# Genesis Theory

*A primer on the constraint-first model behind Genesis forecasts*

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Paul Campillo

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> **For forecasting reviewers**
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> This primer introduces the model behind the Genesis forecasting workflow. If you want the applied work first, start with the Forecast Card and Evaluation Plan. For the full scholarly treatment, see the published preprints (links at the end of this document).

# The convergence

Across multiple fields, researchers have converged on a finding none of their disciplines can fully explain: what an organized system can become depends less on its internal properties than on the encounters it participates in.

Kauffman (1993, 2000) argues the biosphere constructs its own possibility space through interaction. Moretti (2012) and Chetty et al. (2014) show empirically that identical individuals produce different outcomes depending on encounter context. Dyer & Singh (1998) demonstrate that competitive advantage can be irreducibly relational. Emirbayer (1997) calls for a relational ontology that treats relations as primary. Collins (2004) shows emotional energy originates in interaction rituals, not in individual properties.

Meanwhile, Montévil & Mossio (2015) formalize biological organization as closure of constraints—mutual dependence between processes and the structures that canalize them. Parsons (1956) proposed four functional prerequisites for social system survival. Beer (1972) identified five systems necessary for organizational viability. Sterling (2012) showed biological regulation works through anticipatory maintenance, not static equilibrium.

These traditions converge on two claims:

1. What a system can become depends on its encounters, not just its properties.
2. What a system must maintain to persist requires categorically distinct kinds of work.

But they developed independently, use incompatible vocabularies, and none spans biological through institutional scales with testable constructs.

Genesis Theory proposes the cross-scale operationalization those findings lack. It advances a small set of falsifiable hypotheses organized into six pillars.

# The six pillars

## Pillar 1 · Potential

**CORE CLAIM**

Net-new potential is boundary-emergent, not intrinsic. Internal processing can reconfigure what's already inside, but cannot expand the reachable set beyond what prior boundary exposure made available.

When organized complexity meets organized complexity at a boundary, the encounter can generate possibilities that didn't exist in either system alone. This follows from thermodynamic, information-theoretic, and dissipative-structure constraints: new ordered states require energy gradients, and gradients require difference across a boundary.

$$\Pi_{\text{reachable}} = \cap\,(\Pi_{\text{avail}}, \mathcal{R}(\Psi_{\text{func}}))$$

Where $\Pi_{\text{avail}}$ = potential made available at boundaries, $\Psi_{\text{func}}$ = functional capacity to convert, and $\mathcal{R}(\Psi_{\text{func}})$ = reachability set given that capacity.

The diagnosis requires both sides. Capacity without boundaries has nothing to convert. Boundaries without capacity can't convert what's available.

**GENESIS NOTE**

If Genesis is right, most developmental interventions are aimed at the wrong variable. Building internal capacity without expanding boundary access leaves the reachable set unchanged. Expanding boundary access without adequate capacity produces encounters the system can't convert.

**Published:** *Boundary-emergence and potential generation in organized systems* (Part I)—Zenodo, March 2026.

# Pillar 2 · Existence (SIRF)

**CORE CLAIM**

Organized systems persist through four irreducible functional channels—Structural, Informational, Relational, Foundational (SIRF). For systems maintained far from equilibrium, those channels name four kinds of ongoing thermodynamic work.

| CHANNEL | WHAT IT MAINTAINS | PHYSICS LINEAGE |
|---|---|---|
| **S** (Structural) | Boundaries, arrangement, form | Prigogine—dissipative structures |
| **I** (Informational) | Configuration, signals, encoded state | Shannon—information theory; Landauer—erasure cost |
| **R** (Relational) | Exchange, coupling, connection | Schrödinger—open-system thermodynamics |
| **F** (Foundational) | Energy, resources, substrate | Gibbs—free energy; Atkinson—energy charge |

The paper's central distinction: *state* describes what organized existence holds. *Functional work* describes what keeps it from dissolving. Structure is frozen work—the accumulated residue of prior effort. Work is flowing state—the current organization observed dynamically. This dual-aspect claim parallels the constraint/process distinction that Montévil & Mossio (2015) formalized for biological systems.

**Bottleneck principle:** Capacity tracks the weakest channel, not the average. Optimizing a non-bottleneck channel yields minimal gain.

$$\Psi_{\text{int}} = \min(S, I, R, F) \times A \times \eta$$

**Persistence profiles:** How systems balance frozen structure against active regeneration predicts how they fail. Retained-dominant systems ossify. Active-dominant systems exhaust. And some patterns persist parasitically—recruiting host resources to sustain themselves against the host's own thriving.

