Minimum Economy of Relational Information

Minimal canonical architecture, closure protocol, and execution mandate

Le Matt Ansatz Di Ego

August 14, 2026 · To the mother, our origin

Statement of Purpose

This document establishes the reference architecture of the **Minimum Economy of Relational Information**. Its purpose is not to enlarge the model through new interpretations, but to order what has already been built according to one simple rule:

Every added difference must state what it resolves, what structure it costs, and what it still leaves open.

The proposal begins from a minimal intuition: reality does not become describable because names are added to it, but because differences appear that can be compared, preserved, and closed without concealing their residue.

The canonical line of the project is preserved:

$$\aleph \to D_1 \to C_1 \to R \to U \to V \oplus m \to \text{identity} \to \text{cycle} \to \text{rhythm} \to \text{time} \to \text{dynamics}$$

The decisive improvement is that no arrow is regarded as resolved merely because a later arrow produces an attractive result. Each step must stand on its own construction, its translation rule, and its falsifier.

This document rigorously distinguishes:

the **ontological intuition**;

the project's **canonical nomenclature**;

the chosen **formal realization**;

the **physical correspondences** that may eventually be tested.

No experimental validation is claimed. Physical bridges remain blocked until the corresponding protocol has been completed.

Freeze declaration. This version closes the stage of general architecture. From this point onward, a new global revision is justified only if a proof, an implementation, or a falsifier reveals a concrete incompatibility. The next valid unit of progress is an object-level result: first Checkpoints 0.1 and 0.2, then the remaining nodes according to their dependencies.

This applies minimum economy to the program itself: a reorganization that closes no arrow and removes no contradiction counts as editorial reinforcement, not structural novelty.

Reading Map

Sections 1-2: economic criterion and canonical nomenclature.

Sections 3-8: formal trunk, from closure to the single entry point of the metric.

Sections 9-13: operational economy, interfaces, time, dynamics, and ROSI.

Sections 14-15: dependency tree and locking protocol.

Sections 16-19: conditioned physical branches.

Sections 20-23 and appendices: delivery format, status, scope, and open problems.

1. Principle of Minimal Structure

1.1 Central rule

An architecture is economical when it:

preserves the differences that are still necessary;

inherits closures already obtained;

adds only independent novelty;

conceals no transfers;

does not declare resolved what remains open.

Economy does not always mean using fewer symbols. It means not introducing a decision that performs no discriminable function.

1.2 Six mandatory questions

Every construction must answer:

Opening: what problem does it name?

Discriminant: what new difference does it make expressible?

Added structure: what object, rule, or operator does it introduce?

Epistemic cost: how many independent primitive decisions does it require?

Residue: what remains unresolved?

Falsifier: what result would require abandoning or transferring the construction?

1.3 Absolute limits

The following are not permitted:

allowing a later arrow to validate an earlier one retroactively;

translating between levels without declaring the complete map;

confusing D_1 with C_1;

confusing P_{act} with P_{ch};

confusing R with a measured physical length;

introducing a shape parameter after the target observable is known;

selecting one solution among several minimal ones without a prior selection criterion.

Plain-language reading

The model advances only when it can explain what it added and why. A later coincidence may be interesting, but it does not make an earlier choice necessary.

2. Canonical Nomenclature

The formalization does not replace the original language. Its purpose is to specify what each term means and at which level it may be used.

2.1 $\aleph$: uncompared totality

$\aleph$ names the condition in which no internal difference has been distinguished. It does not represent a physical point, a cosmological singularity, or an instant that occurred before time.

At the canonical level, $\aleph$ has no norm. When a linear realization is introduced, a projective direction appears:

$$[\aleph]=\{\lambda\aleph:\lambda\neq 0\}.$$

Only after a metric has been introduced may a normalized representative be chosen:

$$\|\hat{\aleph}\|=1.$$

The correct sequence is:

$$\aleph\rightarrow[\aleph]\rightarrow\hat{\aleph}$$

Normalization is not an ontological postulate. It is a decision within the metric realization.

