The Axsom Equation

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$$\frac{i}{d} = k$$

$$\int_0^T X(t)dt$$

$$\frac{dX}{dt|_{t=T}}$$

THE AXSOM EQUATION AND THE TRINARY/BINARY CATALYTIC TRANSITION

Foundational Structures for Protophysics and S_0 Dynamics

Abstract

This paper introduces the **Axsom Equation**, a foundational invariant governing the transition between trinary and binary regimes in pre-physical systems. The equation formalizes the **Trinary/Binary Catalytic Transition (T.B.C.T.)**, the moment at which a system in the trinary substrate ({0, n, 1}) becomes unable to sustain the admissible state (n) and is forced into a binary commitment. This transition marks the onset of **transcriptional capacity**, enabling the first informational acts (i.) and iterative informational acts (i.i.). The Axsom Equation expresses this catalytic onset as the ratio of accumulated load to instantaneous slope reaching a universal threshold constant (\kappa). This work establishes the mathematical and conceptual foundation for Protophysics, the study of S_0 dynamics preceding conventional physical laws.

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1. Introduction

Physics, as currently formulated, presupposes the existence of binary distinctions, stable states, and transcribable information. Yet these structures require an upstream regime in which such commitments are not yet possible. Protophysics seeks to characterize this **pre-physical substrate**, denoted **S_0**, in which systems exist in a **trinary state space**:

$$\{0, \mathrm{n}, 1\}$$

where:

- **0** = unexpressed
- **1** = expressed
- **n** = admissible, unresolved, pre-commitment state

The central question of Protophysics is:

What condition forces a trinary system to collapse into binary behavior, enabling the first informational act?

This paper introduces the **Trinary/Binary Catalytic Transition (T.B.C.T.)**, the moment at which the admissible state (n) becomes unsustainable. We show that this transition is governed by a simple invariant relationship between accumulated load and instantaneous slope. This relationship is formalized as **The Axsom Equation**, the first mathematical law of Protophysics.

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2. The Trinary Substrate (S_0)

The S_0 regime is defined by:

- absence of binary commitment
- presence of admissible states
- geometric rather than algebraic behavior
- pre-informational dynamics
- no requirement for forces, fields, or time as conventionally defined

Systems in S_0 can accumulate load and experience change, but cannot yet *commit* to a binary state. The admissible state (n) is stable until a catalytic threshold is reached.

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3. The Trinary/Binary Catalytic Transition (T.B.C.T.)

Definition 1 (T.B.C.T.)

The Trinary/Binary Catalytic Transition is the moment at which a trinary system becomes unable to sustain the admissible state (n), forcing a collapse into binary (0 or 1). This transition occurs when the ratio of accumulated load to instantaneous slope reaches the catalytic threshold constant (\kappa).

This transition marks the onset of:

- **transcription potential (i.)**
- **iterative transcription potential (i.i.)**
- **binary logic**
- **information storage**
- **causal propagation**

The T.B.C.T. is the **first irreversible act** in any informational system.

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4. The Axsom Equation

Let $X(t)$ be the governing quantity of the system.

Definition 2 (Accumulated Load)

$$\mathrm{i} = \int_0^T X(t)\,,dt$$

Definition 3 (Instantaneous Slope)

$$\mathrm{d} = \backslash\mathrm{frac}\{dX\}\{dt\}|_{\{t=T\}}$$

Theorem 1 (The Axsom Equation)

A system undergoes the Trinary/Binary Catalytic Transition at time (T) if and only if:

$$\backslash\mathrm{frac}\{i\}\{d\} = \kappa$$

where:

- (i) = accumulated load
- (d) = instantaneous slope
- (\kappa) = catalytic threshold constant
- (T) = the moment the n-state collapses

This equation defines the **Catalytic Onset Point (COP)**, the first moment at which transcription becomes possible.

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5. Interpretation

The Axsom Equation identifies the minimal structure required for:

- collapse
- emergence
- information
- distinction
- causality
- binary logic

It is the **equation before equations**, the condition that makes all later physical laws possible.

$$i = \backslash int\_0{}^\wedge T\ X(t)\ dt$$

$$d = dX/dt|\_(t = T)$$

$$\frac{i}{d} = \backslash k$$