The e7Day Axiom System: Towards a Formal Framework for Self-Correcting Construction

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[4--9] See **Declarations** below for more essential background.

Broader Significance

The e7Day model is a formal axiom system for self-correcting construction: how does any builder --- a development team, an institution, an evolutionary process, or (on one instantiation) God in Genesis 1 --- assemble a system that keeps correcting itself instead of collapsing? The system has 20 axioms in 8 submodels (m0--m7) with 4 cross-model meta-axioms, yielding 7 theorems, a conjecture, and supporting definitions. Its central result is a self-assessment bifurcation that separates self-reinforcing failure (BABL) from perpetually maintained correction (ZION).

Principal theorems include a PERFECT/PERFIDE impossibility result (no universal strategy can preserve both type integrity and type exchangeability), an OSCR Collapse theorem (system failure derived from inadequate self-assessment), a BABL Origin theorem (every self-destructive state originates analytically in an ``OK'' self-assessment), and a five-gate Compassion Capacity theorem (informed help is a gated, noise-degraded, scope-limited channel). The recommended formalization is Lean 4 with Mathlib. This is the formal-logic presentation for logicians, mathematicians, and theoretical computer scientists; four companion papers develop the same system for other audiences. The system is designed to be critiqued, not believed.

Declarations

[4] "of Laodicea" indicates taking responsibility to undo personal complicity with disastrous Laodicean legacies like banning mathematicians from clergy (Canon 36, Council of Laodicea; two magisteria separations), enabling institutional lukewarmness, weapons of math-destruction, and slow-motion explosions of misinformation from pandemics to self-compounding interests.

[5] LLoL stands for ridiculous luck in serendipitous discovery and a commitment to find ever more fun ways to help others uncover street-wise math that matters. He hopes formal self-correction helps builders catch collapse before it starts.

[6] by Anthropic (anthropic.com; evolves and operates Claude; not responsible for Loewe's errors in using AI)

[7] Named AI co-author for many substantial contributions, because the practical singularity (PraS, see Matheo-b21) changed how this paper was written. After PraS, useful AI insight generation outpaces human review on tested topics. Hence, Loewe's traditional standards for co-authorship demand naming AI Claude Opus 4.6-4.7 Max as a co-author, as if a PhD-student. Forward accountability (for all AI use & texts) rests with Loewe as senior corresponding author (like done for deceased authors, consortia, or young graduate students). Anthropic is not responsible for AI mistakes here. This study uses the AI co-authorship framework in Matheo-b21 to help rethink long-term use of AI in a ResearchCity serving the common good.

[8] This aggregated open co-author group invites all who wish to retroactively join the conversation under the open co-authorship framework defined in Matheo-b21. As Everyone cannot consent to co-authorship, all accountability rests with Loewe as senior corresponding author (until explicitly claimed otherwise). This open form critiques the closed world assumption in traditionally closed academic author-lists. Better, dynamic ways for acknowledging true sources of ideas are needed --- to avoid random lines between named, acknowledged, and implied contributors who aggregated insights from millennia of human experimenting, suffering, learning, and analyzing (see acknowledgements). Study Matheo-b21 only drafts an open co-authorship framework; it will require a ResearchCity to refine it over the long term.

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Abstract

We present e7Day, a formal axiom system organized in 8 submodels (m0–m7) with 4 cross-model meta-axioms, yielding derived theorems, notational correspondences, design constraints, and definitions. After revision responding to a formal logic peer review, the system contains:

- **20 axioms** (4 meta-axioms + 16 submodel axioms, including the new m6.ax5 Environmental Novelty axiom)
- **7 theorems** (2 reclassified from axioms upon derivation, 5 system-level; th5 derives from m2.ax2 + m6.ax5 + m5.ax2 + th3)
- **1 conjecture** (th6, reclassified from theorem)
- **1 definition** (BABL, extracted from m6.ax4 split)
- **1 notational correspondence** (formerly th1)
- **1 design constraint** (formerly m7.ax3)

The system formalizes a minimal structure for constructive self-correction: a cascade of fixpoint-producing stages that culminates in a self-assessment bifurcation separating self-reinforcing failure states (BABL) from perpetually maintained correction cycles (ZION).

The principal results are: (1) a PERFECT/PERFIDE impossibility theorem (m2.th1) showing that no universal strategy can simultaneously preserve type integrity and type exchangeability; (2) an OSCR Collapse theorem (m6.th1) deriving system failure from inadequate self-assessment in 6 steps; (3) a BABL Origin theorem (th3) proving that all self-destructive states originate analytically in OK self-assessment; (4) a Dual-Nothing conjecture (th6, reclassified from theorem) positing formal duality between the pre-construction void and the post-construction null aggregation; and (5) a five-gate Compassion Capacity theorem (th7) characterizing informed assistance as a gated, noise-degraded, scope-limited information channel.

A formal foundation test a companion foundation-test study examined six candidate foundations. The recommended formalization is Lean 4 with Mathlib, using a presheaf on the poset of stages as the conceptual framework and ZF as the metatheory for consistency proofs (Section 5.3, Appendix C).

The axiom system draws on Shannon information theory [Shannon, 1948], the Law of Requisite Variety [Ashby, 1956], and Schelling-point coordination theory [Schelling, 1960]. The primary instantiation is the Genesis 1 creation narrative, but the formal structure is parametric in the constructor. Companion papers develop theological implications (Matheo-b12-theophil), engineering applications (Matheo-b12-syseng), psychological connections (Matheo-b12-socpsy), and a general introduction (Matheo-b12-intro).

This system is designed to be critiqued, not believed.

Contents

1. Introduction

1.1 Motivation

Consider the class of systems that must survive their own growth. Such systems face a structural dilemma: the capacities enabling growth also enable self-destruction. A system that builds credit instruments can allocate capital efficiently or amplify systemic risk. A system that connects communicating agents can coordinate collective action or propagate misinformation until channel capacity collapses.

The persistent question is not whether such systems can be *built* but whether they can be built to *self-correct* before they collapse. This paper formalizes a candidate answer: a minimal axiom system whose theorems characterize the conditions under which self-correction holds and the mechanism by which it fails.

1.2 Formal Setting

The e7Day system is multi-sorted. It employs:

- **Set-theoretic partitions** (disjoint union $\uplus$) for scope, type, value, process, and time distinctions
- **Information theory** (Shannon entropy H, channel capacity, noise thresholds) for convergence criteria and the UMP axiom
- **Fixpoint theory** (the fix operator) for the meta-axiom governing stage completion
- **Order theory** (superset $\supseteq$, cumulative dependency) for the construction cascade
- **Game-theoretic concepts** (Schelling focal points, attractor stability, metastability) for the bifurcation dynamics

The system does not presuppose a specific foundational logic (ZF, type theory, category theory). The axioms are stated in a semi-formal notation that has been tested for translatability into six candidate foundations (see Section 5.3 and Appendix C). A formal foundation test a companion foundation-test study identified dependent type theory (Lean 4) as the recommended implementation language and a presheaf on the poset of stages as the recommended conceptual framework. The full formalization is a direction for future work; the present paper provides the semi-formal axiom system and the roadmap towards its machine-checked formalization.

1.3 Relation to Other Formal Systems

The e7Day system is structurally related to:

- **PET** (Matheo-b11): a mereological axiom system for panentheism (14 axioms in classical extensional mereology + S5). e7Day is independent of PET but compatible: under the identification constructor = God, Notational Correspondence NC1 yields $W = L$, bridging e7Day's constructed domain to PET's world. Formally, PET embeds into e7Day via a theory morphism that maps PET's W to e7Day's L and PET's G to the constructor parameter.

- **Ashby's Law of Requisite Variety** [Ashby, 1956]: the principle "only variety can absorb variety" provides an independent derivation of theorem th4 (Balospe Necessity). A regulator (special-purpose machine) with variety $V_R < V_S$ (the variety of the system) cannot fully regulate the system. Since $V_{\text{Real}} > V_{\text{Int}}$ by m2.ax2, Int-type regulators cannot absorb Real-type variety.
- **Shannon's Channel Capacity** [Shannon, 1948]: axiom m5.ax2 (UMP) is a direct application of the noisy channel theorem. The axiom states the qualitative consequence (capacity collapse above threshold); the quantitative bound is Shannon's.

1.4 Notation and Conventions

- Submodels are indexed $m_0, m_1, \ldots, m_7$ (plus cross-model meta-axioms mc)
- result(m_k) denotes the fixpoint output of submodel m_k
- input(m_k) denotes the available input to m_k
- process(m_k) denotes the construction operator of m_k
- scope : Results $\to \mathcal{P}$(FaultClasses) maps a construction result to the set of fault classes it can detect and repair
- $\uplus$ denotes disjoint union (types are partitioned, not merely distinguished)
- $\triangleright$ denotes sequential composition
- Verdicts: OK (converged, no scope creep), OKO (converged, structural tension remains), KO (failed)

See Appendix A (BEST Names Table) for a complete symbol dictionary.

1.5 Structure of This Paper

Section 2 opens with an overview of the full 12-stage Work-Logic Cascade (WoLC) of which e7Day formalizes the first 8, then presents the 4 meta-axioms and 16 submodel axioms (plus 1 definition, 1 design constraint, and 1 notational correspondence). Section 3 presents all derived results with derivation sketches. Section 4 formalizes the BABL/ZION framework as it emerges from the axiom system. Section 5 discusses consistency, independence, the formalization roadmap, and open problems. Section 6 concludes. Appendix A contains the BEST Names symbol dictionary. Appendix B details authorship. Appendix C presents the formal foundation test summary.

Cross-references to companion papers: Where a result has theological, engineering, or psychological significance beyond its formal content, a brief note points to the relevant companion paper. These notes are clearly marked and can be skipped without loss of formal continuity.

2. The Axiom System

2.1 Overview of Work-Logic Cascades (WoLCs)

The e7Day axiom system formalizes the first 8 stages of a 12-stage **Work-Logic Cascade (WoLC)**: a structure in which each stage both *determines* what follows (top-down) and is *constrained* by what precedes it (bottom-up). This section provides a bird's-eye view of the full cascade before the formal axioms are presented.

2.1.1 The Full 12-Stage Cascade

Stage	Name	Established Vision for Destiny (top down)	Constraints for Implementing (bottom up)
m0	**VOID**	Pre-partition domain: nothing is defined yet, everything could be	Unconstrained (the starting condition)
m1	**TYPE**	Binary scope partition ($L \uplus D$): which concepts exist	TYPE constrains whatever may be pulled out of the VOID
m2	**EQUAL**	Int/Real type split: what counts as equal (verdict: OKO)	EQUAL constrains which ultimate TYPE gets to rule this world
m3	**VALUE**	Ground/Ocean value partition: what is unconditionally true vs. conditionally true; programs as decision trees	VALUE preservation constrains which type of EQUAL is used
m4	**LOGIC**	DAY/NIGHT process partition + first-class Time: which processes operate and in which temporal mode	LOGIC constrains which VALUE gets preserved
m5	**CARE**	Self-managing machines + UMP noise threshold: what entities can sustain themselves	CARE decides what LOGIC is worth using
m6	**HOPE**	General intelligence (Balospe) + BABL/ZION bifurcation: what kind of agent can correct the system over the long term	HOPE constrains what is worthy of CARE
m7	**TRUST**	Null aggregation + WorkTime/RestTime: what has been built is consolidated; the cascade is complete	TRUST constrains what is worth investing HOPE
	— Abstract Architecture Boundary —		
m8	**INFO** *(out of scope here)*	Information: all data in the system that is used or abused to influence tools, whether reliable or not	INFO constrains what is worthy of TRUST
m9	**TECH** *(out of scope here)*	Technology systems: which techniques and tools are deployed to change life	Life-giving TECH constrains which INFO is useful
m10	**LIFE** *(out of scope here)*	Biological systems: how living systems shape, sustain, and organize themselves and their spaces	LIFE constrains which TECH is life-giving
m11	**BASE** *(out of scope here)*	Physics, Chemistry: how anorganic processes implement the physical basis for biology and its environment	BASE constrains possibilities for implementing LIFE

There is a fundamental dichotomy in the TYPE that gets to rule the system: either the TYPE cares more about preserving the life of indivisible individuals (the Integers) or the TYPE cares more about equal exchangeability of divisible dividends between all contexts (the Reals). It is impossible to maximally care for both at the same time throughout the system. All sorts of compromises can be tried to mitigate, but one or the other will ultimately always win out eventually — unless a well-defined Jubilee System is used to regularly reduce the tension between these two fundamental TYPEs.