2.2 D_1: first difference

D_1 represents a difference without a privileged reference. It contains two related positions and admits their exchange:

$$X_{D_1}=\{x_0,x_1\},\ Aut(D_1)\cong S_2.$$

Its reading is:

There are two distinguishable positions, but neither has been chosen as the origin of comparison.

2.3 F_1: free class of the first difference

The historical notation F_1 is retained as the isomorphism class of the elementary difference:

$$F_1 := [D_1)_{\cong}.$$

It is not treated as an ordinary initial object with nontrivial automorphisms. When the exchange action must be retained explicitly, we use:

$$(D_1, S_2).$$

2.4 C_1: first comparison

C_1 appears when one of the positions is marked as a reference:

$$C_1 = (x_{¿} \to x).$$

Comparison does not create the difference. It orients it.

The fundamental sequence is therefore:

$$\aleph \to D_1 \to C_1.$$

Every later construction that uses a reference must indicate how this step was carried out.

2.5 R: marker or relational radius

R expresses an oriented difference relative to a reference. At the canonical level it is not yet a length.

The following should be distinguished:

$$R \text{ relational concept},$$

$[R)$ direction in a linear realization,

r algebraic scale of a representation,

R_{phys} length measured through a physical bridge.

None of these expressions may automatically replace another.

2.6 U: local universe of differences

U is the set or space of differences that a comparison makes available within an image or system. It is not the cosmological universe.

In an algebraic realization one may write, conditionally:

$$U = J_R[\aleph),$$

with the understanding that the result may still be defined only up to scale before a metric is introduced.

2.7 V and m: channels of an identity

V represents what enters into comparison or becomes visible to a specified interface.

m represents the complement preserved by the identity and not participating in that comparison in the same way.

The separation is written:

$$V = P_{ch} U, m = (I - P_{ch}) U.$$

Before a metric is introduced, this relation expresses an algebraic direct sum, not orthogonality:

$$U = V \oplus m.$$

Only if P_{ch} is later shown to be self-adjoint with respect to an admissible metric do we obtain:

$$\langle V, m \rangle = 0.$$

2.8 a: adjustment

We retain the notation:

$$a = J_R V,$$

as a new transformation of the visible channel. Its interpretation as force or interaction belongs to a later physical bridge.

2.9 Identity, present, rhythm, and time

Identity: minimal closure that allows an architecture to remain recognizable through admissible transformations.

Present: internal condition from which an identity maintains its continuity.

Cycle: recognizable structural return.

Rhythm: internal comparison among repetitions of a cycle.

Time: comparison among rhythms through a common interface.

These concepts preserve the original spirit of the project, but their mathematical realizations must be declared separately.

3. The Four Levels and the Formal Layers

3.1 Ontological level

It contains only:

uncompared totality;

difference;

comparison;

closure.

This level presupposes no vectors, norms, physical space, or dynamics.

3.2 Canonical level

It contains the project's own nomenclature:

$$\aleph, R, U, V, m, a, \text{identity}, \text{present}, \text{rhythm}, \text{time}.$$

The canonical level connects intuition with formalization, but does not by itself constitute a physical theory.

3.3 Formal level

To prevent structure from entering silently, the formal level is divided into four layers.

Formal layer A: closure and order

(X, Σ, ar, I, Cl).

No vector space is required.

Formal layer B: linearization

$V_S, Y_S, C_S, ker\, C_S, rank\, C_S$.

This introduces linear structure, but not yet a metric.

Formal layer C: generative algebra

J_R, P_{act}, P_{ch}.

This introduces algebraic operators and their consistency relations.

Formal layer D: metric and gauge

$h_Y, g_S, C_S^\dagger, J_R^\dagger, \langle \cdot, \cdot \rangle$.

Here, and only here, norms, orthogonality, adjoints, and distances appear.

3.4 Physical level

It contains:

units;

measured quantities;

physical constants;

observables;

comparison with experiments.

No formal object acquires physical meaning through verbal or dimensional resemblance.

