Code–Source–Origin Cosmology (CSOC)

A Unified Event-Generative Framework for Emergence, Stability, and Collapse Across Scales

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Abstract

This paper introduces *Code–Source–Origin Cosmology (CSOC)*, a unified event-generative framework proposing that observable reality is not a primitive substrate, but the accumulated, emergent result of structured information ("Code") executed through discrete events over time.

CSOC advances three minimal, non-metaphysical assumptions: (1) Information precedes state, (2) Events mediate execution, and (3) Reality is defined as the historical accumulation of executed events.

Within this framework, life, cognition, and civilization are modeled as progressively complex information-execution systems operating under evolving rule sets. CSOC further introduces the *Information–Rule Mismatch* condition

$$\frac{dC}{dt} > \frac{dR}{dt}$$

as a general mechanism underlying systemic instability and black-swan phenomena across scales.

CSOC does not seek to replace physical or biological theories, but proposes a higher-level generative layer compatible with empirical investigation through multi-agent simulation and AI world models.

1. Introduction: The Generative Question

Modern science excels at describing how systems behave once they are assumed to exist. Physics explains state evolution through dynamical laws; biology explains adaptation through selection; neuroscience models cognition through neural computation; economics formalizes interaction through agents and equilibria.

Despite their successes, these disciplines share a largely unexamined assumption: the existence of a pre-given reality upon which dynamics unfold.

CSOC challenges this assumption by shifting attention from behavior to generation. Rather than asking how states evolve, CSOC asks a more fundamental question: *What generates the accumulating sequence of events that constitutes reality itself?*

Aligning with complexity science, CSOC treats reality as an emergent process rather than a static object. It focuses on the execution of information into irreversible historical structure, introducing a generative layer orthogonal to material substrate descriptions.

2. Conceptual Positioning of CSOC

CSOC is situated within complexity science, information theory, and systems theory, yet operates at a distinct explanatory layer.

It does not compete with physics or biology; instead, it specifies the structural conditions under which any system can coherently accumulate events. CSOC is not an ontological doctrine but a methodological framework concerned with generative sufficiency.

Importantly, CSOC avoids metaphysical commitment. It does not posit external agency, intentional design, or consciousness as primitives. It formalizes only what is minimally required for irreversible history to emerge.

3. Foundational Assumptions

CSOC is built upon three minimal, methodological assumptions.

3.1 Information Precedes State

Observable states require underlying structured information capable of execution. Without such specification, state transitions become indeterminate or purely stochastic.

3.2 Events Mediate Execution

Information does not influence reality directly. It must be executed through discrete, irreducible events E that transform potential into history.

3.3 Reality as Accumulation

Reality is defined as the historical accumulation of executed events:

$$\text{Reality}(t) = \sum_{\tau=0}^{t} E(\tau)$$

This formulation emphasizes irreversibility and path dependence.

4. Formal Generative Chain: Code, Event, Reality

4.1 Code (C)

Code refers to any structured information capable of producing state transitions:

$$C(t) = \{c_1, c_2, \ldots, c_n\}$$

4.2 Event (E)

Events are the irreducible execution units transforming code into state change:

$$E(t) = \mathcal{T}(C(t), R(t), S(t))$$

4.3 Reality

Reality emerges as the cumulative integration of executed events over time:

$$\text{Reality}(t) = \sum_{\tau=0}^{t} E(\tau)$$

5. Life as a Stable Event-Execution System

Within CSOC, biological life is modeled as a stable, self-maintaining event-execution system:

$$\text{Life} = \{E(t) \mid \text{Stability}(E) \geq \theta\}$$

Life emerges when code can be stored and replicated, events maintain dynamic stability, and rules enable local error correction.

6. Cognition as Interpretive Execution

Cognition is modeled as an interpretive function:

$$\text{Mind}(t) = \Phi(C(t), S(t), R(t))$$

Decision-making is understood as event-path selection under uncertainty, aligning with predictive processing frameworks.

7. Civilization as Collective Code Systems

Civilizations are modeled as large-scale, multi-agent information-execution systems. Institutions function as rule-synchronization and code-compression mechanisms enabling coordinated event execution across populations.

8. Information–Rule Mismatch and Systemic Instability

Systemic instability arises when the rate of information change exceeds the adaptive capacity of governing rules:

$$\frac{dC}{dt} > \frac{dR}{dt}$$

This condition explains crises across cognitive, social, and civilizational scales.

9. Empirical and Simulation Pathways

CSOC is compatible with empirical investigation through: multi-agent simulations, AI world-model training, cognitive signal analysis, and institutional evolution modeling.

10. Discussion

CSOC reframes reality as a continuously executed historical process rather than a static substrate. It offers a unified framework for understanding emergence, stability, and collapse across scales.

11. Conclusion

CSOC proposes that reality persists only insofar as information can be executed into events under adaptable rules. This generative perspective provides a foundation for a unified science of existence.

Disclaimer

This document presents a theoretical research framework intended solely for academic discussion. It does not assert established scientific fact and does not provide medical, legal, financial, or policy advice.