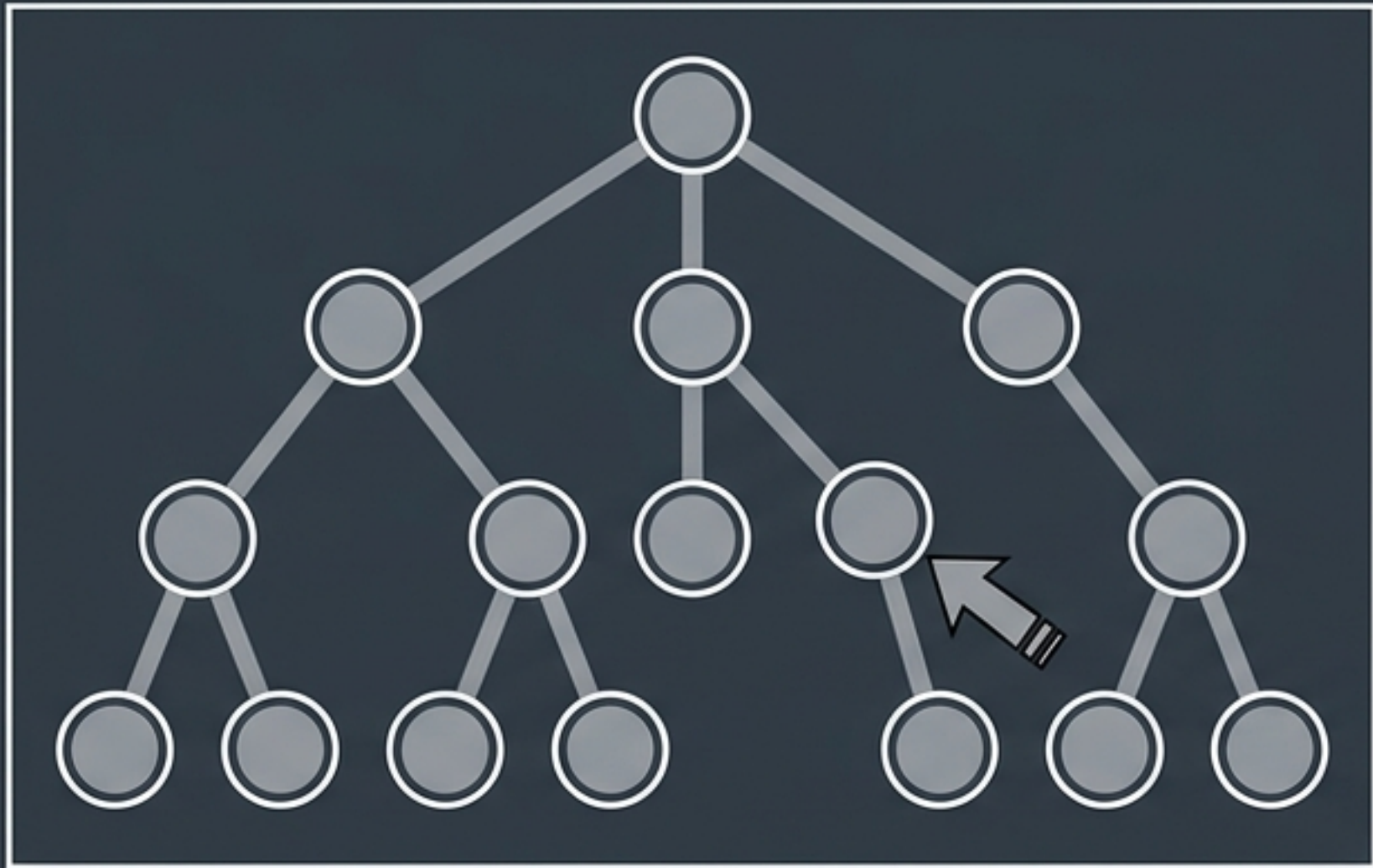


# The Organizational Manifold

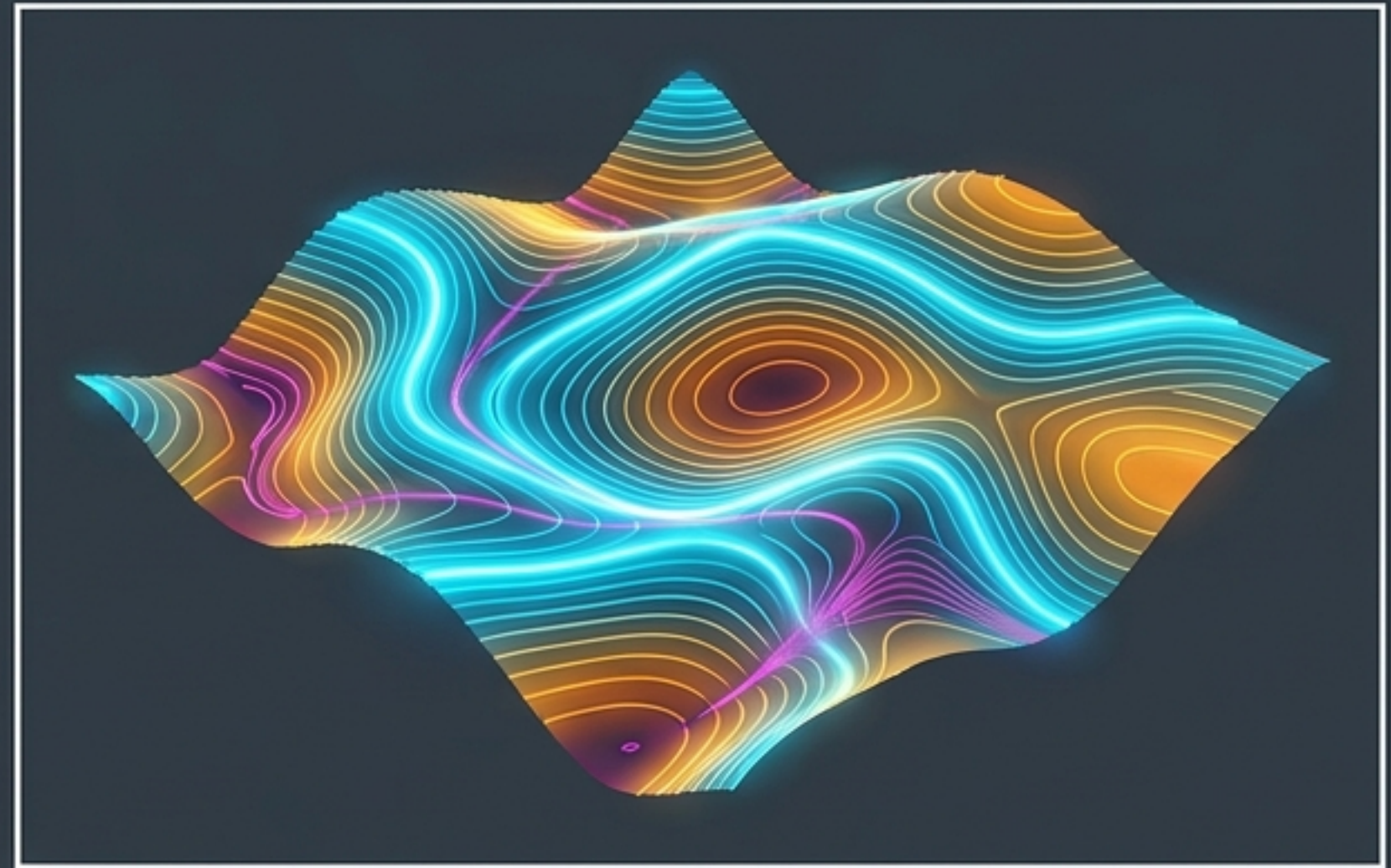
A Field-Theoretic Interpretation of Neural  
Heterogeneity, Collective Migration,  
and Admissibility Geometry.