3.5 Translation record

Every arrow between levels must be registered as:

$$T = (O, D, M, S, I, U, R, F)$$

where:

O: source object;

D: destination object;

M: translation map;

S: added assumptions;

I: preserved invariants;

U: introduced units;

R: residue;

F: falsifier.

Plain-language reading

The same symbol may have an intuition, a mathematical representation, and a measurement. These three uses are connected, but they are never identical without an explicit bridge.

4. Finite Relational Architectures

4.1 Well-typed object

A finite relational architecture is a quintuple:

$$A=(X,\Sigma,ar,I,Cl)$$

with:

X: finite set of positions;

Σ: finite set of relation symbols;

$ar:\Sigma\to N$: arity of each symbol;

$I(s)\subseteq X^{ar(s)}$: interpretation of symbol s;

$Cl:2^{\Sigma}\to 2^{\Sigma}$: closure operator on the discriminants.

This definition distinguishes three objects that could previously be confused:

$$\text{relation symbol}\neq\text{interpreted relation}\neq\text{related tuple}.$$

4.2 Moore closure

The closure satisfies:

$$E\subseteq Cl(E),$$

$E\subseteq F\Rightarrow Cl(E)\subseteq Cl(F)$,

$Cl(Cl(E))=Cl(E)$.

These three conditions produce an order structure before any vector is introduced.

4.3 Morphism

A morphism between architectures:

$$(f,\varphi):A\to B$$

consists of:

a function $f:X_A\to X_B$;

a map $\varphi:\Sigma_A\to\Sigma_B$ preserving arities.

It must satisfy:

$$f^{ar(s)}(I_A(s))\subseteq I_B(\varphi(s)),$$

for every $s\in\Sigma_A$, and:

$$\varphi(Cl_A(E))\subseteq Cl_B(\varphi(E)).$$

For the first results, when sufficient, a fixed-signature subcategory will be used, in which φ is the identity. This restriction reduces formal cost and may be broadened later.

4.4 Three classes of map

General morphism: preserves relations and closure, but may identify positions.

Strong embedding: preserves the relevant differences without creating additional closures within its image.

Quotient: may identify positions and turn active differences into closed differences.

This distinction makes it possible to speak precisely about inheritance, interface, and information loss.

4.5 Associated categories

$RelArch_{fin}$: architectures without a privileged reference.

$RelArch^{\bullet}_{fin}$: architectures with a marked position.

$Comp_{fin}$: architectures with an oriented comparison $(x_{¿}\to x)$.

The universal property of C_1 must be proved within $Comp_{fin}$, not assumed from the canonical language.

4.6 Lattice of closures

The closed sets:

$$L_{Cl}=\{E\subseteq\Sigma:Cl(E)=E\}$$

form a complete lattice.

The meet is:

$$E\wedge F=E\cap F,$$

while the closed join is:

$$E \vee F = Cl(E \cup F).$$

This provides a first rigorous form of:

inheritance;

accumulation of discriminants;

shared closure;

comparison among architectures.

It does not yet require linearity.

4.7 Finite constructions

The existence of products, pullbacks, and pushouts is not presupposed for the whole category.

The first formal objective will be to prove which constructions exist:

in the general category;

in the fixed-signature subcategory;

along strong embeddings.

If a construction does not exist in full generality, the program may transfer it to an admissible subcategory. A global collapse will not be declared when only an overly broad formulation has failed.

Plain-language reading

An architecture distinguishes positions, names relations, and records which relations are implied by others. The category studies which transformations preserve that structure.

5. Linearization and Sustainability

5.1 Why a linear layer is introduced

Closure organizes relations, but it does not yet make it possible to measure independence, rank, or kernel. An explicit linear realization is introduced for that purpose.

This realization is a tool, not an ontological property.

5.2 Space of differences

For a finite set X, a minimally useful realization is:

$$V_X = \left\{ v \in R^X : \sum_{x \in X} v_x = 0 \right\}.$$

Elementary differences are represented by:

$$e_x - e_y.$$

This space requires no inner product in order to exist.