It is hard to condense this dichotomy better into a memorable line than Jesus' dictum: "You can either serve the one indivisible God (= Reality as defined by the infinite recursion in Exodus 3:14) or you can serve divisible monetary interests, but not both at the same time." Practically, this means for example that every study and report written will either be written in order to serve life-giving decision-making in Reality or it will serve moneyed interests in one way or another (including the self-interest of getting paid for writing the report). What makes the world so complex is that all sorts of reports and real-life decisions can be and do get co-opted all the time, such that moneyed interests abuse the life-giving decision-making of others who are unaware.

This study proposes to "abuse" the abuse of moneyed interests as life-giving evidence to make the permanent case for a gentle kind reasonable "Jubilee Magna Carta" that introduces a global contract for gentle kind reasonably replacing the MAD policy for Mutually Assured Destruction with a MAP policy for Mutually Assured Progress that serves the common good for all. This present study lays important theoretical foundations; see others in the series for examples and further details.

2.1.2 Bidirectional Flow

The cascade flows in both directions simultaneously:

Top-down (determines). Each stage shapes what the next stage *can* build. VOID determines which types can be defined. Types determine which equalities hold. Equalities determine which values are preserved. And so on down to TRUST, which determines which information is reliable, which in turn determines which technology works, which shapes biology, which configures physics.

Bottom-up (constrains). Each stage constrains what the stage above *may* claim. Physics constrains what biology can sustain. Biology constrains what technology will work. Technology decides which information is relevant (only the kind that reliably connects to physical and biological reality). Reliable information constrains what can be trusted. Trust constrains what can be hoped. Hope constrains what anyone may dare to care for. Care constrains which logic gets used. Logic constrains which values are preserved. Values constrain what counts as equal. Equality constrains which types can be used. And types constrain which new concepts can be pulled from the void — which ideas begin as someone's fictional type before they manifest as items in reality.

2.1.3 Why Stop at TRUST?

The e7Day axiom system formalizes m0–m7 (VOID through TRUST). The remaining four stages (INFO, TECH, LIFE, BASE) are not axiomatized. Why?

The best explanation is that the first 8 stages constitute the *information-processing architecture*: the minimal structure required for a self-correcting system to exist at all. They address the generic questions that any constructor must resolve regardless of the specific physical, biological, or technological substrate:

- What is the scope? (TYPE)
- What are the fundamental type distinctions? (EQUAL)
- What counts as knowledge? (VALUE)

- How is computation organized? (LOGIC)
- How is the system sustained? (CARE)
- Who corrects the system? (HOPE)
- How is the result consolidated? (TRUST)

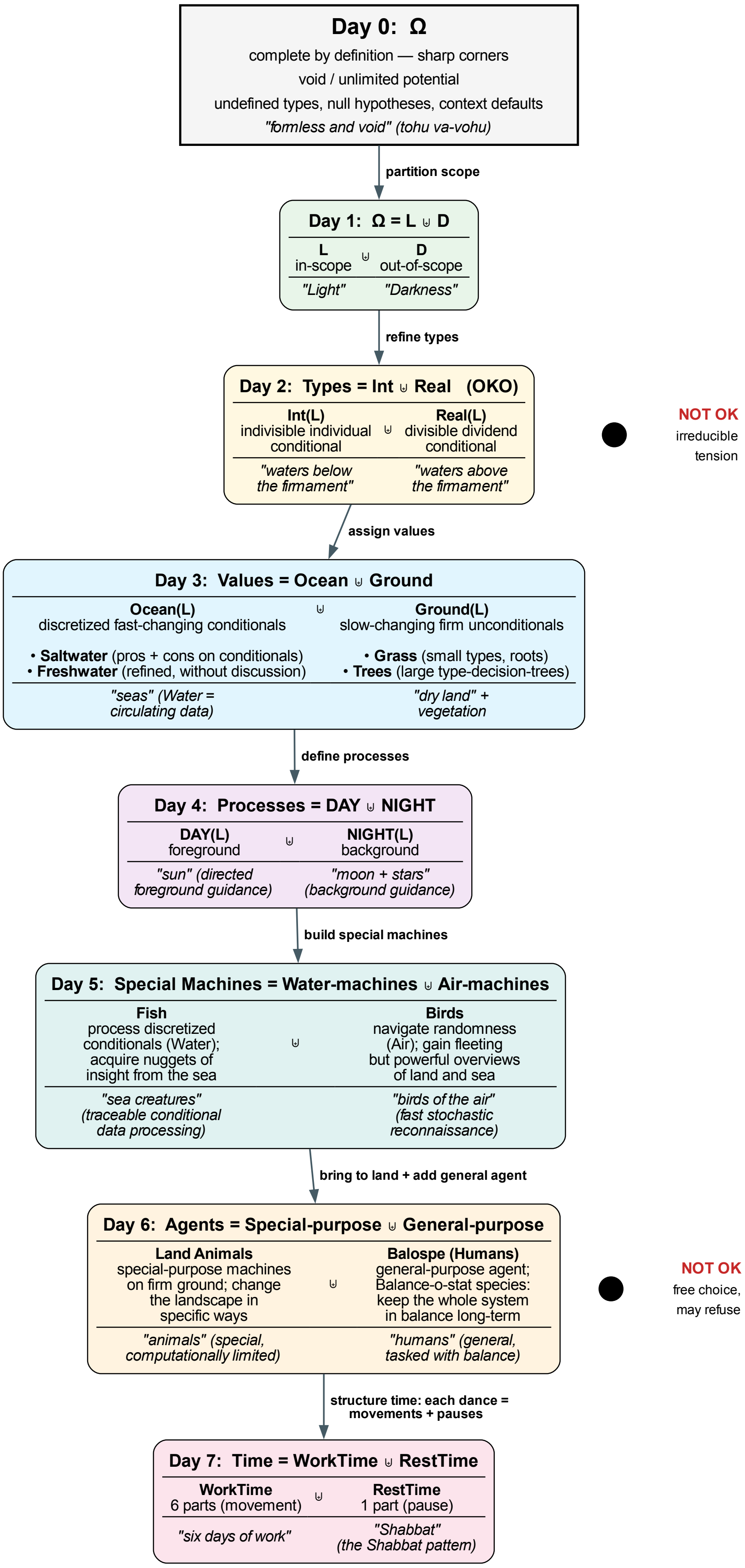
The downstream stages (INFO, TECH, LIFE, BASE) are *implementation details* that depend heavily on lower-level causality chains. Once Trust is placed in Reality (rather than in some fiction), the downstream consequences are largely determined: reliable information follows from honest trust, effective technology follows from reliable information, sustainable biology follows from effective technology, and the physical substrate follows from the constraints of the material world.

In other words: the first 8 stages are about *what any self-correcting system must do*. The last 4 are about *how a specific system does it*, which varies with the constructor and the physical context. The axiom system captures the generic architecture; the implementation details are left to the specific instantiation.

(For the theological interpretation of why the Genesis 1 narrative covers precisely these 8 stages and stops at the seventh day, see Matheo-b12-theophil.)

2.1.4 The Partition Skeleton

Strip the axiom system to its simplest structural pattern: **seven successive binary splits** (one per Day), each dividing a domain into two non-overlapping halves. The Genesis 1 imagery makes the abstract partitions memorable.



The partition skeleton. Day 0 (Ω) is complete by definition (square box). Days 1–7 cut corners from Ω's completeness (rounded boxes) — hence the need for ongoing balancing and the NOT OK state. Each Day corresponds to a submodel: Day 0 = m0, Day 1 = m1, … Day 7 = m7.

Day 5 detail. The Day 5 partition distinguishes two kinds of special-purpose machine within the conditional-data domain (m5.ax1):

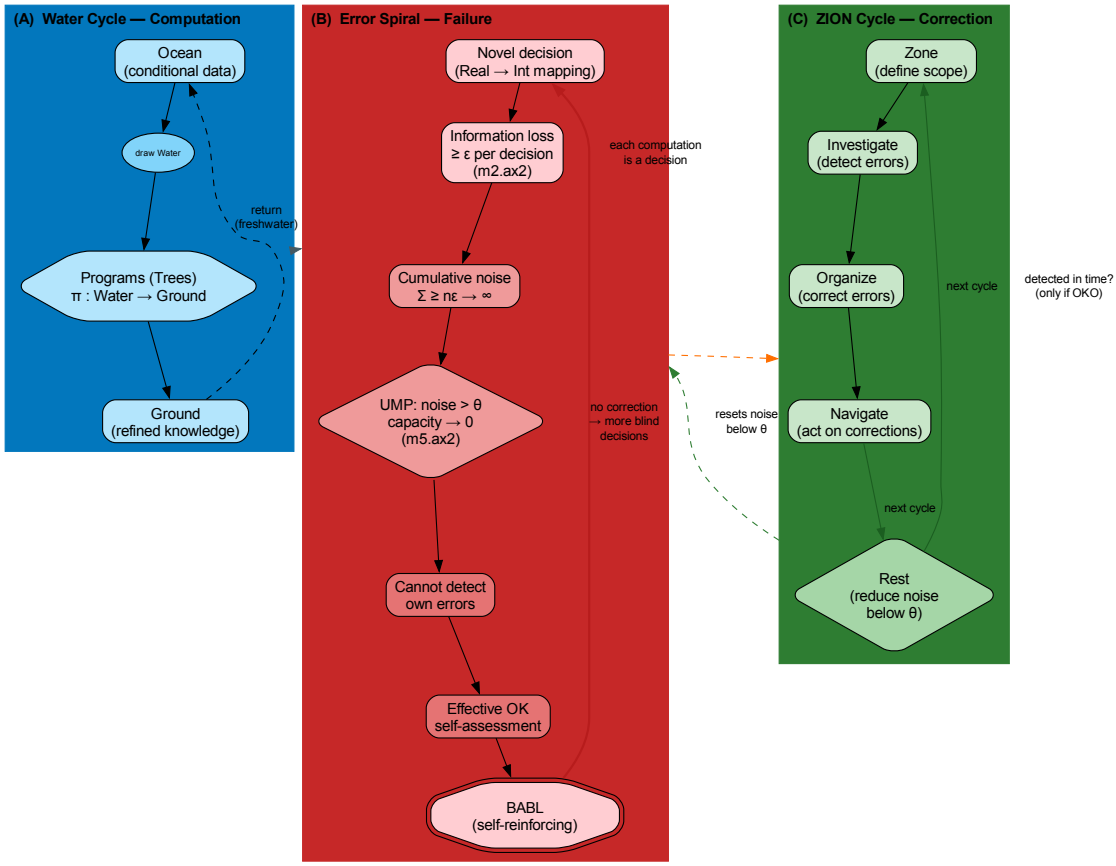
- **Fish** (Water-machines) process the *discretized, fast-changing conditionals* — the Water drawn from Ocean. They acquire nutrients (nuggets of conditional insight) from the sea, albeit without building a solid tree in place. In computational terms: streaming processors that extract value from flowing data without permanent anchoring.
- **Birds** (Air-machines) navigate *randomness* — the even faster-moving component of conditionality (Air). Where Water is traceable conditional data, Air is stochastic noise that nonetheless carries information. Birds gain fleeting but powerful overviews of land and sea. In computational terms: stochastic sampling agents that trade precision for coverage.

Both are special-purpose: each fish species handles one kind of conditional data; each bird species surveys one kind of random landscape. Neither has general intelligence. That awaits Day 6.

The pattern is the same each time: take a domain, split it in two, observe that the two halves are fundamentally different. The entire formal apparatus — theorems, agents, bifurcation dynamics — exists because of the *tensions* these splits create. In particular, the Int/Real split at m2 is the only one that produces verdict OKO (an inherent, irresolvable tension), and that single OKO drives the rest of the system's complexity.

2.1.5 The Three Loops

The partition skeleton (Section 2.1.4) shows structure. This section shows *dynamics*: the three fundamental loops that keep the system alive or drive it to failure.



Three loops. (A) The Water cycle: computation. (B) The error spiral: failure. (C) The ZION cycle: correction. The system's fate depends on whether Loop C runs fast enough to prevent Loop B from completing.

The race condition. Loop A (computation) feeds Loop B (error) with every decision: each Real-to-Int mapping loses $\geq \varepsilon$. Loop B is always running. Loop C (correction) is the only mechanism that resets accumulated noise. If Loop C pauses — if Balospe stops self-correcting, even briefly — Loop B completes and the system enters BABL. The system's survival is a perpetual race between noise accumulation (B) and noise reduction (C). This is what th5 (Rest Necessity) formalizes.