# Entity-Centered Models Fail at Distributed Coordination



## Localist Limits

Standard models assign stable properties to discrete components. This relies on mean-field shifts, fixed structural roles, and isolated mechanisms. It fails to explain coherent macroscopic behavior emerging from distributed interactions.

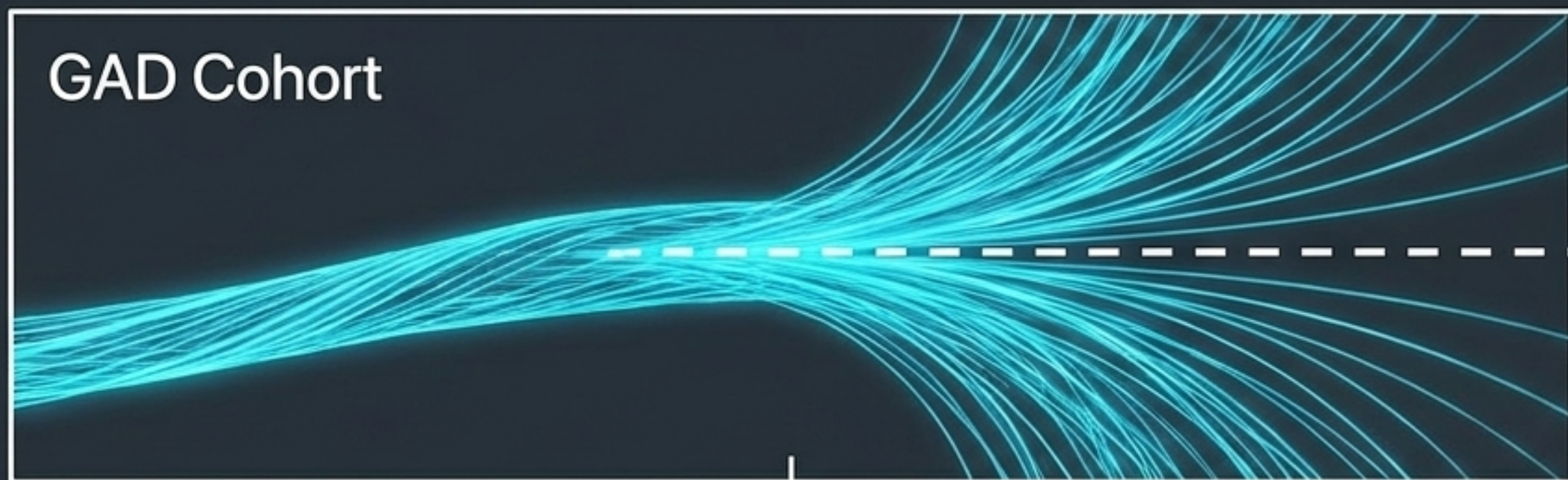
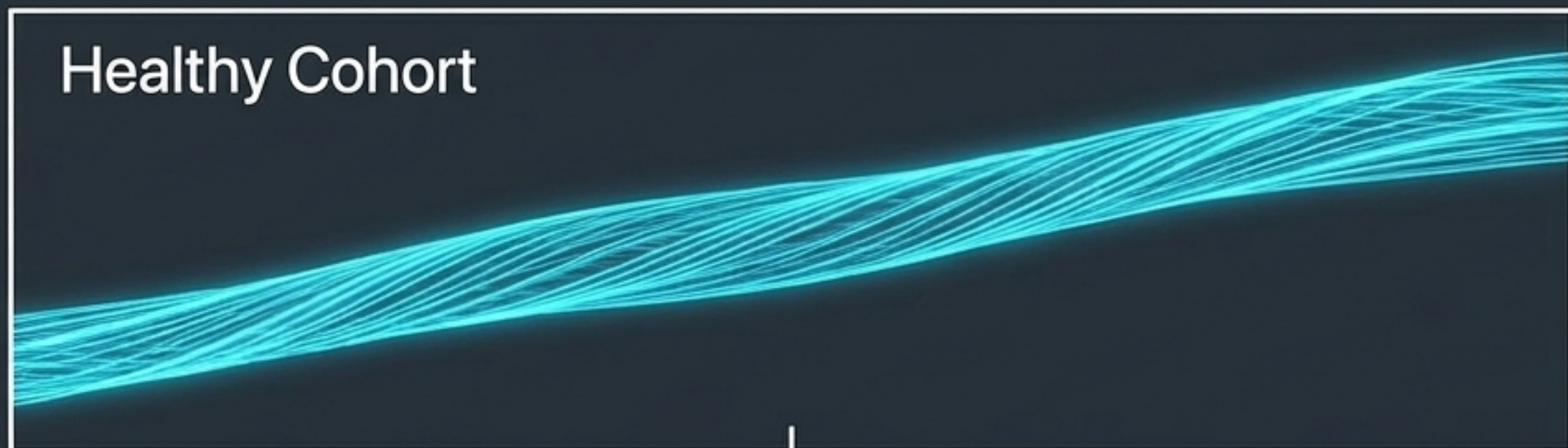