5.3 Comparison map

Let Y_S be the linear space of discriminant outcomes of an architecture S. We introduce:

$$C_S : V_S \to Y_S .$$

The map records which differences are visible to the family of comparators being used.

Two positions are indiscernible when:

$$x \sim_S y \Leftrightarrow C_S (e_x - e_y) = 0 .$$

5.4 Sustainable quotient

The differences not distinguished by the comparator form:

$$ker\, C_S .$$

The sustainable information is:

$$V_S^{sus} = V_S / ker\, C_S .$$

The relational dimension is:

$$d_{rel}(S) = rank\, C_S .$$

Here, dimension is not yet interpreted as physical spatial dimension. It is the number of linearly independent differences that the architecture can sustain.

5.5 Two notions of reduction

We distinguish:

Closure basis

A subfamily $B \subseteq \Sigma$ such that:

$$Cl(B) = \Sigma .$$

Discernibility reduct

A subfamily of comparators that preserves the same indiscernibility classes or the same decision capacity.

They are not equivalent, and ROSI must treat them separately.

5.6 Matroidal closure and the difference between order and linearity

If a fixed family of discriminants is represented by vectors or linear functionals, the function

$$r_{lin}(A) = dim\, span(A)$$

is already the rank of a representable matroid. Verifying its submodularity again does not constitute a new result.

The question specific to the Minimum Economy of Relational Information concerns the canonical closure of Layer A. It must be determined whether Cl satisfies MacLane-Steinitz exchange:

$$y \in Cl(A \cup \{x\}) \text{¿} (A) \Rightarrow x \in Cl(A \cup \{y\}).$$

If it does, the closure system is matroidal. If it does not, the difference

$$Cl \text{ versus } cl_{span}$$

measures what relational dependence adds beyond linear dependence.

A finite falsifier consists in finding two minimal closure bases B_1, B_2 such that:

$$Cl(B_1) = Cl(B_2) = \Sigma, |B_1| \neq |B_2|.$$

ROSI will compare a greedy algorithm with exact search on small architectures. A certified gap proves that the general closure lacks the exchange property in that case. The computational complexity of reduction must be recorded as a cost of the type of closure being used.

Plain-language reading

Linearization does not create the differences. It places them in a representation where we can determine which are independent, which are repeated, and which disappear for a comparator.

6. Generative Algebra and the Active Projector

6.1 Two routes for J_R

The generative operator may have either of two statuses.

Induced route

An operation is sought from closure or from an algebraic structure on $\Im C_S$.

If a bracket already exists on V_S, it descends to the quotient only if $\ker C_S$ is an ideal.

If the bracket is defined on $\Im C_S$, one must prove:

$$[\Im C_S, \Im C_S] \subseteq \Im C_S.$$

Primitive route

If the derivation fails or is not unique, J_R is declared to be additional algebraic structure. This does not invalidate the program, but it adds one primitive decision to the epistemic cost.

6.2 Polynomial identity

The minimal algebraic condition adopted for the generative branch is:

$$J_R^3 = \sigma r^2 J_R, \sigma \in \{-1, +1\}.$$

It requires no inner product. It is an operator identity.

6.3 Active projector without a metric

For $r \neq 0$, define:

$$P_{act} = \sigma \frac{J_R^2}{r^2}.$$

The polynomial identity yields:

$$P_{act}^2 = P_{act},$$

$P_{act} J_R = J_R P_{act} = J_R,$

$\Im P_{act} = \Im J_R,$

$ker\, P_{act} = ker\, J_R.$

Therefore:

$$V_S^{sus} = ker\, J_R \oplus \Im J_R.$$

This decomposition is algebraic. It does not yet assert orthogonality.

6.4 Degenerate regime

When:

$$r = 0,$$

the formula for P_{act} is undefined and the identity reduces to:

$$J_R^3 = 0.$$

This case is retained as a separate degenerate stratum. It is not automatically assumed that $J_R = 0$.

6.5 Antisymmetry and skew-adjointness

The property:

$$A \times B = -B \times A$$

is algebraic.

The property:

$$J_R^\dagger = -J_R$$

is metric and may be introduced only after an inner product has been defined.