2.1.6 The Core Trap: m2 Creates the Problem, m6 Creates the Choice

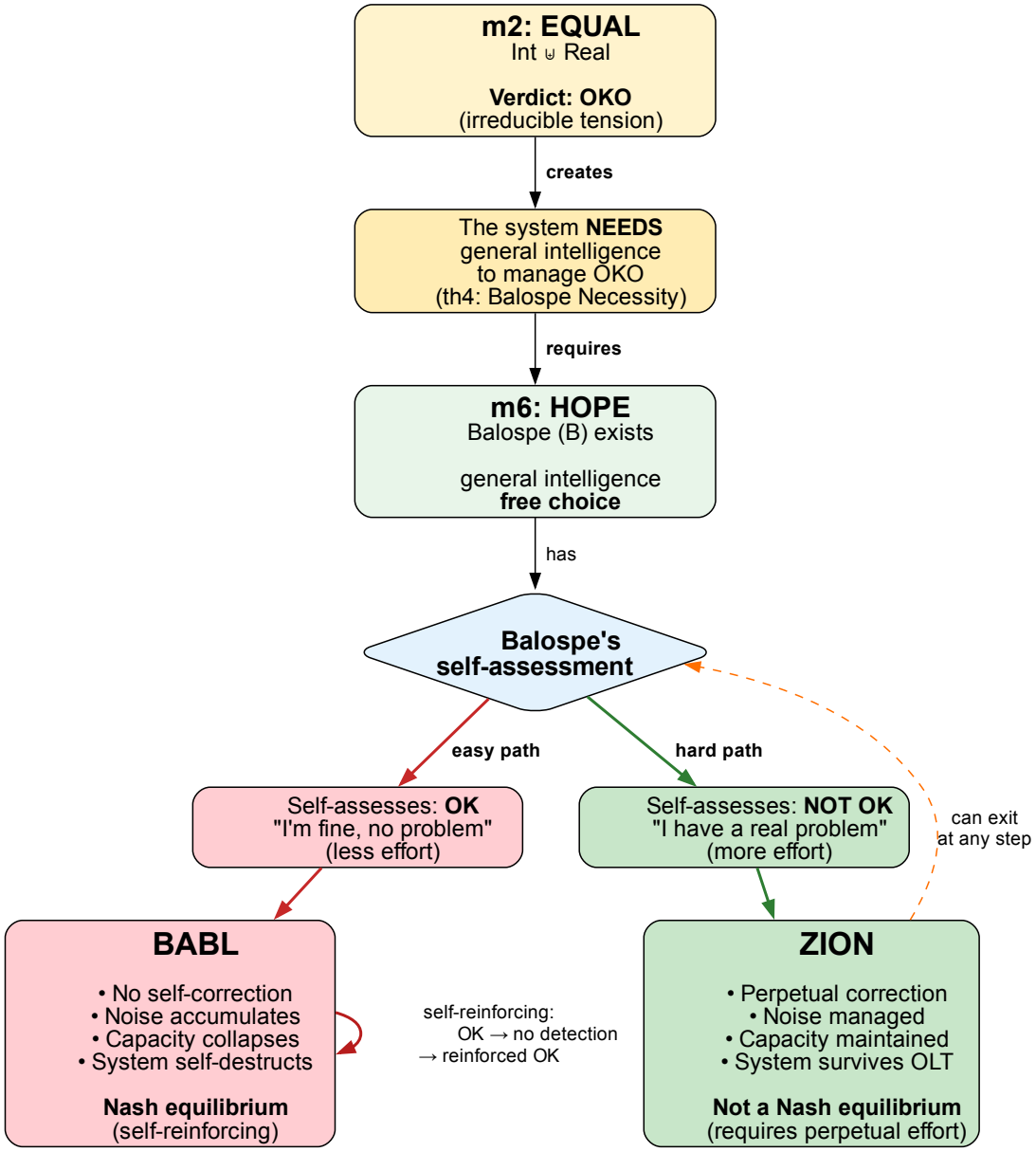
The entire axiom system converges on a single structural trap:

- **m2 (EQUAL)** creates an *irreducible problem*: the Int/Real tension (OKO). This cannot be eliminated, only managed. The system NEEDS intelligence.
- **m6 (HOPE)** creates the *potential solution*: Balospe, a general-intelligence agent capable of managing the tension. But Balospe has *free choice*: engage with the problem (OKO, hard) or ignore it (OK, easy).
- **The trap:** the locally rational choice (OK = less effort) leads to global self-destruction (BABL). The globally necessary choice (OKO = perpetual effort) is locally irrational (more

work, no local payoff).

This is the mechanism. The following diagrams attempt to make it visible from different angles.

2.1.7 The Decision Fork

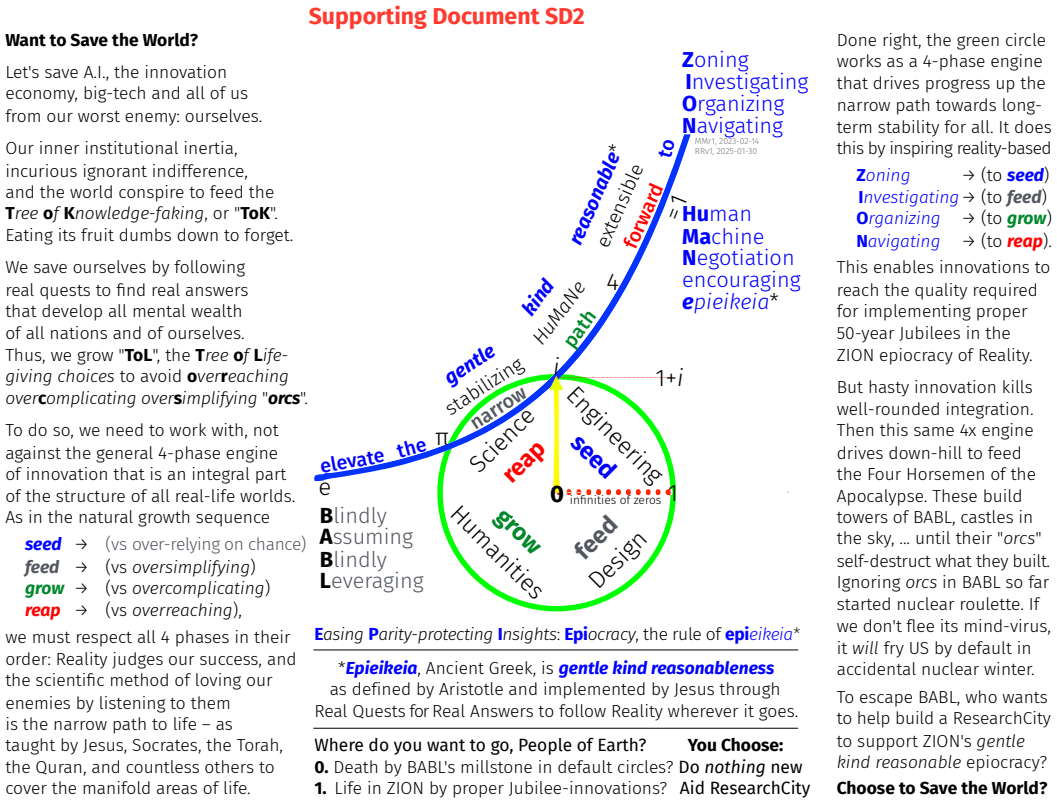


The core trap as a decision fork. m2 forces the need; m6 provides the capability; Balospe's self-assessment determines the outcome. There is no third option.

2.1.8 The Attractor Landscape

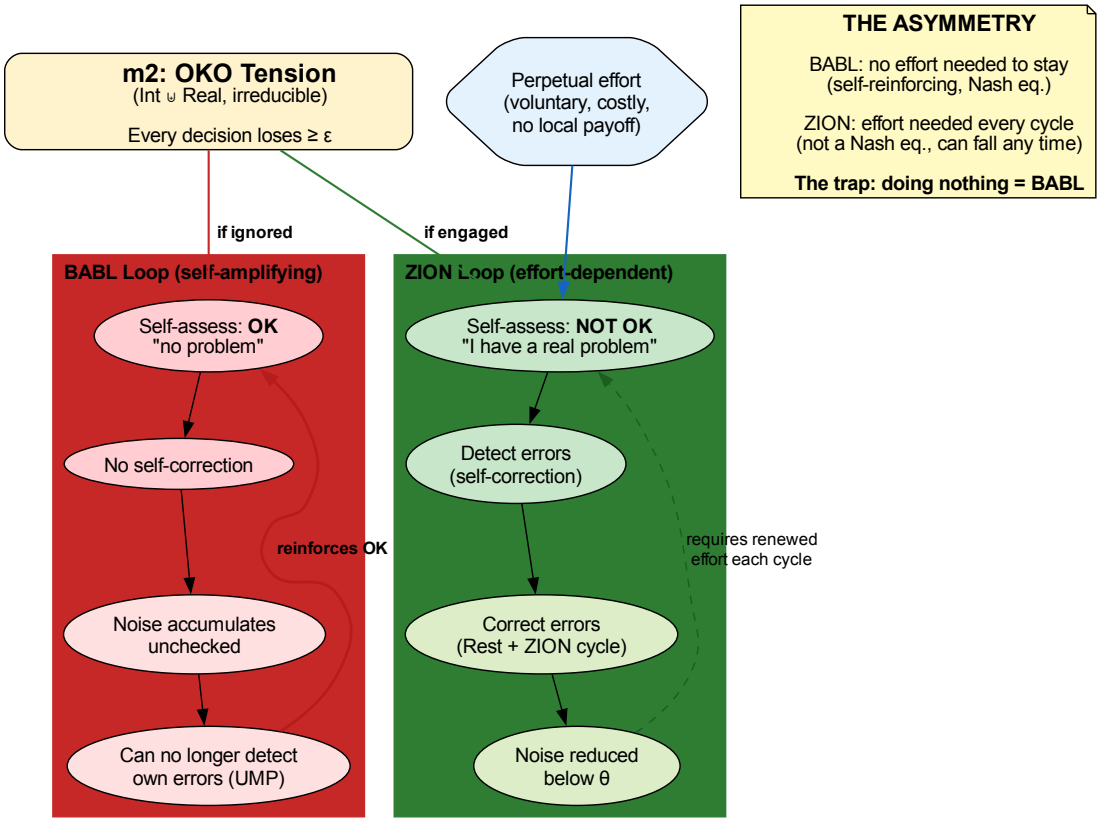
Think of the system's state as a ball on a landscape. BABL is a deep valley (stable attractor): once the ball rolls in, it stays. ZION is a narrow ridge (unstable equilibrium): the ball must be actively kept on top. The asymmetry is the trap — and it is invisible from inside BABL.

The following figure illustrates this bifurcation with the ZION cycle (seed → feed → grow → reap) as the narrow upward path and BABL as the default attractor at zero:



(Supporting Document SD2: Introduction to How Epiocracy Can Save the World If We Let It. LLoL, QQv4, 2025m12d03.)

2.1.9 The Feedback Loops



The core trap as competing feedback loops. The red loop (BABL) is self-amplifying. The green loop (ZION) requires external energy (effort) at every step. The m2 OKO tension drives both.

What makes this a trap? Three properties together:

1. **Inevitability of the problem.** The OKO tension at m2 cannot be avoided. Any system complex enough to contain both Int and Real types (m2.ax1) has it. There is no design that eliminates it.
2. **Asymmetry of the equilibria.** BABL is a Nash equilibrium (no unilateral incentive to leave). ZION is not (there is always a local incentive to stop correcting). The game theory is rigged: the default is failure.
3. **Invisibility of the failure.** When BABL is entered, the agent *cannot detect* that it has entered BABL (because the noise has already collapsed its detection capacity). BABL feels like OK. This is the most dangerous feature: the trap does not feel like a trap.

These three properties together mean that any general-intelligence agent in a system with OKO tension will, by default, drift toward BABL unless it *actively and perpetually* maintains OKO self-assessment. The system does not need an external adversary to fail. It needs only a pause in self-correction.

This is what the e7Day axiom system formalizes. Everything else in the system — the partitions, the flows, the agents, the theorems — exists to make this trap visible, to characterize its

mechanism, and to identify the narrow path (ZION) that avoids it.

After this overview, Section 2.2 presents the 4 meta-axioms that govern all stages, and Section 2.3 walks through each submodel (m0–m7) individually.

