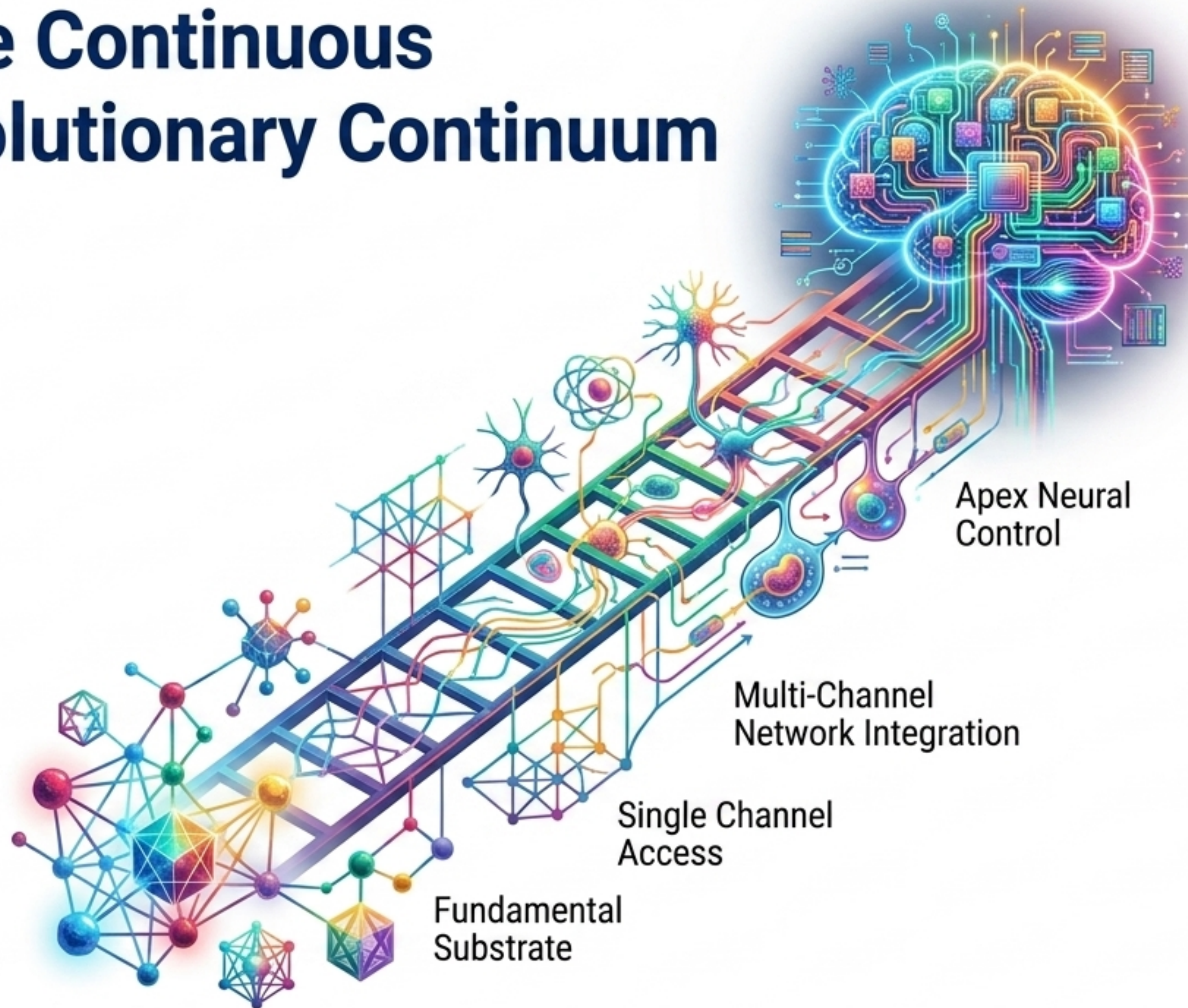


The formula is open-ended, but current terrestrial biology is not.

Within the constraints of biological volume, electrochemical propagation speed, and metabolic cost, the maximum achievable Cl_0 for a standard biological nervous system rests between 192 and 200.

Reaching this limit requires integration density approaching the threshold of qualitatively superior architecture ($N > 1.0$) and minimised forced emission. Exceeding this ceiling is physically impossible without a fundamental, qualitative shift in the integration medium or physical architecture.

The Continuous Evolutionary Continuum



The diversity of living systems is the diversity of structural configurations through which matter accesses and integrates the four fundamental channels of the substrate field.

Each increment in Cl_0 across the evolutionary record corresponds to a structural improvement in channel access, integration density, or control depth.

Evolution is simply the process by which matter moves up this physical scale under a perpetuation drive.

Life is not an exception to physics. It is physics, at sufficient structural complexity, becoming aware of itself through integrated, multi-channel sensing.