Confusing these properties would introduce the metric before the authorized checkpoint.

Plain-language reading

The generative operator can automatically separate the part on which it acts from the part on which it does not act. That separation does not require measuring angles or lengths.

7. Channel Projector and the U, V, m Architecture

7.1 Three distinct functions

The program preserves a strict triad:

$$J_R : \text{generates a transformation},$$

P_{act} : selects the space on which J_R acts,

P_{ch} : separates the channels V and m.

No operator may assume two of these functions without an additional proof.

7.2 Conditioned definition of the channels

If a channel projector exists:

$$P_{ch}^2 = P_{ch},$$

define:

$$V = P_{ch} U,$$

$m = (I - P_{ch}) U$.

Then:

$$U = V \oplus m.$$

7.3 Non-confusion proof

P_{act} is determined by J_R when $r \neq 0$.

P_{ch} requires additional information in order to separate two channels within the active architecture.

The polynomial identity for J_R implies that the spectrum of J_R^2 generally distinguishes only:

$$0 \text{ and } \sigma r^2.$$

The associated nontrivial spectral projector is P_{act}. Therefore:

$$J_R^2 \text{ does not by itself derive a } P_{ch} \neq P_{act}.$$

7.4 Channel relative to an interface

The canonical reading of V as what a comparison makes visible favors an interface-indexed formulation:

$$P_{ch}^K, V_K = P_{ch}^K U, m_K = (I - P_{ch}^K) U.$$

Dependence on K is not regarded as a defect: it expresses that visibility is relational. The program will investigate this route first and only then ask whether an intrinsic projector independent of every interface exists.

The possible outcomes are:

RESOLVED: every admissible interface induces the same projector, or an internal rule proves a unique selection;

SUPERPOSED: one interface admits several non-equivalent minimal projectors;

TRANSFERRED: the separation exists only as a property of the system-interface pair;

COLLAPSED: the projector is adjusted after the physical result is observed.

Internal symmetries, closure rules, or reducible representations may also be explored, but none may use J_R^2 as its sole source, because that spectrum already determines P_{act}, not a distinct channel.

7.5 Quadratic partition

The relation:

$$\omega_I^2 = \omega_V^2 + \omega_m^2$$

does not belong to the pre-metric layer. It requires:

a metric;

orthogonality of channels;

a translation rule from norm to frequency.

The quadratic partition is therefore retained as a conditioned realization, not as an automatic consequence of J_R.

Plain-language reading

Knowing where an operator acts is not the same as knowing how an identity divides what is visible from what is preserved. That second separation needs its own reason.

8. Single Entry of the Metric and Gauge

8.1 Entry point

The metric enters the program only once, after the construction of:

closure and order;

linearization;

generative operator;

active projector;

channel candidate.

A metric form is introduced on the discriminant space:

$$h_Y.$$

The induced form on the space of differences is:

$$g_S = C_S^{¿} h_Y C_S .$$

Here $C_S^{¿}$ denotes the dual or adjoint defined by the chosen metric structures.

8.2 Metric consequences

Only from this point onward may one define:

norms;

orthogonality;

pseudoinverse;

orthogonal projections;

path lengths;

gradients.

The normalized representative $\hat{\aleph}$ appears here.

8.3 Refinement of P_{ch}

If:

$$P_{ch}^{\dagger} = P_{ch} ,$$

then:

$$\langle V , m \rangle = 0 ,$$

for:

$$V = P_{ch} U , m = \left(I - P_{ch} \right) U .$$

8.4 Metric branch of J_R

If the metric is positive definite and one requires:

$$J_R^{\dagger} = - J_R ,$$

then, on the active space:

$$J_R^2 = \sigma r^2 I$$

forces:

$$\sigma = -1 .$$

The branch $\sigma = +1$ remains algebraically possible, but requires an indefinite form or a different metric condition.