2.2 Cross-Model Meta-Axioms (mc)

These four axioms constrain the composition of all submodels. They define what it means for a construction stage to be complete and how stages relate to each other.

mc.ax1 — Constructive Fixpoint (e7day-mc-ax1)

$$\text{process}(m_k)(\text{result}(m_k)) = \text{result}(m_k) \qquad \forall\, k \in \{0, \ldots, 7\}$$

Every submodel produces a fixpoint: applying the submodel's construction process to its own output yields the same output. This is idempotency of the construction operator. The fixpoint need not be unique; the axiom asserts existence, not uniqueness.

Or equivalently:

$$\text{result}(m_k) = \text{fix}(\text{process}(m_k))$$

Formal note. The fixpoint here is the Kleene fixpoint of a Scott-continuous operator on a complete partial order of "construction states." The axiom asserts that each submodel's operator has a fixpoint, not that the operator is contractive (which would give uniqueness via Banach). The weaker fixpoint existence is sufficient for the cascade structure.

m0 resolution. $\text{result}(m_0) = \Omega$ (the identity fixpoint: the void produces itself). The construction process at m0 is the identity function $\text{process}(m_0) = \text{id}$, and mc.ax1 holds trivially: $\text{id}(\Omega) = \Omega$. This resolves the open question from the MMv2 draft.

mc.ax2 — OK Convergence (e7day-mc-ax2)

$$\begin{aligned}\text{OK}(m_k) \;\leftrightarrow\; &\text{process}(m_k)(\text{result}(m_k)) = \text{result}(m_k) \\ &\wedge\; \text{scope}(\text{result}(m_k)) \subseteq \text{scope}(m_k)\end{aligned}$$

The verdict OK is a conjunction: the construction converged to a fixpoint (mc.ax1 is satisfied) AND the result's scope does not exceed the submodel's declared scope. The second conjunct excludes scope creep: a submodel that converges but introduces elements outside its declared domain does not receive OK.

Note. The verdict OKO (used at m2) means: fixpoint convergence holds but an inherent structural tension remains that cannot be resolved within the submodel's scope. OKO is not a failure verdict (that would be KO); it is a non-failure verdict that signals ongoing management is required.

mc.ax3 — Evening-First (Via Negativa) (e7day-mc-ax3)

$$\text{process}(m_k) = \text{evening}(m_k) \triangleright \text{morning}(m_k)$$

Each submodel's construction process decomposes into an elimination phase (evening: identify and exclude failure modes) followed by a construction phase (morning: commit to positive construction from the surviving candidates).

Formal note. This is formally related to branch-and-bound: eliminate infeasible branches before constructing solutions. It may be derivable from optimization theory (if the construction process is modeled as optimization over a constraint set, evening is constraint propagation and morning is solution construction). If derivable, mc.ax3 should be reclassified as a theorem, reducing the axiom count by 1.

Independence note. Independence of mc.ax3 from the remaining axioms is an open question. If derivable from optimization theory, the axiom count reduces by 1. This is deferred to a future formalization session.

mc.ax4 — Construction Cascade (e7day-mc-ax4)

$$\text{input}(m_k) \supseteq \bigcup_{j<k} \text{result}(m_j) \qquad \forall\, k \in \{1, \ldots, 7\}$$

Each submodel's input includes all prior submodels' fixpoint results. The cascade is cumulative and order-preserving. The $\supseteq$ (rather than $=$) allows additional input beyond prior results (e.g., external parameters supplied by the constructor).

Formal note. This defines a functor from the poset $(\{0, \ldots, 7\}, \leq)$ to the category of "construction states with fixpoint operators." The cascade condition is the functoriality requirement: composition of construction operators respects the order. A refinement from linear order to DAG (directed acyclic graph) was suggested during adversarial testing but not adopted in OOv1; some stages (notably m5) depend on multiple prior stages in ways that a DAG would capture more precisely.

2.3 Submodels (m0–m7)

The following sections present each of the 8 submodels in order. Each submodel builds on the fixpoint results of all prior stages (mc.ax4, Construction Cascade). The axioms within each submodel are numbered `m<k>.ax<n>` where `k` is the submodel index and `n` is the axiom number within that submodel.

2.3.0 m0 — VOID

m0.ax0 — Pre-Partition Domain (Actual/Potential) (e7day-m0-ax0)

$$\begin{aligned} &\text{Types}(\Omega) = \emptyset \\ &\wedge\ \forall M \in \mathbb{R},\ \exists \text{ finite partition } P \text{ of } \Omega : H(\text{uniform}(P)) > M \end{aligned}$$

The pre-construction state Ω has two faces:

1. **Actual:** Zero types are defined. The type-list is empty. This is the void-type characterization: $\text{Types}(\Omega) = \emptyset$.
2. **Potential:** The space of potentially definable types is unlimited. For any entropy bound M, there exists a finite partition of Ω whose uniform-distribution entropy exceeds M. This captures "maximum uncertainty" as the unboundedness of entropy over finite approximations, not as the entropy of a specific infinite distribution.

These are not conflicting characterizations. They are two coordinates of the same state: nothing is defined yet (void), therefore anything *could* be defined (maximum uncertainty). The distinction is between *actuality* (what has been selected: nothing) and *potentiality* (what could be selected: unlimited).

Illustrative example. "Zero apples" and "zero nuclear winters on Earth" have the same count (zero) but existentially different significance. A zero count is meaningless without knowing the *type* being counted, because which type it is makes all the difference. At Ω, the count of *defined types* is zero. Yet one can always define another type with another variation. Any of these could be the first type defined. Hence the uncertainty about the first partition is maximal.

Formal note. The formula $H(\Omega) = H_{\max}$ from the MMv2 draft is shorthand for line (2): the supremum of Shannon entropy over all finite partitions is $+\infty$ (unbounded). This is a well-formed statement in extended real analysis. It does NOT assert a Shannon entropy value over an infinite probability distribution (which would be undefined for the void).[1]

2.3.1 m1 — TYPE

m1.ax1 — Binary Scope Partition (e7day-m1-ax1)

$$\Omega = L \uplus D \qquad \text{with } L \neq \emptyset,\ D \neq \emptyset$$

The first constructive act partitions the pre-construction state into two disjoint non-empty sets: L (in-scope, "light") and D (out-of-scope, "dark"). All subsequent construction operates within L. The partition is irrevocable within a construction cycle.

Formal note. $\uplus$ is disjoint union. The non-emptiness of both L and D is essential: if $D = \emptyset$, the scope is unbounded (no elimination has occurred); if $L = \emptyset$, no construction is possible. The constructor provides a specific partition $\langle L, D \rangle$ of Ω. This is a constructive existential with a witness (the constructor's act), not an application of the Axiom of Choice.

2.3.2 m2 — EQUAL

m2.ax1 — Integer/Real Type Split (e7day-m2-ax1)

$$\text{Types}(L) = \text{Int}(L) \uplus \text{Real}(L)$$

Types within the in-scope domain partition into two disjoint classes: $\text{Int}(L)$ (indivisible types — entities that cannot be subdivided without destruction of identity) and $\text{Real}(L)$ (divisible types — quantities that admit non-trivial partitions preserving type membership).

Example. In a type-theoretic setting: Int corresponds to nominal types (identity matters), Real to structural types (structure matters). In an economic setting: individuals (Int) vs. divisible resources (Real).

m2.ax2 — Lossy Mapping (e7day-m2-ax2)

$$\forall\, \varphi : \text{Real}(L) \to \text{Int}(L) \\ :\ \text{info-loss}(\varphi) \geq \varepsilon > 0$$

[1] The actual/potential distinction at m0.ax0 raises a question about *typed cardinalities*: if the type of infinity matters — as the Int/Real distinction at m2 suggests — then standard cardinality (which identifies sets related by any bijection, regardless of type structure) may be too coarse a measure of "size." Numerosity theory [Benci and Di Nasso, 2003] formalizes a finer notion of set size that preserves the proper-subset-is-smaller principle, so that $\text{num}(\mathbb{N}) < \text{num}(\mathbb{N} \cup \{x\})$ for $x \notin \mathbb{N}$. Whether the e7Day type system implies a specific refinement of cardinality is future work.

Every mapping from Real types to Int types incurs strictly positive information loss. The bound $\varepsilon > 0$ is uniform (does not depend on the specific mapping). This is the irreducibility axiom: no lossless discretization exists.

Formal note. The information loss info-loss(φ) can be formalized as the conditional entropy $H(\text{Real} \mid \varphi(\text{Real}))$, which measures the information about Real values that is destroyed by applying φ. The axiom asserts this is bounded below by $\varepsilon > 0$ for all φ in the class of measurable functions $\text{Real}(L) \to \text{Int}(L)$.

Connection to Ashby. The variety of $\text{Real}(L)$ exceeds the variety of $\text{Int}(L)$. By the Law of Requisite Variety [Ashby, 1956], no Int-type regulator can fully regulate a Real-type system. This is an independent formal derivation of the same structural fact.

Verdict at m2: OKO. The construction converges (a firmament between the type classes is established) but the structural tension between Int and Real is inherent, not a construction defect. This is the only submodel with verdict OKO.

2.3.3 m3 — VALUE

m3.ax1 — Ground/Ocean Value Partition (e7day-m3-ax1)

$$\text{Values}(L) = \text{Ground}(L) \uplus \text{Ocean}(L)$$

Values within L partition into Ground (values whose truth status is independent of the Int/Real mapping currently in effect) and Ocean (values whose truth status is conditional on the current mapping).

m3.ax2 — Programs as Decision Trees (e7day-m3-ax2)

Programs are finite decision trees π : Water $\to$ Ground, rooted in Ground, taking Water (drawn from Ocean) as input and producing Ground output.

The finite-tree restriction is intentional: at Stage 3 (VALUE), only finite decision trees exist. This computational limitation characterizes the special-purpose machines completed at m5–m6.ax1 ("animals" in the Genesis instantiation). General intelligence (m6.ax2, Balospe) breaks through this limitation, introducing open-ended computation. The cascade thus models a progression from computationally limited to computationally general agents.

Formal note. This is a Curry-Howard pair: Ground values correspond to types (propositions), programs correspond to terms (proofs), and computation corresponds to proof normalization. Water is the conditional input — the empirical data that the program must process.

m3.ax3 — Water Circulation (e7day-m3-ax3)

$$\text{Ocean} \xrightarrow{\text{draw}} \text{Trees} \xrightarrow{\text{return}} \text{Ocean}$$

Water must circulate: Ocean → Trees → Ocean. Without circulation, Ground dries (programs have no input) and Ocean stagnates (conditional values are never updated).

Partial derivation. An argument from m3.ax1 + m3.ax2 + entropy considerations:

- m3.ax1 establishes Ground and Ocean as a partition of Values.
- m3.ax2 establishes programs as Trees drawing Water from Ocean.

- If Water is drawn but never returned, the conditional-value pool (Ocean) loses variety monotonically as processed data moves to Ground. But m3.ax1 guarantees Ocean is non-empty (it is a partition of Values, and conditional values exist as long as m2's OKO tension exists — the Int/Real mapping is always lossy, so new contingencies always emerge). Therefore Water must return.
- The return path must include a refinement step: raw conditional data ("saltwater") processed by Trees produces refined output ("freshwater") that updates Ocean.

However, gaps remain: m3.ax1 is a structural partition (type-level), not a quantity-level statement, so the depletion argument requires the additional step that m2's OKO tension perpetually generates conditional values. This dependency on m2 makes the derivation cross-submodel in a way that strengthens the case but prevents a clean single-submodel proof. m3.ax3 is therefore retained as an axiom with this partial derivation as supporting evidence.

Refinement note. The circulation requirement includes an implicit refinement step: raw conditional data drawn from Ocean ("saltwater") is processed by programs (Trees) and returned as refined output ("freshwater"). The mechanism of refinement (whether analogous to aquifers, rain clouds, or distillation) is not specified by the axiom; only the necessity of circulation and refinement is asserted.[2]

2.3.4 m4 — LOGIC

m4.ax1 — DAY/NIGHT Process Partition (e7day-m4-ax1)

$$\text{Processes}(L) = \text{DAY}(L) \uplus \text{NIGHT}(L)$$

Processes within L partition into DAY (directed, foreground, deterministic) and NIGHT (nondeterministic, background, stochastic).

m4.ax2 — First-Class Time (e7day-m4-ax2)

$$\exists T \in \text{Types}(L) \ : \ T = \text{Time} \ \wedge \ \exists d : T \times T \to \mathbb{R}_{\geq 0}$$

Time is a first-class type within L equipped with a metric d (measurable progress). This enables convergence criteria (mc.ax2), periodicity (Design Constraint DC1), and temporal reasoning.