## Distributed Dynamics

The biological signal is carried by **variance geometry**, **dynamic phase transitions**, and **distributed Transport constraint propagation Accessibility** across coupled fields.

# Anomaly I: The Brain-Age Geometry of Anxiety

Structural Brain Configuration



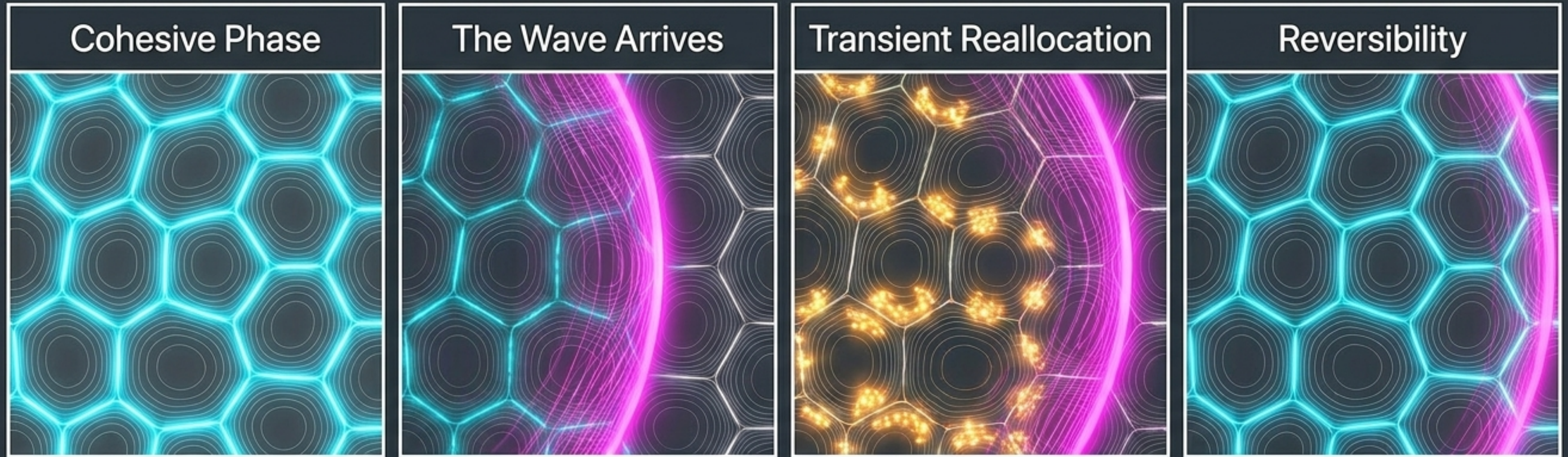
Age 25

Chronological Age

Generalized Anxiety Disorder (GAD) does not uniformly accelerate brain aging. Instead, it massively amplifies the variance of predicted age difference (PAD).

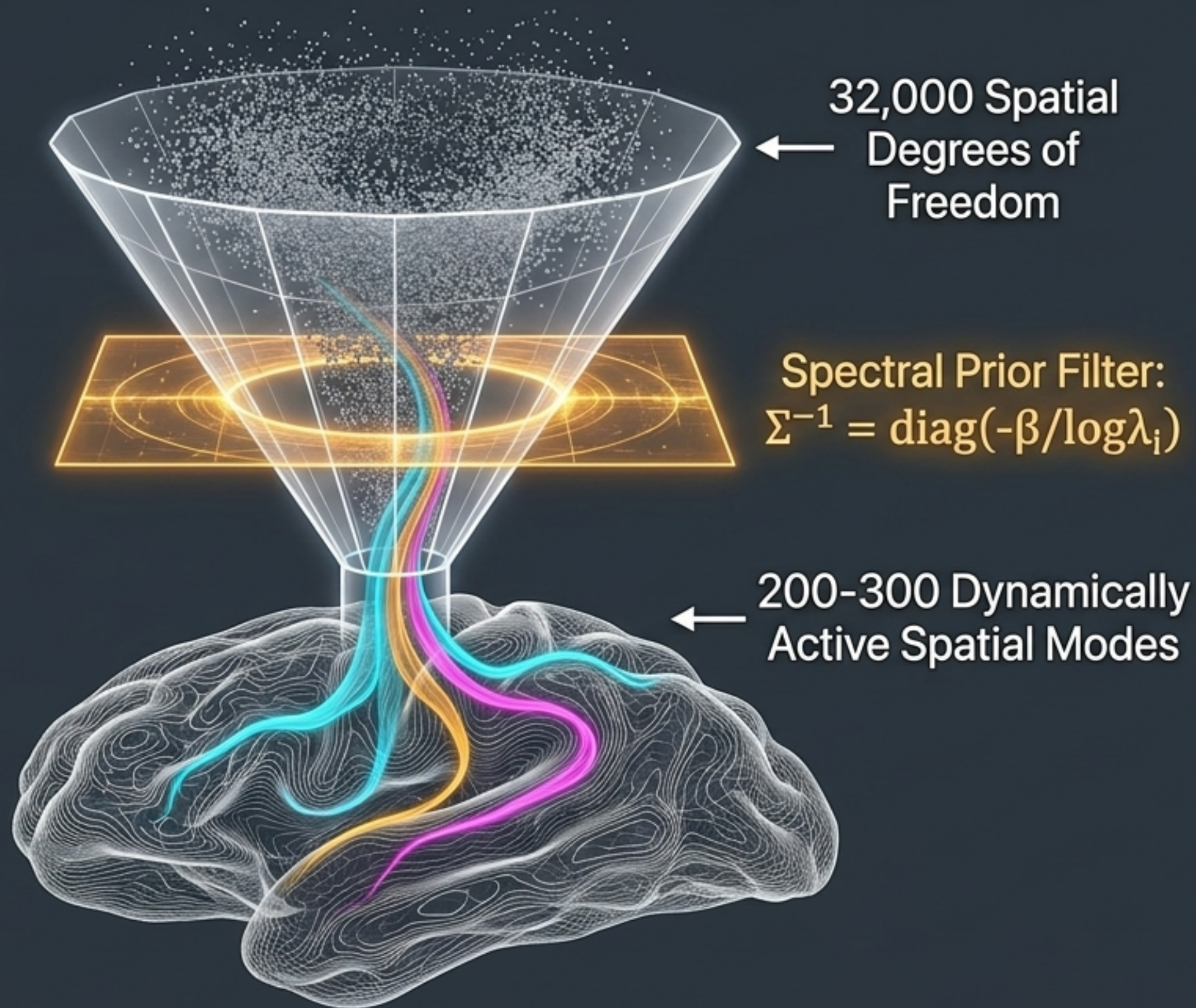
GAD is a dilation of trajectory space, not a translation.