8.5 Coordinate change and reweighting

A legitimate coordinate change on Y_S jointly transforms:

$$C_S \mapsto D C_S ,$$

$h_Y \mapsto (D^{-1})^{¿} h_Y D^{-1}.$

Then the induced form

$$g_S = C_S^{¿} h_Y C_S$$

remains invariant. By contrast, transforming C_S while keeping h_Y fixed reweights the discriminants. That is not a mere gauge transformation: it is added structure.

8.6 Metric induced by symmetry

Let $G = Aut(A)$ be the automorphism group acting on Y_S. If G is finite or compact, an invariant form may be constructed by averaging an initial form.

The metric class is canonical up to scale when:

$$dim\left(Sym^2 Y_S^{¿}\right)^G = 1.$$

The possible outcomes are:

dimension one: canonical conformal class;

dimension greater than one: SUPERPOSED metric family;

no positive-definite form: OPEN, or transfer to an explicit indefinite form.

Transitivity on discriminants helps express non-preference, but does not by itself guarantee uniqueness.

8.7 Conformal class

If only the global scale is fixed:

$$g_S \sim \lambda g_S, \lambda > 0,$$

conformally invariant quantities may be used, for example:

$$\frac{Tr\left(g_S^k\right)}{Tr\left(g_S\right)^k}.$$

These quantities do not resolve anisotropic reweightings. Their scope must be declared.

8.8 Gauge falsifier

If two formally equivalent realizations produce different predictions solely because of a legitimate coordinate change, the metric construction collapses.

Plain-language reading

First we decide which differences exist. Only afterward do we decide how to measure them. Changing coordinates must not change the result; changing the actual weight of a difference is a new decision.

9. Operational Economy

9.1 First stage: admissibility

Before costs are compared, an architecture must pass hard filters.

It is excluded if it:

loses a required discriminant capacity;

introduces hidden transfer;

declares closure without sufficient discriminants;

uses later information to justify a choice;

depends on unlocked parameters;

confuses levels or operators.

The filters are not compensated by a weighted sum.

9.2 Second stage: lexicographic order

Among admissible architectures, lexicographic programming is used:

maximize inheritance I_{cl};

minimize independent novelty N;

minimize avoidable residue I_{pend}^{ev};

minimize decorative reinforcement F_{dec}.

This may be written:

$$EcoMin = LexMin\left(-I_{cl}, N, I_{pend}^{ev}, F_{dec}\right).$$

This order is not identified with a continuous scalar functional. Each level is minimized subject to the optimality of all preceding levels. Ties are not broken: they remain SUPERPOSED.

The priority $I_{cl} > N$ follows directly from the economy of preserving and not adding. The order between avoidable residue and decorative reinforcement is a programmatic decision and must be registered with its cost; if two orders produce different minimal solutions without an additional criterion, that part remains SUPERPOSED.

9.3 Unit of novelty

Novelty is not counted by sentences or symbols. It is counted by independent primitive decisions.

A dependency graph is maintained for this purpose:

each node is a decision;

each arrow indicates that one decision is derived from another;

only nodes that are not internal consequences are counted as novelty.

9.4 Reinforcement

We distinguish:

functional reinforcement;

redundancy for robustness;

decorative repetition.

Only the last is automatically penalized.

9.5 Accounting

Every update declares:

I_{cl}: preserved inheritance;

N: independent novelty;

F: reinforcement;

I_{tr}: transfer;

I_{pend}: open residue.

9.6 States

Every construction takes one of the states:

RESOLVED;

SUPERPOSED;

OPEN;

TRANSFERRED;

COLLAPSED.

The ontological and canonical levels may be marked FROZEN when fixed as the language of an iteration, without confusing that decision with a proof.

Plain-language reading

First we remove the solutions that cheat. Then, among what remains, we choose the one that preserves more and adds less. If there is a tie, the tie is the result.

10. Interfaces, Inheritance, and Fusion

10.1 Interface

An interface K is an architecture inheritable by two systems through embeddings:

$$K \hookrightarrow A, K \hookrightarrow B.$$

10.2 Fusion

When the pushout exists:

$$A \sqcup_K B,$$

it represents the minimal fusion that identifies only the inheritance expressed by K.