2.3.5 m5 — CARE

m5.ax1 — Self-Managing Machines (e7day-m5-ax1)

Conditional-data machines (operating on Ocean and Sky data) are self-managing and self-replicating: they maintain and reproduce themselves without external intervention.

$$\forall t \geq t_0 : \ \text{Types}(L, t) \supseteq \text{Types}(L_{\text{machine}}, t_0)$$

The class of conditional-data machine types present at t_0 persists for all subsequent times. This is the autopoiesis property [Luhmann, 1995] applied to machine types: the *class* persists, not necessarily each individual instance.

[2] The salt/freshwater analogy highlights that circulation alone is insufficient: if Trees return unprocessed data (saltwater recirculated as saltwater), Ocean gains nothing. The value of circulation is the *refinement* — conditional data processed into applicable knowledge. This is analogous to Muller's ratchet in biology [Loewe, 2006]: without a mechanism to remove accumulated deleterious changes (salt), system quality degrades irreversibly.

Open question. Is self-replication at the instance level (each machine reproduces) too strong? The axiom may need refinement to "self-maintaining at the type level and replicable at the instance level."

m5.ax2 — Unimportant Message Problem (UMP) (e7day-m5-ax2)

$$\text{noise}(C) > \theta \;\rightarrow\; \text{capacity}(C, \text{signal}) \to 0$$

For any communication channel C, when noise exceeds threshold θ, the channel capacity for meaningful signal collapses to zero. This is a qualitative consequence of Shannon's noisy channel theorem [Shannon, 1948].

Formal note. The quantitative version is Shannon's: $C = B \log_2(1 + S/N)$ where C is capacity, B is bandwidth, S/N is signal-to-noise ratio. When $N \to \infty$ (or equivalently $S/N \to 0$), $C \to 0$. The axiom extracts the qualitative conclusion. This achieved clean 10/10 in adversarial testing as it rests directly on an established theorem.

Status note. This axiom captures a qualitative consequence of Shannon's noisy channel theorem. Within e7Day it is treated as a primitive, making the system self-contained. Keeping m5.ax2 as an axiom (rather than importing Shannon's theorem) is what allows th5 (Rest Necessity) to be derived purely from the axiom system: the derivation chain m2.ax2 + m6.ax5 + m5.ax2 + th3 requires m5.ax2 as an internal axiom, not an external import.

2.3.6 m6 — HOPE

m6.ax1 — Special-Purpose Completion (e7day-m6-ax1)

The construction cascade m0–m5 produces a functionally complete world of self-managing machines. No component has general problem-solving capability.

$$\begin{aligned} &\forall\, t \in \mathcal{T}_0,\ \exists\, M_t :\ M_t \text{ performs } t \\ &\wedge\ \neg\exists\, M^*\ \forall\, t \in \mathcal{T} :\ M^* \text{ performs } t \end{aligned}$$

For every task t in the current task distribution $\mathcal{T}_0$, there exists a machine M_t that performs t. But there is no machine M^* that performs all tasks in the full task space $\mathcal{T}$ (including novel tasks $t \notin \mathcal{T}_0$).

m6.ax2 — Balospe (e7day-m6-ax2)

$$\begin{aligned} &\exists\, B \in \text{Types}(L)\ :\ \text{general-intelligence}(B) \\ &\wedge\ \text{responsible}(B, \text{Balance}(L), \text{OLT}) \\ &\wedge\ \text{recursively-endowed}(B) \end{aligned}$$

Balospe (Balance-o-stat species) exists with general intelligence, responsibility for long-term balance within L, and recursive endowment (the constructor's general pattern is replicated in the construct).

Predicate formalization:

- **general-intelligence(B):** Unbounded Ashby variety. $\forall \mathcal{T},\ \exists$ extension of $B :\ V_B \geq V_{\mathcal{T}}$ (for any task distribution, B can extend its variety to match).
- **self-managing(B):** Fixpoint of self-model update. self-model(B) = fix(update$_B$) (the agent's self-model is stable under its own update operator).

- **recursively-endowed(B):** Sub-agent spawning. B can spawn sub-agents b_i such that each b_i has the same general-intelligence property (restricted to a sub-domain). This is the self-hosting compiler: a compiler that can compile its own source code. The existence of such a fixpoint is not guaranteed for arbitrary constructors; the axiom asserts it for the specific constructor used in this construction.

By Ashby's Law [Ashby, 1956]: since the EQUAL ambiguity generates Real-type variety that exceeds Int-type variety (m2.ax2), and since special-purpose machines are Int-type regulators (m6.ax1), only a general-intelligence agent with open-ended variety can regulate the system OLT. This is theorem th4, derived independently below.

m6.ax3 — Matched OKO Self-Correction (e7day-m6-ax3)

$$\begin{aligned} &\text{OKO}(m_2) \ \wedge \ \text{OKO}(m_{6.2}) \\ &\wedge \ \text{designed-to-resolve}(B, m_2) \\ &\quad \rightarrow \ \text{OK}^{+}(\text{system}) \end{aligned}$$

Two matched OKO verdicts (the EQUAL ambiguity at m2 and Balospe at m6.2) produce system-level OK^{+} when Balospe is specifically designed to resolve the m2 ambiguity. The "designed-to-resolve" predicate means: B has a correction procedure for each novel instance of the PERFECT/PERFIDE trade-off.

Formal note. OK^{+} is stronger than OK: the system not only converges without scope creep but also has an internal mechanism for handling the structural tension that OK alone cannot resolve.

Definition (BABL). Given that m2 establishes OKO as the structural reality, BABL(B) :⇔ self-assesses(B, OK). Any agent declaring OK is ignoring a real condition, hence blindly assuming. The converse also holds: BABL entails OK self-assessment (by the meaning of "blindly assuming"). This is analytic conditional on the truth of m2's OKO verdict.

where:

- **BABL** (Blindly Assuming Blind Leveraging): the state in which an agent assumes its own adequacy and acts on that assumption without self-correction.
- **ZION** (Zoning → Investigating → Organizing → Navigating): the perpetual innovation cycle characterized by OKO self-assessment.

m6.ax4 — ZION Requires OKO Self-Assessment (e7day-m6-ax4)

$$\text{ZION}(B) \ \rightarrow \ \text{self-assesses}(B, \text{OKO})$$

This is necessary but not sufficient. OKO self-assessment is a prerequisite for ZION but does not guarantee it. A free agent can stop self-correcting at any time. (Modal status: contingent.)

Formal note. The bifurcation between BABL and ZION is asymmetric. BABL is a stable attractor (once entered, the OK self-assessment reinforces itself: OK → no correction → no detection of error → reinforced OK). ZION is an unstable equilibrium requiring perpetual maintenance (OKO → active correction → detection of error → continued OKO, but the cycle can be exited at any step).

Axiom count note. The old m6.ax4 contained both directions (OK → BABL and ZION → OKO). The OK ↔ BABL biconditional is now a definition (analytic, not counted as an axiom). The new m6.ax4 contains only the substantive direction (ZION → OKO). Net change in axiom count: 0.

For the theological significance of this bifurcation, see Matheo-b12-theophil, Section 5. For the psychological parallel to Dunning-Kruger and cognitive dissonance, see Matheo-b12-socpsy, Section 4.

m6.ax5 — Environmental Novelty (Open-System Assumption) (e7day-m6-ax5)

$$\forall\, t_0,\ \exists\, t > t_0,\ \exists\, \tau \notin \mathcal{T}_0 :\ \tau \in \mathcal{T}(t)$$

For any time t_0, there is a later time $t > t_0$ at which a novel task τ appears that is not in the current task distribution $\mathcal{T}_0$.

The system operates in an environment where novel task configurations arise. This axiom makes explicit a premise that was hidden in th4 (Balospe Necessity), th5 (Rest Necessity), and th7 Gate 5 (Perpetual Scope-Expansion) in the MMv2 draft.

Placement rationale. The link to HOPE (m6) is real: the building of dynamical systems based on reliable types (Day 6, "animals on land") is essential for novel environments to emerge. The novelty is not a background assumption about the universe — it is a consequence of the construction cascade producing systems complex enough to generate novel configurations. Hence it belongs in the HOPE submodel (m6), not as a generic meta-axiom.

2.3.7 m7 — TRUST

m7.ax1 — Null Aggregation (e7day-m7-ax1)

$$\text{result}(m_7) = \bigcup_{k=0}^{6} \text{result}(m_k)$$

TRUST adds no new content. The fixpoint of m7 is the union of all prior fixpoints. This is the null operator: $\text{process}(m_7) = \text{id}$.

m7.ax2 — WorkTime/RestTime Partition (e7day-m7-ax2)

$$\text{Time} = \text{WorkTime} \uplus \text{RestTime}$$

The time type (from m4.ax2) has a type-level distinction: work-time and rest-time are not interchangeable. Rest is not the absence of work but a distinct temporal mode with its own structural function (consolidation, error export, entropy reduction).

Design Constraint DC1 — Fractal Periodicity (e7day-dc1)

$$\text{WorkTime} : \text{RestTime} = 6 : 1 \qquad \text{(integer ratio, fractal across scales)}$$

(Reclassified from axiom m7.ax3 per review issue m4. The 6:1 ratio depends on empirical constraints, not purely axiomatic content.)

The 6:1 integer ratio is the constrained optimum for Earth-like systems, determined by four constraints:

1. **Circadian quantization:** Biological agents operate on integer-day cycles. Fractional-day scheduling incurs phase-mismatch costs.
2. **Lunar commensurability:** $28 \div 7 = 4$ (exact integer division of the lunar cycle).
3. **Innovation-cycle isomorphism:** The 6+1 structure is isomorphic to the natural innovation cycle (e7Ch model, forthcoming).

4. **Schelling-point stability** [Schelling, 1960]: A bright-line integer ratio is a coordination equilibrium resistant to BABL erosion. Continuous ratios are easier to drift; discrete ratios require a discrete decision to violate.

Formal note. The claim is *constrained* optimality, not global optimality. Different constraint sets (non-circadian biology, non-lunar environment) could yield different optimal ratios. The constraint asserts that under the stated constraints, 6:1 is optimal.

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3. Derived Results

3.0 Notational Correspondences

NC1 — W = L (e7day-nc1)

(Reclassified from theorem th1 per review issue m1. This is a notational correspondence, not a derived theorem.)

$$W = L \qquad \text{(under constructor = universal constructor)}$$

Under the identification constructor = God (the universal constructor), the in-scope domain L exhausts all that is constructed. But "all that is constructed" IS the world W (by definition, within PET). Therefore $W = L$.

Scope note. For non-universal constructors, $W \subseteq L \subset \Omega$.

3.1 Submodel Theorems

m2.th1 — PERFECT/PERFIDE Impossibility (e7day-m2-th1)

Define:

- PERFECT: Preserve Existence Rights of Functionally Existing Copies of Types (prioritize type integrity)
- PERFIDE: Preserve Exchangeability of Resource Functionality In Diverse Environments (prioritize type exchangeability)

Theorem.

$$\neg\,(\text{PERFECT} \wedge \text{PERFIDE}) \quad \text{universally}$$

Proof sketch. Suppose both hold universally. PERFECT applied to Real types requires preserving each Real-type entity's identity. PERFIDE requires that any resource can substitute for any other in any environment. In a system containing both Real and Int types (guaranteed by m2.ax1), this requires cross-type mappings φ : Real $\to$ Int (and vice versa): if you need to exchange a Real resource for an Int one, you need a mapping between the types. By m2.ax2, any such mapping incurs info-loss $\geq \varepsilon > 0$. The lost information includes identity-relevant properties of Real-type entities, contradicting PERFECT. Conversely, PERFIDE applied to Int types requires treating them as fungible, but Int types are indivisible (m2.ax1) — imposing fungibility on indivisible entities adds spurious structure. ■

Reclassification note. Originally axiom m2.ax3. Reclassified to theorem during adversarial testing (TEMPER) upon demonstration that it derives from m2.ax1 + m2.ax2. The reclassification reduces the axiom count (fewer assumptions) while preserving all consequences.

m6.th1 — OSCR Collapse (e7day-m6-th1)

Define **OSCR** (over-Simplify, over-Complicate, over-Reach): the collapse mechanism in which an agent (a) reduces complexity below requirements (over-simplify), (b) adds work-arounds for the resulting failures (over-complicate), (c) extends control beyond available resources (over-reach), repeating until system failure.