# Anomaly II: ERK Waves & Collective Tissue Migration



Cells do not migrate via independent decisions. The tissue behaves as a coupled dynamical medium where signaling activation fronts reorganize mechanical architecture collectively across space and time.

# Anomaly III: Cortical Eigenmodes and Spectral Priors



Brain dynamics do not utilize all theoretical configurations. The geometric admissibility of cortical manifold heavily penalizes high-frequency, high-curvature modes. They are structurally suppressed, reducing effectively infinite possibilities to a highly constrained, low-dimensional trajectory space.

# The Unifying Insight: Biology is Governed by Admissibility Geometry



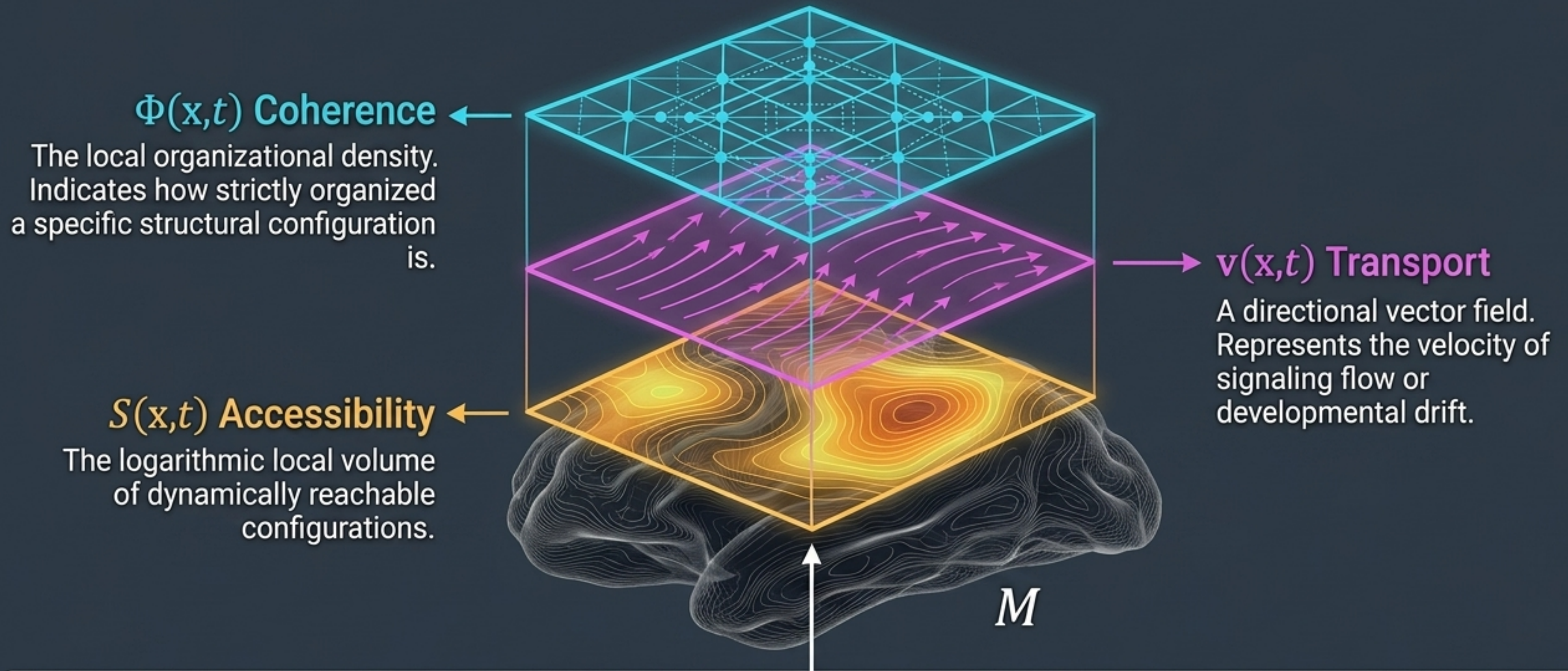
What connects psychiatric variance, migrating cells, and brain source imaging?

**Constraint Propagation.**

The biological signal is not the macroscopic state itself, but the geometry of accessible trajectories.

Systems are governed by which states are organizationally permissible to access.