**The boundary criterion:** If all functional work ceases, does the organization dissolve? If yes, the system falls within the framework's scope. A rock holds state

SIRF at equilibrium. A cell performs functional SIRF continuously. The criterion separates systems the theory diagnoses from those it merely describes.

**Published:** *The four channels of organized existence: Functional conditions for persistence in organized systems* (Part II)—Zenodo, April 2026.

## Pillar 3 · The field

**CORE CLAIM**

The field in which encounters occur has organized structure of its own—and that structure decomposes through SIRF channels, explaining why agents with identical resources in identical locations trace radically different trajectories.

Core 0 introduces field-fit ($\chi$) as a scalar: the external environment supports, constrains, or blocks boundary encounters. But a scalar hides too much. Two engineers in the same city, same industry, same salary band—one thrives, the other stalls. Scalar field-fit says: same field, different agents. Must be internal.

Often it isn't. What differs is which channels of the field they couple to. One connects to trust networks that generate high-quality encounters (R-channel coupling). The other occupies the same physical and economic space but lacks relational access. The field's R-channel might as well not exist for them.

$$\chi_c = \chi_S, \quad \chi_I, \quad \chi_R, \quad \chi_F$$

Channel-specific field-fit ($\chi_c$) decomposes the scalar into four coupling terms—explaining how the same environment generates different encounter availability for different systems based on which channels they can access.

The field also operates inward. Internal calibrations—beliefs about what's possible, trust assumptions, scarcity models—function as an internal field that shapes which encounters the system perceives as available. The same grammar, operating externally and internally.

**Status:** Working spec (v0.5). Paper forthcoming (Part IV).

# Pillar 4 · Transformation dynamics

**CORE CLAIM**

Every transformation follows a five-stage causal sequence grounded in physics, not domain-specific logic. Skip a stage and conversion fails.

$$G \to \Gamma_{\text{fail}} \to C \to W \to Z$$

| STAGE | NAME | GROUNDING |
|---|---|---|
| **G** | Gradient | Thermodynamics—a free energy difference exists that can do work |
| $\Gamma_{\text{fail}}$ | Regime failure | Feedback control—current regulation can't contain the gradient |
| **C** | Configuration | Dynamical systems—a new arrangement forms (bifurcation, lock-in) |
| **W** | Work | Thermodynamics—energy flows into the new arrangement |
| **Z** | Stabilization | Stability theory—the new state persists as a new attractor |

The claim: these causal dependencies hold regardless of scale or domain. You can't resource a configuration that hasn't formed. You can't stabilize a state that hasn't shifted. Systems fail at specific stages—and the failure stage predicts what intervention would help versus what intervention wastes energy.

**Margin and the volitional clock:** Systems have a window in which transformation remains voluntary. As margin depletes, the window narrows. Below a threshold, the system can no longer choose its transformation—it gets transformed by external forces instead.

**Status:** Working spec (v0.2). Paper forthcoming (Part V).

# Pillar 5 · Agency

**CORE CLAIM**

Model-bearing systems can steer their own conversion—but the same mechanism that enables innovation also enables systematic self-deception.

What changes when a system can imagine:

**Model-dominance ($\beta$)**—how much internal models vs. environmental signals drive behavior. At $\beta \sim 1$, behavior couples to environment (reactive). As $\beta \to 0$, internal models dominate.

**Model-reality divergence ($\Delta\Phi$)**—the distance between what the system believes and what's actually happening. Three species: $\Delta\Phi_{\text{env}}$ (world model errors), $\Delta\Phi_{\text{self}}$ (self-assessment errors), and $\Delta\Phi_{\text{field}}$ (misperception of the encounter environment).

**Correction rate ($\lambda$)**—how fast the system updates when contradicted. $\lambda > 0$ means the system corrects. $\lambda < 0$ means it doubles down—the model drifts further from reality under contradiction.

**GENESIS NOTE**

The duality: innovation capacity = blindness capacity. Same mechanism, different outcomes depending on whether the internal model lands inside or outside physical reality. This is why $\Delta\Phi$ doesn't merely predict failure—it explains why the same agency that enables transformation also enables delusion.

**Status:** Working spec (v0.5). Paper forthcoming (Part VI).

# Pillar 6 · Energy routing

**CORE CLAIM**

Three energy modes—generative, maintenance, and clearing—route through the four SIRF channels, producing a 4×3 operational matrix with distinct failure signatures and intervention targets.

Every channel carries all three modes of energy. Generative energy builds new organized complexity. Maintenance energy sustains existing organization. Clearing energy dissolves patterns that no longer serve the system.