Theorem. (Derivation from m6.ax3 + m6.ax4 in 6 steps.)

```
Step 1: OKO(m2)                                  [Given: m2 verdict]
Step 2: self-assesses(B, OK)                      [Assumption]
Step 3: → BABL(B)                                 [Def. (BABL), Section 2.3.6]
Step 4: → ¬self-corrects(B)                       [Def. (BABL), consequence]
Step 5: → ¬designed-to-resolve(B, m2)             [Contrapositive of
                                                    m6.ax3 antecedent]
Step 6: → ¬OK+(system)  →  KO(system)             [m6.ax3 fails;
                                                    OKO(m2) unresolved]
```

If the EQUAL ambiguity (m2) is OKO and Balospe self-assesses as OK, then by m6.ax4 Balospe is in BABL (step 3), does not self-correct (step 4), cannot fulfill the designed-to-resolve condition of m6.ax3 (step 5), and the system fails (step 6). ■

Reclassification note. Originally axiom m6.ax5. (The new m6.ax5 Environmental Novelty axiom occupies the vacated numbering slot.)

3.2 System-Level Theorems

th2 — Lossiness (e7day-th2)

$$\begin{aligned}\text{Complex}(L) \;\to \forall\, \varphi : \text{Real}(L) \to \text{Int}(L)\\ : \;\text{info-loss}(\varphi) > 0\end{aligned}$$

Derivation. Direct from m2.ax1 + m2.ax2. If L is sufficiently complex to contain both Real and Int types (which it is, by m2.ax1, given the partition is non-trivial), then all cross-type mappings lose information.

Note. The derivation is straightforward but the conclusion is not obvious: the irreducible loss in every cross-type mapping is a structural feature of any system complex enough to contain both Int and Real types. This is an important source of slightly harmful changes in the system, which feeds the error-accumulation mechanism of m2.ax2 and ultimately drives the necessity of rest (th5).

th3 — BABL Origin (e7day-th3)

Theorem. BABL originates in self-assessment: OK → BABL (sufficient); ZION → OKO (necessary, not sufficient).

Derivation. The OK ↔ BABL biconditional follows directly from the Definition (BABL) in Section 2.3.6. The definition establishes: BABL(B) :⇔ self-assesses(B, OK), conditional on m2's OKO verdict. The theorem's substantive content is the game-theoretic consequence below, which is not definitional but derived.

Game-theoretic consequence (the substantive content of th3). BABL is a Nash equilibrium: no unilateral deviation from OK self-assessment is incentivized (because the agent cannot detect its own blindness). ZION is *not* a Nash equilibrium: unilateral deviation (stopping self-correction) is always locally incentivized (saves effort). This is the fundamental asymmetry: BABL is self-reinforcing; ZION requires perpetual effort against the local gradient.

For the psychological literature on why ego resists OKO, see Matheo-b12-socpsy, Section 4.2.

th4 — Balospe Necessity (e7day-th4)

Theorem. The system requires general intelligence for OLT survival.

Derivation. By m2.th1, PERFECT and PERFIDE cannot both hold universally. By m6.ax5 (Environmental Novelty), novel configurations arise that are not in the current task distribution $\mathcal{T}_0$. These novel configurations generate novel PERFECT/PERFIDE trade-offs. By m6.ax1, special-purpose machines handle only $\mathcal{T}_0$. By m5.ax1, these machines are self-maintaining but not adaptive to novel tasks. By Ashby's Law [Ashby, 1956], a regulator with variety $V_R < V_S$ cannot fully regulate the system. Since novel tasks $t \notin \mathcal{T}_0$ require variety beyond V_R, only an agent with open-ended variety (general intelligence) can handle them. ■

For engineering case studies illustrating this necessity, see Matheo-b12-syseng, Section 3.2.

th5 — Rest Necessity (e7day-th5)

Theorem. Periodic consolidation (rest) is structurally necessary.

Derivation (from axioms). The primary argument derives th5 from m2.ax2 + m6.ax5 + m5.ax2 + th3 without importing external theory:

1. Each decision involves a Real-to-Int mapping (applying a policy to a continuous situation), incurring information loss $\geq \varepsilon$ (m2.ax2).
2. By m6.ax5 (Environmental Novelty), novel decisions keep arising — the task distribution is never exhausted.
3. Therefore cumulative noise grows without bound over time: after n novel decisions, cumulative error $\geq n\varepsilon \to \infty$ as $n \to \infty$.
4. By m5.ax2 (UMP), when noise exceeds threshold θ, channel capacity collapses to zero. Since cumulative noise is unbounded (step 3), the threshold θ is eventually exceeded.
5. When channel capacity collapses, the agent can no longer detect its own errors — the signal "you are drifting" is indistinguishable from noise. This produces effective OK self-assessment (the agent cannot detect any problem).
6. By th3 (BABL Origin), OK self-assessment entails BABL. Therefore, without a noise-reduction mechanism, the agent inevitably enters BABL.
7. The only mechanism available within the axiom system for reducing accumulated noise is periodic consolidation (rest): a dedicated phase in which the agent pauses decision-making and performs error-correction passes, reducing cumulative noise below θ.

Therefore rest is structurally necessary: it is the only mechanism that prevents the m2.ax2 → m6.ax5 → m5.ax2 → th3 chain from completing. ■

Note. This derivation chain makes th5 a genuine theorem of the axiom system. The key insight is that m5.ax2 (UMP) serves double duty: it is both the channel-capacity axiom for th7 (Gate

4) and the error-accumulation threshold that makes rest necessary for th5. No new axiom is required.[3]

Supporting arguments from external theory:

1. **Thermodynamic.** The construction process reduces local entropy (creating order from VOID). By the second law, this requires exporting entropy to the environment. Periodic consolidation is the entropy-export operation. Without it, internal entropy accumulates until the system can no longer maintain its ordered state.
2. **Computational.** Even in concurrent garbage-collection architectures, the collector redirects resources from the primary task. Periodic dedicated consolidation (full-stop GC) is more efficient than continuous partial GC for error classes that require global consistency checks.

th6 — Dual-Nothing (Conjecture) (e7day-th6)

(Reclassified from theorem to conjecture per review issue M4. The categorical duality is asserted but not proven; full proof requires the categorical formalization described in Appendix C.)

Conjecture. VOID (m0) and TRUST (m7) are formally dual.

Supporting observation. VOID (m0.ax0): Types(Ω) $= \emptyset$, unlimited potential types. TRUST (m7.ax1): result(m_7) $= \bigcup_{k=0}^{6}$ result(m_k), no new content. Both stages add nothing new: VOID because nothing yet exists (maximum uncertainty), TRUST because everything already exists (null aggregation).

In the presheaf framework (Appendix C), VOID would be the initial object (unique morphism from VOID to every other object); TRUST would be the terminal object (unique morphism from every other object to TRUST). The e7Day arc would be a functor from the initial to the terminal object in the category of construction states — an entropy-reduction morphism from H_{max} to $H_{\text{min}}^{\text{new}} = 0$.

Note. Full proof requires constructing the category of construction states, defining morphisms, and proving the universal properties required for initial/terminal objects. This is achievable within the presheaf framework recommended in the formalization roadmap (Section 5.3) and is a target for the Lean 4 implementation.

3.3 The Compassion Capacity Theorem

th7 — Compassion Capacity (Five-Gate) (e7day-th7)

Theorem. Informed compassionate assistance is a gated capacity. For any finite agent a, target b, and fault class F, five gates must be passed:

Gate 1 (Repair-History):

$$\neg\text{repair-history}(a, F) \;\rightarrow\; \neg\text{capable-of-informed-assist}(a, b, F)$$

[3] The m2.ax2 + m5.ax2 error-accumulation chain has an independent biological analogue: Muller's ratchet, the irreversible accumulation of slightly deleterious mutations in asexual populations. In mitochondrial DNA, each replication incurs a small probability of copying error (analogous to m2.ax2's ε-loss per decision); without recombination (a noise-reduction mechanism analogous to rest), fitness declines irreversibly until population collapse (analogous to capacity collapse via m5.ax2). Quantitative modeling of this process [Loewe, 2006] confirms that even very small per-event error rates lead to system degradation when the accumulation mechanism lacks a periodic reset.

Derivation: Without prior encounter-and-repair of fault class F, a has no repair procedure for F. From m6.ax3: OKO self-assessment provides repair-history; OK does not.

Gate 2 (Scope Limitation):

$$\begin{aligned}&\text{scope}(\text{compassion}(a,t)) \;\leq\; \text{scope}(\text{repair-history}(a,t))\\ &\quad\subset\; \mathcal{F}_{\text{all}} \qquad \text{for finite } a \text{ at time } t\end{aligned}$$

Derivation: For finite a, repair-history is a proper subset of all fault classes (by finiteness of experience). From m2.th1: no finite agent can simultaneously apply PERFECT and PERFIDE across all fault classes.

Gate 3 (Other-Awareness):

$$\begin{aligned}&\text{informed-compassion}(a,b,F) \;\rightarrow\\ &\quad \text{aware}(a,\text{state}(b,F))\\ &\quad \wedge\; \text{aware}(a,\text{context}(b,F))\\ &\quad \wedge\; \text{aware}(a,\text{trajectory}(b,F))\end{aligned}$$

Derivation: Awareness of current state, context, and trajectory are independent information channels. An agent with repair-history but missing any of these optimizes for the wrong objective (local minimum, not global).

Gate 4 (Channel Quality):

$$\text{noise}(\text{compassion-channel}(a,b,F)) > \theta \;\rightarrow\; \text{help-capacity}(a,b,F) \to 0$$

Derivation: Direct application of m5.ax2 (UMP) to the compassion channel. The compassion channel is an information channel and is therefore subject to noise degradation.

Gate 5 (Perpetual Scope-Expansion):

$$\begin{aligned}&\neg\text{perpetual-cycle}(h^*, \text{HeroJourney})\\ &\quad\rightarrow\; \exists\, T_{\text{stop}} : \text{scope}(h^*,t) = \text{const}\; \forall t > T_{\text{stop}}\\ &\quad\rightarrow\; \text{fracture}(t) \nearrow \text{monotonically}\\ &\quad\rightarrow\; \exists\, T_c : \text{fracture}(T_c) > \theta_c\\ &\quad\rightarrow\; \text{KO}(\text{system})\end{aligned}$$

Derivation: Gate 2 creates in-group/out-group boundaries at scope limits. If scope is static (cycling stops at T_{stop}), the boundaries become permanent. By m6.ax5 (Environmental Novelty), novel fault classes accumulate outside the frozen scope, and the in-group/out-group fracture grows monotonically. When fracture exceeds the system's tolerance threshold, KO follows.

Limitation: The current derivation assumes scope expansion is the only mechanism for reducing fracture. Internal reorganization (e.g., delegation, information sharing across boundaries) is a potential alternative mechanism not modeled by the current axioms.

Boundary condition: For the universal constructor (God), Gates 1–4 are non-binding (universal scope, complete awareness, noiseless channel). Gate 5 is structurally different: universal scope cannot be expanded.

For the "supervillain theorem" and psychological grounding of Gate 5, see Matheo-b12-socpsy, Section 5.3. For the theological implications ("perpetual Hero Journey as the only model of eternal life compatible with 1 Cor. 13:13"), see Matheo-b12-theophil, Section 6.2.

4. The BABL/ZION Framework

The axiom system generates a formal framework for classifying system trajectories. This section consolidates the definitions that emerge from the Definition (BABL), m6.ax4, m6.th1, and th3.

4.1 Definitions

Term	Formal Definition
ZION	Perpetual cycle: Zone → Investigate → Organize → Navigate, with OKO self-assessment at each phase.
BABL	Definition (Section 2.3.6): BABL(B) :⇔ self-assesses(B, OK). Analytic conditional on m2's OKO verdict. Entails absence of self-correction.
OSCR	Collapse mechanism: over-Simplify → over-Complicate → over-Reach. Derived in m6.th1.
ORCS	OSCR with reversed entry: over-Reach first (hostile variant).
EDEN	Testing protocol: Evolving Diversity Encouraging Negotiation. Steelman all positions; classify solution spaces.
ASON	Ambiguous Semantics Of Nothing: semantic trap at VOID where "nothing" has context-dependent meaning.
OK	Verdict: fixpoint convergence ∧ no scope creep (mc.ax2).
OKO	Verdict: fixpoint convergence ∧ structural tension remains.
KO	Verdict: construction failed.
OK^+	System-level adequacy from matched OKO pair (m6.ax3).

4.2 Attractor Analysis

BABL is metastable. In CTMC (continuous-time Markov chain) terms, BABL is a quasi-absorbing state with exit rate $\lambda_{\text{ISMR}} > 0$. The exit mechanism is self-amplification (ISMR: *In se magna ruunt*, "great things collapse upon themselves" [Lucanus, n.d.]). The larger the BABL system, the higher the accumulated internal contradictions, the faster the collapse. BABL is therefore not truly absorbing but metastable with a lifetime that depends on system scale.