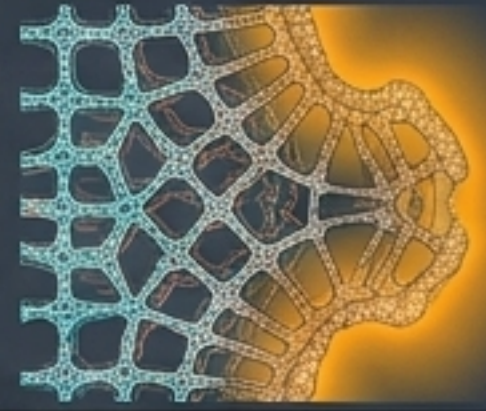
# The Relativistic Scalar-Vector Plenum (RSVP) Framework



The RSVP Triple defines organizational geometry across any substrate. High accessibility implies massive plasticity; high coherence implies rigid consolidation.

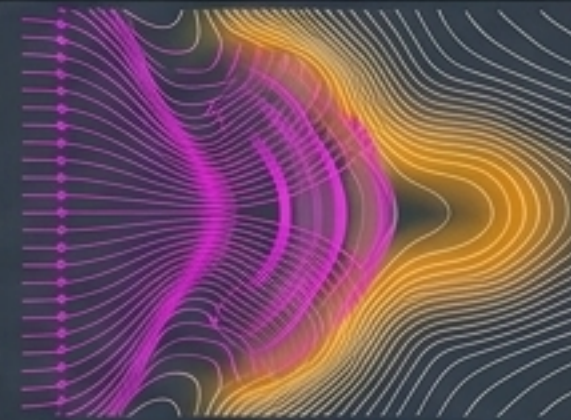
# The Coupled Dynamics of Organizational State

$$\frac{\partial \Phi}{\partial t} = -\text{div}_M(\Phi \mathbf{v}) + \lambda R(\Phi, S)$$



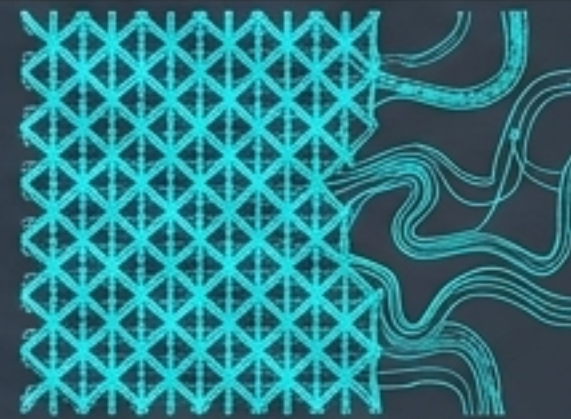
Structural regeneration is actively suppressed when Accessibility is too high.

$$\frac{\partial \mathbf{v}}{\partial t} = -\nabla_v^M \mathbf{v} - \alpha \text{grad}_M \Phi + \beta \text{grad}_M S + F_{\text{ext}}$$



Transport waves bend preferentially toward open domains of high accessibility.

$$\frac{\partial S}{\partial t} = \kappa \Delta_M S - \gamma \Phi S + \delta Q(\mathbf{v})$$



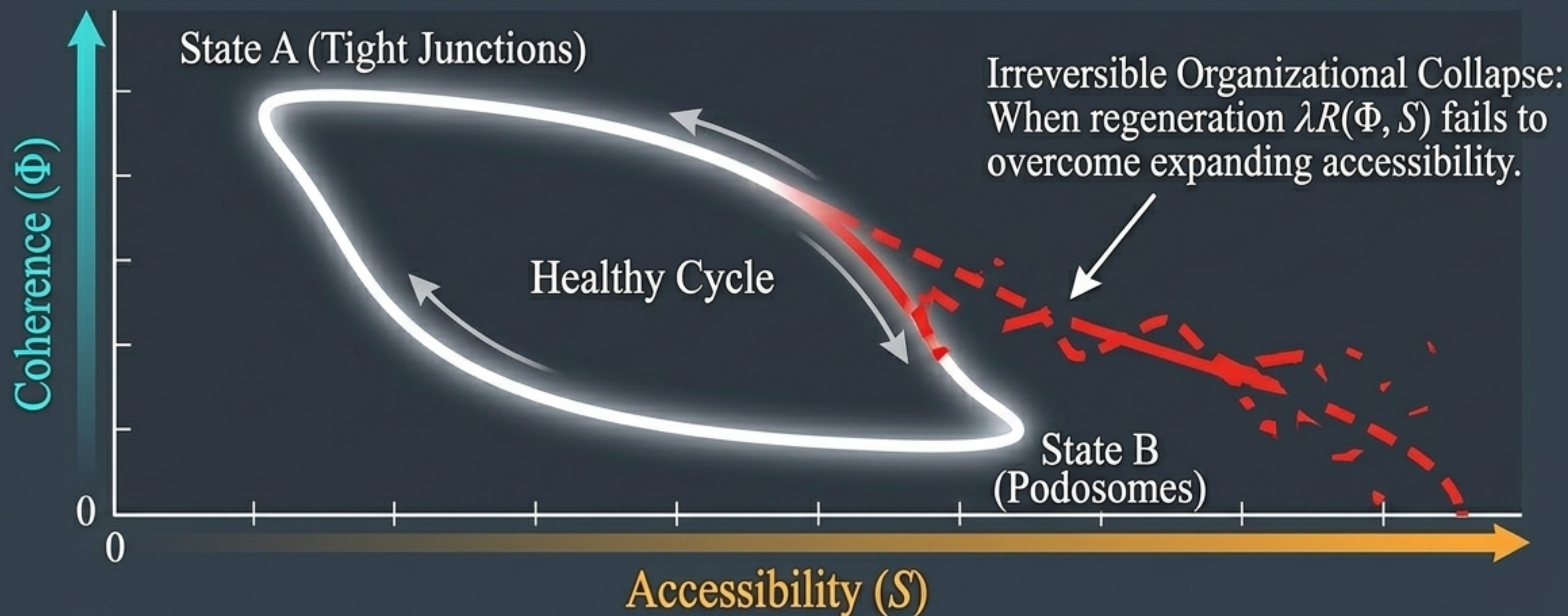
High organizational coherence closes off alternative trajectory pathways.