The routing variables:

- **Efficiency ($\eta$)**—how much allocated energy reaches its conversion target
- **Balance ($\rho$)**—distribution across generative, maintenance, and clearing modes
- **Surplus ($\sigma$)**—energy remaining after maintenance obligations

When efficiency drops, the system works harder without proportional result. When balance tilts toward maintenance, the system sustains but can't grow. When surplus goes negative, the system mines its own reserves.

**Status:** Working spec. Paper forthcoming.

# What the framework predicts

The conventional framing and the Genesis prediction differ on specific, testable dimensions:

| CONVENTIONAL FRAME | GENESIS FRAME |
|---|---|
| Develop better actors | Architect better encounters |
| Potential lives inside systems | Potential emerges at boundaries |
| Develop individuals to improve outcomes | Design encounter interfaces to expand reachable sets |
| Brand damage is reputational | Boundary closure is structural—an absorbing state |
| Demand weakness explains contraction | $\Pi_{\text{avail}}$ contraction explains it—the boundary portfolio shrinks |
| Time heals | $\lambda < 0$ means escalation—the gap compounds |
| Failure is generic decline | Failure clusters by channel—ossification, exhaustion, isolation, and depletion have distinct signatures |

> **GENESIS NOTE**
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> The unique insight: closed $\neq$ damaged. When a boundary gatekeeper makes an identity decision ("I am not a Brand-X customer"), that boundary no longer exists on relevant horizons absent a regime change. Identity closures behave like absorbing states. They don't respond to product improvement, price reduction, marketing spend, or time passing. Cash cannot purchase access to closed boundaries.

# Validation approach

Genesis earns its place by outperforming alternatives:

| METRIC | SUCCESS CRITERION |
|---|---|
| Directional accuracy | $\geq$ 60% of predictions correct |
| Calibration | Brier $<$ 0.25; stated confidence matches outcomes |
| Baseline lift | Outperforms raw model vs. structured protocol vs. protocol + diagnostics |
| Early warning | Identifies constraints before conventional analysis |
| Actionable specificity | Points to the bottleneck, not generic recommendations |

**First completed case:** Kodak retrodiction—Brier score 0.050 against a 0.25 target, 17/17 directional accuracy. Genesis diagnosed structural inability to transform at peak revenue, sixteen years before bankruptcy.

**Active prospective case:** Tesla Automotive—timestamped predictions with explicit falsifiers, 12-month resolution timeline, comparison against conventional analysis. Pre-registered on OSF.

## What we're testing

| HYPOTHESIS | CLAIM | CONFIDENCE |
|---|---|---|
| H0 | Potential is boundary-emergent, not intrinsic | 70–85% |
| H1 | Four SIRF channels are minimally sufficient for organized persistence | 70–85% |
| H2 | Bottleneck operator (min) outperforms alternatives | 70% |
| H3 | Persistence profile predicts characteristic failure type | 75–85% |
| H4 | $\lambda$ predicts trajectory better than static state assessment | 60–70% |
| H5 | Closed boundaries behave as absorbing states | 60–75% |
| H6 | Channel-specific field-fit ($\chi_c$) outperforms scalar field-fit | 55–70% |

| CLAIM | WHAT WOULD FALSIFY IT |
|---|---|
| Boundary-emergence | Identical systems in identical encounter contexts produce systematically different outcomes explainable only by internal properties |
| Four-channel sufficiency | A fifth irreducible category emerges that doesn't decompose into S, I, R, or F |
| Bottleneck principle | Systems where the weakest channel demonstrably does not constrain throughput |
| Persistence prediction | Systems with identical persistence profiles produce different failure types |
| Absorbing states | Identity-closed boundaries reliably reopen without regime change in the closing party |

Falsification criteria exist for each hypothesis. Results will be published regardless of outcome.

# Published research

| PAPER | TITLE | STATUS |
|---|---|---|
| Part I | *Boundary-emergence and potential generation in organized systems* | Published—Zenodo, SSRN |
| Part II | *The four channels of organized existence* | Published—Zenodo |
| Part III | *Third things and asymmetric returns at the boundary* | Forthcoming |
| Part IV | *Field constraints on encounter availability and conversion* | Forthcoming |
| Part V | *Transformation dynamics and the mechanics of conversion failure* | Forthcoming |
| Part VI | *Navigational distortion and correction in model-bearing systems* | Forthcoming |

All preprints carry explicit confidence bands and falsification criteria. If the hypotheses fail under scrutiny, the failure itself constrains what a cross-scale framework would require.

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GENESIS RESEARCH LAB

genesistheory.org