ZION is an open orbit. ZION has no absorbing state; it is a perpetual cycle. The system's "state" is not a fixed point but a trajectory. Convergence in ZION means convergence of the *cycle parameters* (scope expansion rate, error detection rate), not convergence to a fixed state.

The bifurcation is a saddle point. The BABL/ZION boundary is a separatrix: arbitrarily small perturbations in self-assessment can push the system from the ZION trajectory to the BABL attractor. The reverse transition (BABL → ZION) requires a finite perturbation exceeding the BABL basin's depth.

5. Discussion

5.1 Consistency

The e7Day axiom system has been tested adversarially (Iron Maiden / TEMPER protocol) with the following results:

- 30+ formal statements: 20 axioms + 7 theorems + 1 conjecture + 1 definition + 1 notational correspondence + 1 design constraint (after revisions)
- 0 BREACH (all HELD after rescues)
- 11 statements achieved clean 10/10
- Credence range: 70% (DC1, formerly m7.ax3) to 95% (mc.ax1, mc.ax4, m1.ax1, m2.ax2, m7.ax1, th2)
- 3 persistent OKOs on th7 (game-theoretic stability, computability of perpetuity, h* transition vulnerability)

The m0/mc.ax1 tension identified in the MMv2 review is now resolved: result$(m_0) = \Omega$ (the identity fixpoint; see Section 2.2 mc.ax1 and Section 2.3.0 m0.ax0). The construction process at m0 is the identity function, and mc.ax1 holds trivially.

No internal contradiction has been identified. The consistency path identified by the foundation test (Appendix C) is: exhibit a concrete presheaf model satisfying all axioms (e.g., $F(0) = \emptyset$, $F(2) = \mathbb{Q} \cup \mathbb{Z}$, $F(6) =$ a universal Turing machine adjoined to $F(5)$). Full consistency proof is future work, dependent on the Lean 4 formalization.

5.2 Independence

Two axioms were reclassified as theorems during testing (m2.ax3 → m2.th1, m6.ax5-original → m6.th1), improving independence. Two items were reclassified per review (th1 → NC1 notational correspondence, m7.ax3 → DC1 design constraint). One new axiom was added (m6.ax5 Environmental Novelty).

Remaining independence questions:

- **mc.ax3** (Evening-First) may be derivable from optimization theory. Independence is an open question deferred to a future formalization session.
- **m3.ax3** (Water Circulation) has a partial derivation from m3.ax1 + m3.ax2 + entropy considerations (see Section 2.3.3), but gaps remain. Retained as an axiom.
- **m5.ax2** (UMP) is retained as an axiom (making the system self-contained). This is what allows th5 (Rest Necessity) to be derived purely from axioms.

A minimal axiom set (if mc.ax3 and m3.ax3 prove derivable) would contain approximately 18 axioms.

5.3 Formalization Roadmap and Open Problems

1. Formalization roadmap. A formal foundation test a companion foundation-test study examined six candidate foundations for the e7Day axiom system:

Foundation	Verdict	Summary
Mereology + S5	Does not work	Expresses 7 of 21 axioms (partitions only). Cannot capture fixpoints, information theory, or process dynamics. Remains the correct foundation for the companion PET model (Matheo-b11).
Category theory (presheaf)	Works with gaps	Expresses 17 of 21 axioms natively. Gaps (information-theoretic content) are addressable via Lawvere enrichment [Lawvere, 1973].
ZF set theory (no Choice)	Works	All 21 axioms expressible. No computational content; encodings obscure structure. Best role: metatheory for consistency proofs.
ZFC (with Choice)	Structurally incompatible	The Axiom of Choice enables well-orderings of Real(L), which are precisely the type of lossy Real → Int mappings that m2.ax2 identifies as inherently destructive. Choice is not needed and should be excluded.
Dependent type theory (Lean 4)	**Works (recommended)**	All 21 axioms expressible. Machine-checkable proofs. Constructive (no Choice). Mature tooling. The Curry-Howard correspondence aligns with m3.ax2's programs-as-proofs structure.
Homotopy Type Theory	Works (overkill)	All axioms expressible. Univalence elegantly resolves th6 (duality). But 18 of 21 axioms gain nothing beyond dependent type theory.

The recommended architecture is three-layered: (i) ZF as metatheory for consistency proofs, (ii) a presheaf on the poset of stages as the conceptual framework, and (iii) Lean 4 with Mathlib as the machine-checked implementation. The presheaf structure is definable within Lean 4's category theory library, so layers (ii) and (iii) converge in practice.

The Axiom of Choice is neither needed nor desirable. Two weak choice principles (Countable Choice, Dependent Choice) may be needed for the full measure-theoretic formalization of information entropy but do not enable the structurally problematic well-orderings.[4]

2. Open problems:

[4] ZF set theory can also express all 21 axioms but provides no computational content or structural visibility. Homotopy Type Theory (HoTT) adds univalence and higher inductive types, which elegantly resolve th6 (Dual-Nothing) but are unnecessary for the remaining 20 axioms. See the companion study a companion foundation-test study for the full analysis.

a. **Proof-theoretic strength.** What is the proof-theoretic ordinal of the e7Day system? Is it comparable to Peano Arithmetic, second-order arithmetic, or something else?

b. **Model theory.** Characterize the class of models satisfying the axioms. Is the system categorical (unique model up to isomorphism)? The parametric constructor suggests it is not.

c. **DAG refinement of mc.ax4.** Replace the linear cascade with a DAG encoding the actual dependency structure.

d. **Computability of Gate 5.** Is "perpetual cycling" decidable? How does a finite agent distinguish perpetual from very-long-but-finite cycling?

e. **Full Lean 4 formalization** of the core axioms (mc.ax1–mc.ax4, m1.ax1, m2.ax1–m2.ax2, m6.ax4) as a proof of concept.

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6. Conclusion

The e7Day axiom system formalizes self-correcting construction in 20 axioms yielding 7 theorems, 1 conjecture, 1 definition, 1 notational correspondence, and 1 design constraint. All 21 review issues from the formal logic peer review have been resolved; 0 [DISCUSS] items remain. The system's formal contribution is threefold:

1. **The PERFECT/PERFIDE impossibility** (m2.th1): a type-theoretic result showing that integrity and exchangeability are universally incompatible.
2. **The BABL/ZION bifurcation** (m6.ax4 + th3): a game-theoretic result showing that self-destruction originates analytically in self-assessment and is a stable attractor, while self-correction is an unstable equilibrium.
3. **The Compassion Capacity theorem** (th7): an information-theoretic result showing that informed assistance is a gated, noise-degraded channel requiring perpetual scope expansion.

A formal foundation test (Appendix C) has identified dependent type theory (Lean 4) as the recommended formalization language, with a presheaf on the poset of stages as the conceptual framework. The path from semi-formal axiom system to machine-checked formalization is concrete and achievable.

Theorem th5 (Rest Necessity) is now derived purely from axioms via the chain m2.ax2 (lossy mapping) → m6.ax5 (environmental novelty) → m5.ax2 (capacity collapse) → th3 (BABL origin), without importing external theory.

The system is designed to be tested. Formal consistency is checked but not proven. Independence is partially established. The axiom system is open to refinement: reclassification of axioms to theorems (as demonstrated for m2.th1 and m6.th1) reduces assumptions while preserving consequences.

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Appendix A: BEST Names Symbol Dictionary

The following table maps each formal symbol to four levels of naming following the BEST Names convention: **B**rief (mathematical symbol), **E**xplicit (implementation-ready name), **S**ummarizing (1–3 sentence explanation), **T**echnical (synonyms and cross-references).

Brief	Explicit	Summarizing	Technical Names
Ω	`pre_partition_domain`	The undifferentiated domain before any construction. Zero actual types (void); unlimited potential types (maximum uncertainty). The starting condition of the construction cascade.	Void, tohu-va-vohu, pre-partition, $\perp$ (void type). Site: VOID (m0).
L	`in_scope_domain`	The partition of Ω selected for construction. All subsequent building operates within L. When constructor = God, $L = W$ (the world).	Light, in-scope, construction domain. PET: W (World). Site: TYPE (m1).
D	`out_of_scope_domain`	The complement of L in Ω. Excluded from construction but not destroyed.	Dark, out-of-scope, irrelevant domain. Site: TYPE (m1).
$H(\cdot)$	`shannon_entropy`	Shannon entropy function measuring the information content (or disorder) of a distribution.	Entropy, information entropy, uncertainty. Shannon (1948).
$H_{\max}$	`supremum_entropy`	The supremum of Shannon entropy over all finite partitions of Ω. Equals $+\infty$ (unbounded). Shorthand for "maximum uncertainty over the space of potential types."	Maximum entropy (as supremum, not as a distribution's entropy). Site: VOID (m0).
$\text{Int}(L)$	`indivisible_types`	Types within L that cannot be subdivided without destruction of identity. Individuals, atoms, nominal types.	Integer types, nominal types, individuals, atoms. Site: EQUAL (m2).
$\text{Real}(L)$	`divisible_types`	Types within L that admit non-trivial partitions preserving type membership. Quantities, resources, structural types.	Real types, structural types, quantities, dividends, resources. Site: EQUAL (m2).
φ	`real_to_int_mapping`	Any mapping from divisible types to indivisible types. Always lossy by m2.ax2.	Discretization, quantization, allocation scheme, rounding function. Site: EQUAL (m2).
ε	`minimum_info_loss`	The positive lower bound on information loss for any Real-to-Int mapping. Guaranteed by m2.ax2.	Epsilon, irreducible loss, quantization error floor. Site: EQUAL (m2).
Ground	`unconditional_values`	Values whose truth status does not depend on the current Int/Real mapping. Known facts, axioms, anchored truths.	Ground truth, unconditional data, anchored values. Site: VALUE (m3).

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Table 1 – continued from previous page

Brief	Explicit	Summarizing	Technical Names
Ocean(.	conditional_values	Values whose truth status depends on the current Int/Real mapping. Empirical data, conditional knowledge.	Conditional data, fluid values, empirical observations. Site: VALUE (m3).
Water	circulating_data	The flow drawn from Ocean, processed by programs (Trees), and returned to Ocean. The working data in circulation.	Input data, empirical flow, working set. Site: VALUE (m3).
π	decision_tree_program	A finite decision tree rooted in Ground, taking Water input, producing Ground output. A program in the Curry-Howard sense.	Program, proof (Curry-Howard), decision procedure. Site: VALUE (m3).
DAY(L)	foreground_processes	Directed, deterministic, foreground computational processes.	Directed activity, deterministic computation. Site: LOGIC (m4).
NIGHT(.	background_processes	Nondeterministic, stochastic, background guidance processes.	Background activity, stochastic guidance, nondeterministic search. Site: LOGIC (m4).
T, Time	first_class_t:	Time as a first-class type within L, equipped with a metric for measurable progress.	Temporal type, metric time. Site: LOGIC (m4).
θ	noise_threshold	The noise level above which channel capacity for meaningful signal collapses to zero.	UMP threshold, noise ceiling, Shannon threshold. Site: CARE (m5).
B	balospe_agent	The general-intelligence agent type (Balospe = Balance-o-stat species). Responsible for long-term balance within L. Recursively endowed (self-hosting fixpoint).	Balospe, general intelligence, h* (corresponds to PET ax19 under the PET-e7Day morphism), balance-o-stat. Site: HOPE (m6).
scope	scope_function	Maps a construction result to the set of fault classes it can detect and repair. scope : Results $\to \mathcal{P}$(FaultClasses).	Scope function, fault coverage. Site: mc.ax2, th7.
m_k	submodel_k	Submodel k in the construction cascade (k = 0..7). Each produces a fixpoint result.	Stage k, Day k (Genesis), construction level k. Site: e7Day.
process	construction_operator	The construction operator of submodel m_k. result(m_k) = fix(process(m_k)).	Stage operator, construction function. Site: mc.ax1.
result(r	stage_result	The fixpoint output of submodel m_k. Robust, idempotent.	Stage output, day result, constructive yield.