# Structural Homology Across Biological Scales

Empirical Phenomenon	Substrate ( $M$ )	Coherence ( $\Phi$ )	Transport ( $v$ )	Accessibility ( $S$ )
Neural Trajectories (GAD)	Configuration state space	Structural organization	Developmental drift	Trajectory plasticity ( $-\log \rho$ )
Epithelial Migration (ERK)	Physical tissue surface	Junction-maintenance architecture	ERK wave propagation	Structural accessibility for podosomes
Cortical Imaging (GBF)	Cortical mesh	Organized amplitude distribution	Optical-flow phase gradients	Spectral prior weighting ( $-\log \lambda_i$ )

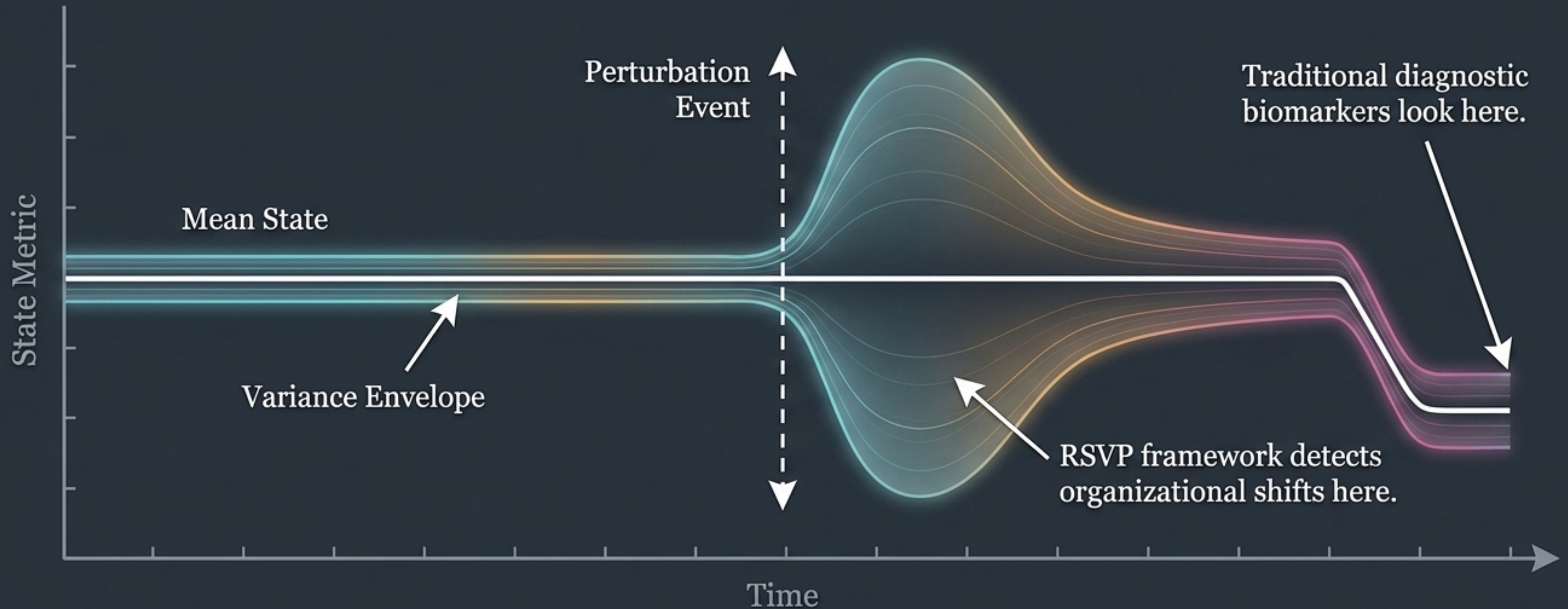
The framework demonstrates exact structural homology at the level of organizational constraint, without requiring shared mechanistic identity.

# Organizational Competence is Phase-Transition Reversibility



Biological health is not remaining stationary in a single attractor basin. It is the ability to transiently suppress coherence to allow functional reorganization, and subsequently rebuild that constraint. Failure to restore is pathology.

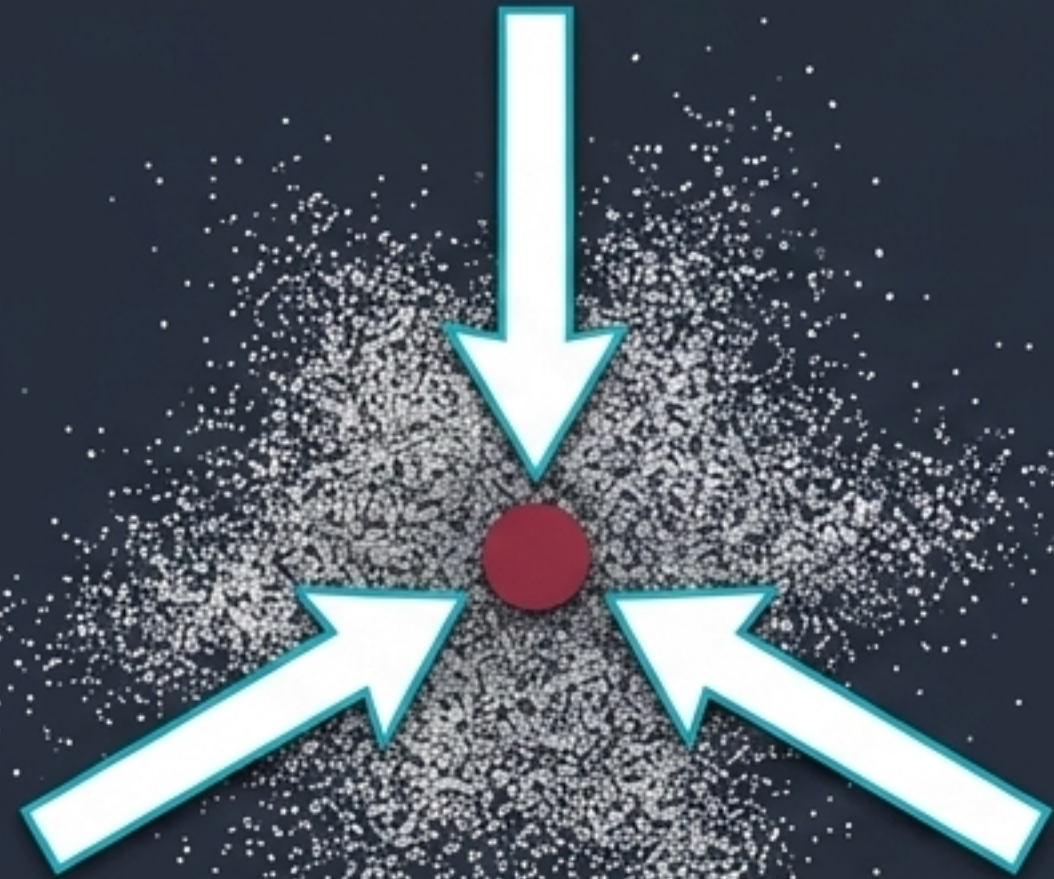
# Variance is the Primary Signal, Not Statistical Noise