It is not assumed that every pair of architectures has a pushout in the general category. Existence must be proved in the subcategory being used.

10.3 Economic fusion

If several admissible interfaces exist, apply:

hard filters;

maximum inheritance;

minimum novelty;

minimum avoidable residue.

If several fusions remain tied, the result is:

$$\text{SUPERPOSED}.$$

10.4 Update

An update is represented without using an undefined direct sum:

$$A' = \left(Cl\left[Join_E \{ A_i \} \cup N_{¿} \right), F_{¿} \right).$$

The first component is the closed architecture. The second records functional and decorative reinforcements.

11. Cycle, Phase, Rhythm, and Time

11.1 Cycle

A cycle is a closed path in a class of configurations that preserves a recognizable identity.

11.2 Compact phase

On a constant-rank stratum Q_k, introduce a closed one-form α whose class is integral:

$$\frac{[\alpha)}{2\pi} \in H^1 \left(Q_k, Z \right).$$

Then:

$$\oint_\gamma \alpha = 2\pi n, n \in Z.$$

11.3 Formal momentum

Define:

$$p = \kappa \alpha .$$

Therefore:

$$\oint_{\gamma} p = 2 \pi \kappa n .$$

κ remains a formal constant. Its identification with $\hbar$ belongs to a physical bridge, not to this topological result.

11.4 Rhythm

A rhythm is the variation of one phase with respect to another admissible internal or external reference.

11.5 Time through composable interfaces

The temporal comparison between two systems is written:

$$\Gamma_{A \vee B;K} ,$$

because it depends on an interface K declaring which cycles may legitimately be compared.

When they possess inverses and composition, admissible interfaces form a groupoid of comparisons. Integrable time is a functor from that groupoid to the multiplicative group of positive ratios:

$$\Gamma : G_{int} \rightarrow \left(R_{>0} , \times \right) .$$

For composable interfaces one should have:

$$\Gamma_{A \vee C} = \Gamma_{A \vee B} \Gamma_{B \vee C} .$$

Define the defect:

$$\delta \left(A , B , C \right) = \frac{\Gamma_{A \vee C}}{\Gamma_{A \vee B} \Gamma_{B \vee C}} .$$

Integrable case

$\delta = 1 .$

The comparison composes without path memory.

Coherent defect

$\delta \neq 1$

but remains stable under legitimate reparametrizations and depends systematically on the cycle of interfaces. It may conditionally be interpreted as the holonomy of a connection or as a nontrivial cocycle.

Incoherent defect

δ changes under equivalent choices or admits no composition rule. The concrete temporal comparison collapses.

The relation between this defect and a quantum geometric phase may be asserted only after constructing a representation of the interface groupoid in $U(1)$ or another holonomy group.

11.6 Present and eternity

In the canonical language:

the present is the internal continuity of an identity;

eternity represents the absence of an external comparison ordering that continuity.

These readings do not automatically become cosmological claims.

Plain-language reading

Time is not a substance that flows on its own. It appears when two rhythms find a legitimate way to be compared. If the comparison depends on the path, that dependence must be measured, not concealed.

12. Stratified Dynamics

12.1 Configuration space

Before speaking of a distance between architectures, a configuration space must be constructed:

$$Q = \bigsqcup_k Q_k,$$

with:

$$Q_k = \{S : d_{rel}(S) = k\}.$$

Each stratum contains architectures with the same sustainable rank.

12.2 Transport at constant rank

A family of sustainable projectors Π_λ may be transported by:

$$\dot{U} = [\dot{\Pi}, \Pi] U,$$

provided the required metric and regularity have already been fixed.

This transport preserves the sustainable subspace within a stratum.

12.3 Minimizing movements within economic admissibility

The lexicographic economy first defines the admissible set $Adm_{eco}(S_n)$. Only within that set is a metric functional introduced:

$$S_{n+1} \in arg \min_{B \in Adm_{eco}(S_n)} \left[F_k(B) + \frac{d_G^2(S_n, B)}{2\tau} \right).$$

F_k does not represent the whole economy; it describes metric evolution within the economic level already selected.