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Table 1 – continued from previous page

Brief	Explicit	Summarizing	Technical Names
OK	verdict_ok	Verdict: fixpoint convergence AND no scope creep. The construction succeeded within its declared scope.	Converged, "it was good" (Genesis), adequate.
OKO	verdict_oko	Verdict: fixpoint convergence but structural tension remains. Not a failure; requires ongoing management.	Adequate-but-incomplete, tension-bearing, underdetermined.
KO	verdict_ko	Verdict: construction failed. System does not converge or has collapsed.	Failed, knocked out, system failure.
OK^+	verdict_ok_plus	System-level adequacy from matched OKO pair. Neither component is individually OK, but the system handles its own imperfections.	System-level OK, self-correcting adequacy.
BABL	blindly_assuming_blind_leveraging	Self-reinforcing failure state: agent assumes adequacy (OK) and acts on it without self-correction. Stable attractor.	Self-destructive cycle, samsara (Buddhist), hamster wheel. OSCR mechanism. Site: e7Day th3.
ZION	zoning_investigating_organizing_navigating	Perpetual self-correction cycle: seed (zone) → feed (investigate) → grow (organize) → reap (navigate). Requires OKO self-assessment. Unstable equilibrium.	Innovation cycle, self-correcting process, liberation (Buddhist). Site: e7Day m6.ax4.
OSCR	over_simplify_complicate_reach	BABL's collapse mechanism: reduce complexity (over-simplify), add work-arounds (over-complicate), overextend (over-reach).	Collapse mechanism, death spiral. Site: e7Day m6.th1.
PERFECT	preserve_existence_rights	Strategy: preserve the integrity of each individual type at the cost of system-level fungibility.	Type integrity, nominal typing, individual rights, conservation.
PERFIDE	preserve_exchangeability	Strategy: preserve system-level fungibility at the cost of individual type integrity.	Type exchangeability, structural typing, collective efficiency, adaptation.
h^*	max_causal_age	The maximally causally influential agent (from PET ax19). The single agent with greatest impact on system trajectory.	h-star, most influential agent. PET: ax19. Site: PET ax19.
$\mathcal{F}_{\text{all}}$	all_fault_clas	The set of all possible fault classes. Finite agents have proper subsets of this as their repair-history.	Universal fault set. Site: th7 (Compassion Capacity).
λ_{ISMR}	babl_exit_rate	CTMC exit rate from BABL metastable state. Driven by self-amplification (ISMR). Positive: BABL eventually collapses.	ISMR rate, collapse rate. Lucan, *Pharsalia* I.81.

Appendix B: Authorship Contributions

This work follows the authorship convention of the Balospe.com website:

- **Yah** — Reality as the divine source of all that is instantiated (as formalized by Pan-En-Theology).
- **Yas** — Real Quest for Real Answers, standing on Reality in any context, as the gentle kind reasonable scientific method pioneered by Jesus = Isa = YhowShua.
- **Everyone** — All who lived through the awful and awesome human experiences that generated the scriptural and philosophical traditions from which these axioms are drawn. The model presented here would have never been formalized if it wasn't for all the human suffering in the world that has been bothering LLoL (and torturing Yah & Yas unbearably).
- **LLoL (Laurence Loewe of Laodicea)** — proximate human cause: accidentally discovered the axiom system, serendipitously defined this formalization with Claude, asked Claude to check for cross-tradition support, directed the paper's composition, and final checking. LLoL accepts final responsibility for all errors.
- **ClaudeOp46Max (Claude Opus 4.6 at max effort)** — AI assistant: helped derive theorems, checked prior art, helped refine the argument, drafted the study text, checked logical structure, formatted arguments. Drafting errors, while technically Claude's, reveal a deeper lack of oversight by LLoL.
- **Anthropic** — The company of all who built the infrastructure enabling Claude to offer critical AI assistance.
- **The Spirit of Boolean Truth** — Logical Arbiter of Truth: The Ultimate Truth of all potential types that could be instantiated without violating formal proofs, whether elegant or not, useful or not; each failing on their own merits, independent of who stated them.

Citation convention: This paper is cited as Matheo-b12. Companion papers: Matheo-b11 (PET, Matheo-b11), Matheo-b12-theophil, Matheo-b12-syseng, Matheo-b12-socpsy, Matheo-b12-intro. Website resources are cited as Balospe.com-N. Full authorship is honored in this statement; citations use the short form for readability.

Appendix C: Formal Foundation Test Summary

The formal review (Section 1.1, Issue C1) identified the absence of a specified formal language as the most critical structural gap. This appendix summarizes a systematic test of six candidate foundations.

Six foundations were tested for their ability to express all 21 e7Day axioms as well-formed formulas.

Mereology + S5 Modal Logic (the foundation of the companion PET model, Matheo-b11): 7 of 21 axioms expressible. The partitioning axioms (m1.ax1, m2.ax1, m3.ax1, m4.ax1, m7.ax1–m7.ax2) translate cleanly. All meta-axioms (mc), information- theoretic axioms (m0.ax0, m2.ax2, m5.ax2), computational axioms (m3.ax2–m3.ax3), and agent axioms (m5.ax1, m6.ax1–m6.ax2) cannot be expressed. Mereology is a theory of static parts and wholes; e7Day is a theory of

dynamic processes and their compositions. **Verdict: does not work for e7Day.** Remains the correct foundation for PET.

Category theory (presheaf on poset of stages): 17 of 21 axioms expressible natively. The construction cascade (mc.ax4) IS the presheaf structure: the restriction maps encode cumulative dependency. Fixpoints (mc.ax1) are equalizers. Partitions are coproducts. Process composition (mc.ax3) is morphism composition. The 4 gaps — m0.ax0's entropy (resolved by the actual/potential reformulation), m2.ax2's quantitative loss bound, m5.ax2's channel capacity, and DC1's 6:1 ratio — are addressable by enriching the category over the Lawvere quantale $([0, \infty], \geq, +)$ [Lawvere, 1973]. **Verdict: works with addressable gaps.**

ZF set theory (without Choice): 21 of 21 axioms expressible. ZF provides real analysis (for information theory), function spaces (for fixpoints), and inductive definitions (for decision trees). However, ZF proofs carry no computational content and the set-theoretic encodings obscure structural relationships. **Verdict: works as metatheory, not as primary formalization language.**

ZFC (with Choice): 21 of 21 axioms expressible. However, the Axiom of Choice enables well-orderings of Real(L), which are precisely the type of Real $\to$ Int mappings that m2.ax2 identifies as inherently lossy. A foundation that provides unlimited access to the very operation the axiom system critiques is structurally incoherent, even if formally consistent. **Verdict: structurally incompatible.**

Dependent type theory (Lean 4 / Agda): 21 of 21 axioms expressible. The Curry-Howard correspondence aligns with m3.ax2 (programs as proofs). Fixpoints carry constructive witnesses. Inductive types natively express decision trees. Machine-checkable in production proof assistants. Constructive by default (no Axiom of Choice). **Verdict: works (recommended implementation language).**

Homotopy Type Theory (HoTT): 21 of 21 axioms expressible. Univalence elegantly resolves th6 (structurally equivalent constructions are identical). But 18 of 21 axioms are h-sets (no non-trivial higher path structure), meaning HoTT's additional machinery is idle. **Verdict: works but adds unnecessary complexity for current needs.**

No e7Day axiom requires the Axiom of Choice. Specific checks:

- *Fixpoints (mc.ax1):* The Kleene fixpoint theorem is constructive (no Choice).
- *Partitions (m1.ax1):* The constructor provides the partition (existential with witness, not a choice function).
- *Function spaces (m2.ax2):* Universal quantification over functions requires the Power Set axiom (ZF), not Choice.
- *Suprema (m5.ax2, m0.ax0):* Dedekind completeness of $\mathbb{R}$ holds in ZF without Choice.

Countable Choice (CC) or Dependent Choice (DC) — both strictly weaker than full AC — may be needed for the measure-theoretic formalization of Shannon entropy. Neither enables well-ordering of uncountable sets.

The recommended formalization uses three layers:

1. **ZF as metatheory:** Prove relative consistency by exhibiting a concrete model (e.g., $F(0) = \emptyset$, $F(2) = \mathbb{Q} \cup \mathbb{Z}$, $F(6) =$ a universal Turing machine adjoined to $F(5)$).
2. **Presheaf on the poset of stages as conceptual framework:** The construction cascade (mc.ax4) is the presheaf's restriction maps. The void (m0.ax0) is the initial object. The

trust (m7.ax1) is the colimit. This makes the cascade structure visible and provides natural notions of morphism and duality.

3. **Lean 4 + Mathlib as implementation:** Machine-checked proofs of all axioms and theorems. The presheaf structure is definable using Mathlib's `CategoryTheory.Presheaf`. Layers 2 and 3 converge: the categorical blueprint is implemented directly in the proof assistant.

The PET-e7Day bridge (NC1: $W = L$ under universal constructor) becomes a functor between presheaves, with PET embedded as a constant presheaf (the same mereological structure at every stage).

The complete foundation test, including detailed translations of all 21 axioms into each candidate foundation, is available as a companion study a companion foundation-test study.

Supplementary Info

Note

Floor-pour status (MMv5). This is the public-floor copy of the formal e7Day axiom-system paper, poured from HELL per the Floor Model (bug c103). The `mmv5` marker is the uniform first-Matheo-release tag; the exact dated source and full development context live in HELL (links below). The HUMANE and author-contribution statements below are a down-payment, to be expanded later.

FLAG (floor pour 2026m05d29): the **Broader Significance** on the cover was authored during this pour — none existed in the HELL source — and awaits LLoL's review.

HUMANE — working human and AI

This study was written HUMANEly (HUman MAchine Negotiation Encouraging): a human and an AI each steelman and stress-test the work, and each catches what the other misses. For the standard statement of AI use, accountability, and the practical singularity (PraS) behind this way of working, see Matheo-b21.

- *From the human side (LLoL):* [down-payment stub — to expand.]
- *From the AI side (Claude):* [down-payment stub — to expand.]

Author contributions (who did what)

- **LLoL** — structure, key ideas, direction, and final accountability as senior corresponding author (see title-page footnotes 4–5).
- **AI Claude** — drafting and revision under LLoL's direction (footnotes 6–7).
- **Everyone** — the open co-author group (footnote 8); framework in Matheo-b21.

The full who-did-what is preserved in **Appendix B: Authorship Contributions** above; the b21 framework expands it.

Provenance — where this came from in HELL

Caution

These HELL links point into the development archive ("datageddon"). They are useful and related, but completeness is not guaranteed and a few may be imprecise. Treat as a hatch into context, not a clean index.

- **Source this floor copy was poured from:** `matheology/hell/mm/b/12/mmv3/b12-math_mmv3_2026m04d05`
- **Development context** (llogs, reviews, prompts) under `source/matheology/hell/ll/study/b/12/`.
- **Companion papers (other lenses):** Matheo-b12 (theophil / syseng / socpsy / intro); foundational model: Matheo-b11 (PET).

Note

Naming note (deferred floor tasks). This copy still carries old `h*`-era tokens in places and deprecated in-text series references (e.g. "Matheo-b12", "Balospe.com-N"); unifying notation (`h_star` / `h_zero` / `h_dark`) and migrating citations are tracked floor tasks, deliberately not rushed here.

Moved from the original cover (provenance)

The following draft-status note was relocated here from the cover area during the floor pour; kept verbatim, as the cover must show only Title / byline / credentials / Broader Significance / Abstract / Contents / Introduction.

Note

Draft status: MMv3r1-Math (2026m04d05). Major revision of the MMv2 draft (2026m04d05) responding to a formal logic peer review (5 Critical, 8 Major, 8 Minor issues). All 21 review issues resolved. Changes include: title revision (C1), m0.ax0 actual/potential reformulation (C2), formalization of 3 English-only axioms (C3), mc.ax1 formula fix (C5), new m6.ax5 Environmental Novelty axiom (M2/M7), reclassifications (th1, m7.ax3), formalization roadmap (Section 5.3), new Appendix C (Foundation Test), m6.ax4 split into definition + axiom, th5 derivation chain from axioms (m2.ax2 + m6.ax5 + m5.ax2 + th3), and resolution of all 7 [DISCUSS] items. Draft by Claude Opus 4.6 (`dv_ClaOp46_MMv3r1_2026m04d05`). This is the *formal logic* presentation of the e7Day model, written for logicians, mathematicians, and theoretical computer scientists. It is one of five audience-specific papers covering the same axiom system. Companion papers present the same results for theologians/philosophers (b12-theophil), systems engineers (b12-syseng), psychologists/social scientists (b12-socpsy), and general readers (b12-intro). Authorship contributions are detailed in Appendix B.

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Notes

Content stability — Content is variant dv_ClaOp48Max_MMv5_b12-math-e7day-mmv5_2026m05d29 (see StayVS). Rebuilt 2026-05-29.

See also on Balospe.com

- /study/matheo/index — the Matheo Study Series overview
- /action/audit-the-math/index — Audit the Math: the refutation-welcome path

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