Altered admissibility geometry drives trajectory variance before it forces a mean shift. Diagnosing a system based solely on mean-state translation structurally ignores the dominant organizational signal.

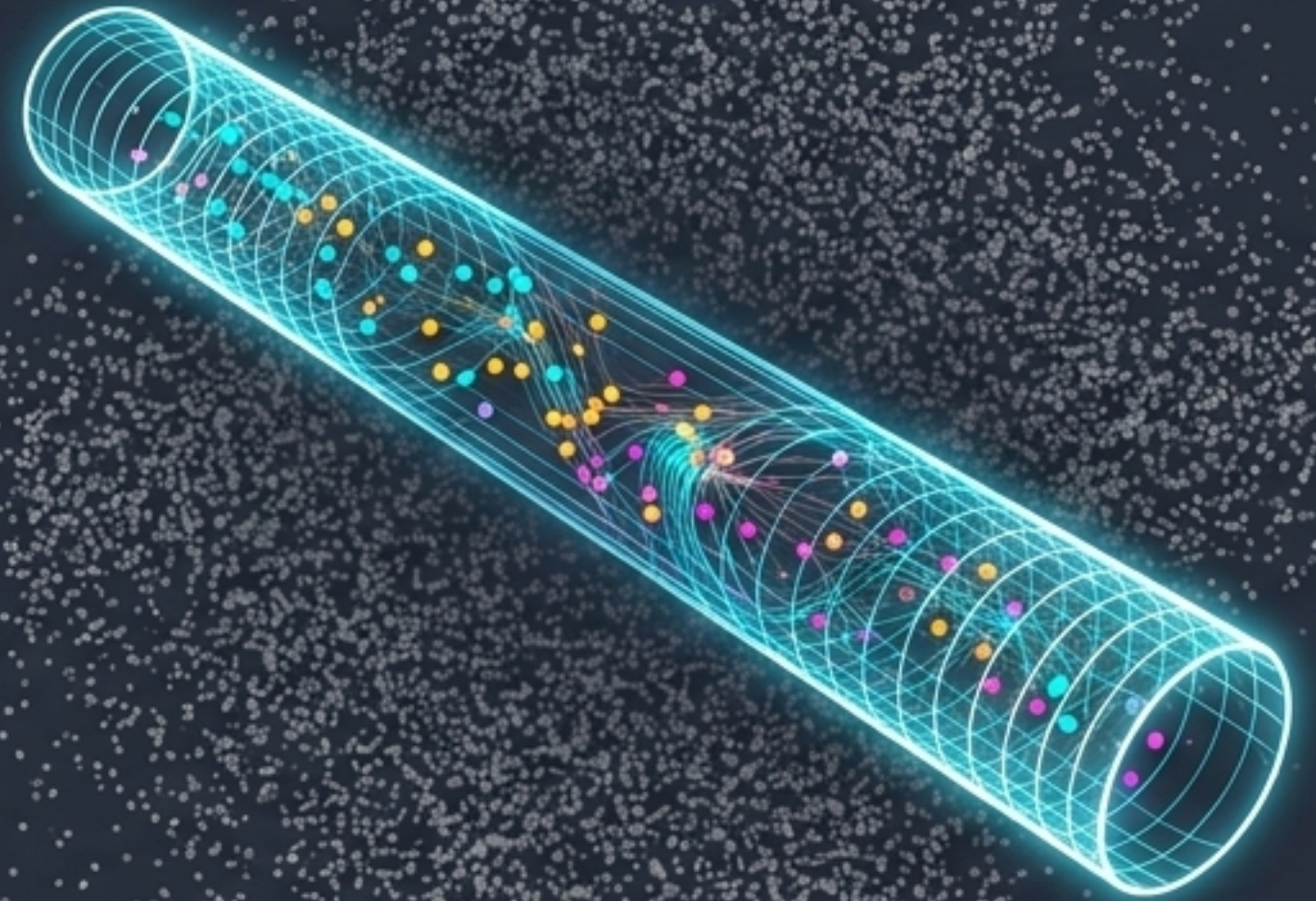
# Admissibility-Preserving Compression

## Destructive Reduction



Averaging across populations destroys the relational geometry that encodes organizational state.

## Admissibility Compression



Biological systems remain mathematically tractable because high-curvature, high-frequency configurations are structurally suppressed. The organism evolves strictly within the admissible sub-manifold.

# Five Falsifiable Signature Predictions

## 1. Variance Transience



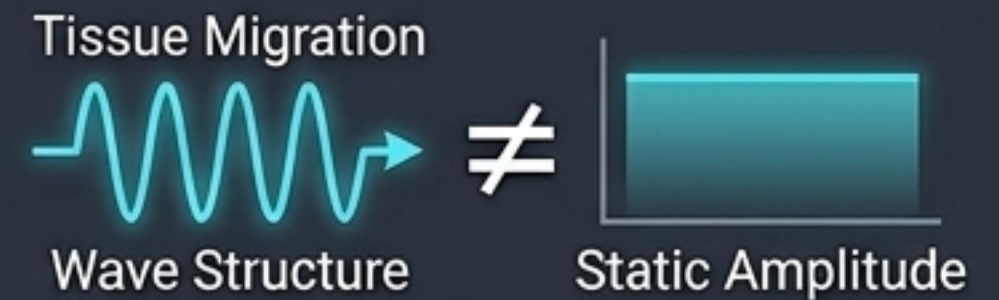
In longitudinal GAD cohorts, PAD variance will transiently widen and reconverge at developmental milestones, rather than monotonically drifting.

## 2. Multimodal Substructure



Symptom-matched GAD cohorts will exhibit divergent bimodal trajectories (consolidation-dominated vs. plasticity-dominated).

## 3. Topology over Amplitude



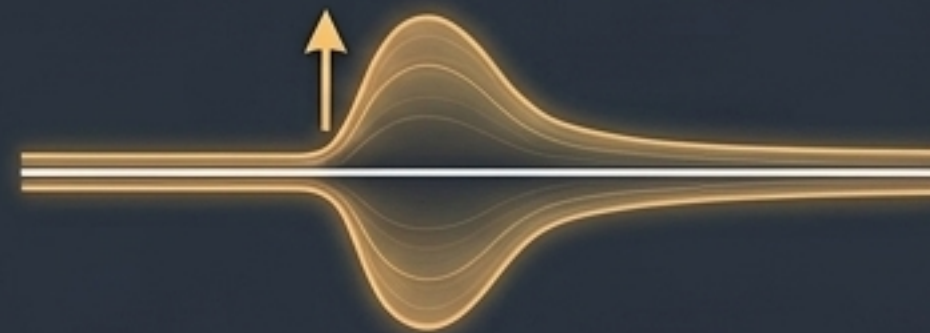
Optogenetic tissue migration coherence depends strictly on the wave structure of ERK activation, outperforming amplitude-matched static stimulation.

## 4. Field Memory



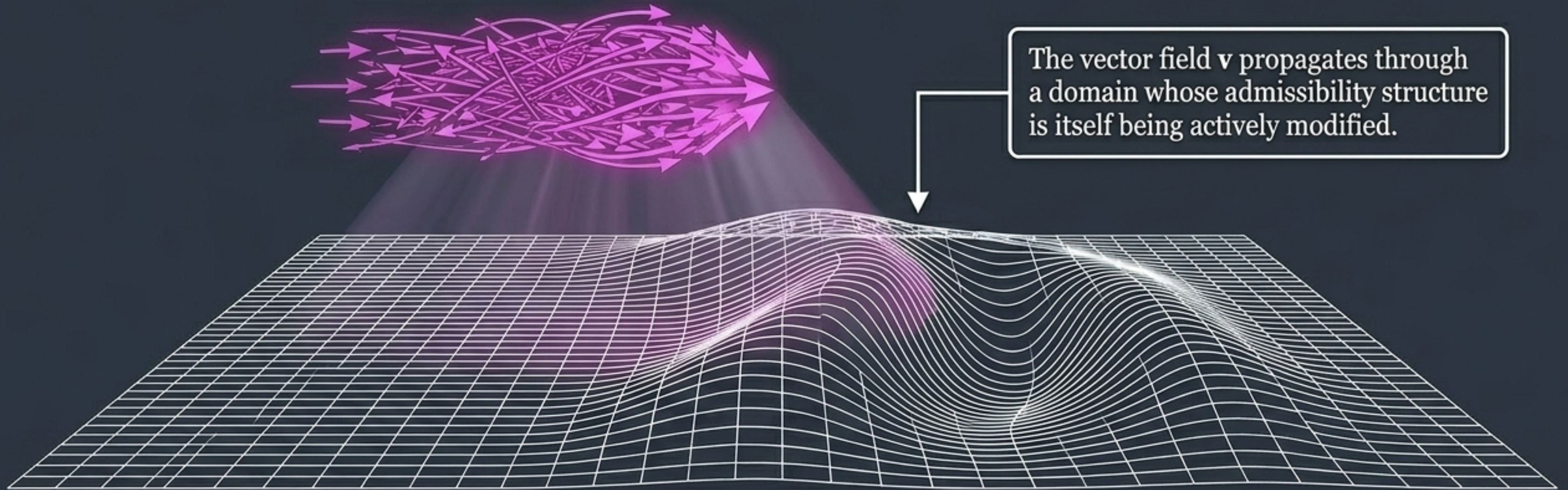
Cells previously traversed by ERK waves exhibit lowered, path-dependent thresholds for future ZO-1 redistribution (hysteresis).

## 5. Perturbation Variance



Any constraint-propagating perturbation will reliably spike variance across system components before moving the population mean.

# Biology as Computation Through Constraint



Tissues and biological networks are genuinely computational systems. They solve coordination problems through distributed, wave-mediated signal processing rather than cellular autonomy or central control. The environment writes constraints onto the cell; the cell actively rewrites the constraints of the environment.

# The New Paradigm of Organizational Geometry

## 1. Primacy of Constraint Propagation

The causally relevant dynamics are not diffusing signals, but **traveling fronts** that alter the local **admissibility** of biological states.

## 2. Variance Over Mean Shift

Disrupted biology manifests first as the **explosive amplification** of **trajectory variance**, making **distributional spread** the true leading biomarker.

## 3. Reversibility Over Equilibrium

Systemic health is defined not by maintaining a static equilibrium, but by the **dynamic capacity** to **reversibly transition** between organizational phases.

*Biological coherence is the ongoing negotiation of spatial and temporal constraints.*