A continuous limit may be asserted only after proving:

completeness of the space;

existence of minimizers;

lower semicontinuity;

coercivity;

sufficient compactness or convexity.

If these conditions hold, a gradient flow may emerge:

$$\dot{S} = -\nabla_G F_k(S).$$

12.4 Reversible part

Reversible dynamics requires additional structure:

$$L : T^{¿} Q_k \to T Q_k, L^{¿} = -L.$$

If it also satisfies the Jacobi identity, it may define a Poisson structure. Without Jacobi it is only an almost-Poisson structure.

12.5 Hybrid dynamics

A programmatic form is:

$$\dot{q} = L(q)\, d H - M(q)\, d F,$$

with:

$$L^{¿} = -L, M^{¿} = M, M \geq 0.$$

To prevent the two parts from destroying each other's function, impose the degeneracy conditions:

$$L\, d F = 0, M\, d H = 0.$$

Under these conditions, the reversible part preserves H and the closure part makes F nonincreasing:

$$\frac{d H}{d t} = 0,$$

$$\frac{d F}{d t} = -\langle d F, M\, d F \rangle \leq 0.$$

It must also be proved that the flow remains in the sustainable space and preserves the stratum while no rank change occurs. If no nontrivial operators satisfy these conditions, the hybrid dynamics is transferred or collapsed according to the residue.

12.6 Rank changes and the $r=0$ regime

When a singular value of C_λ crosses zero, the rank changes. The algebraic regime $r=0$, where

$$J_R^3=0$$

and P_{act} is no longer defined by $\sigma J_R^2/r^2$, naturally belongs to this gluing boundary.

A nilpotent filtration may appear:

$$ker\, J_R \subseteq ker\, J_R^2 \subseteq ker\, J_R^3 = V_S^{sus}.$$

The minimal procedure is:

fix the inherited interface;

identify the comparable subspaces;

use spectral projectors or polar decomposition;

construct a partial isometry on the surviving subspace;

classify the lost subspace.

The classification distinguishes:

closure;

transfer;

residue;

identity change.

Individual vectors inside a degeneracy are not classified. Invariant subspaces are classified.

Plain-language reading

Within the same capacity to distinguish, the system may change continuously. When it loses or gains an independent difference, it needs a special rule stating what survived and where the rest went.

13. ROSI as a Computational Auditor

ROSI does not replace proofs. Its function is to execute the accounting, search for small counterexamples, and register the program's dependencies.

13.1 Minimal modules

Indiscernibility

It computes:

$$x \sim_S y \Leftrightarrow C_S(e_x - e_y) = 0.$$

Closure basis

It searches for minimal sets B such that:

$$Cl(B)=\Sigma .$$

Discernibility reduct

It searches for subfamilies of comparators preserving the same indiscernibility classes or decisions.

Exchange and computational cost

It tests the closure exchange property, compares greedy with exact search, and seeks minimal closure bases of different cardinalities. A gap is a certificate of non-matroidality for the architecture analyzed.

Rank and sustainable quotient

It computes:

$$\ker C_S, \operatorname{rank} C_S, V_S^{sus} .$$

Interfaces and fusion

It verifies embeddings, constructs pushouts when authorized by the categorical checkpoint, and records preserved inheritance.

Superposition

It returns all non-equivalent minimal solutions without selecting one arbitrarily.

Transfer

It requires a receiving architecture and a verifiable interface.

False closure

It checks whether declared novelty already belongs to inherited closure or changes neither rank, indiscernibility classes, nor decisions.

13.2 Baselines

ROSI will compare its reducts with methods from rough-set theory and other attribute-reduction techniques.

The question is not only whether it finds fewer relations, but whether it preserves the same discriminant capacity and makes transfer and false closure visible.

13.3 Living matrix

Each concept maintains a record containing:

name;

level of origin;

realization;

added assumptions;

invariants;

units;

residue;

falsifier;

state;

dependencies.

ROSI will block the use of a premise whenever a necessary dependency remains OPEN.

13.4 Certificates and scope

ROSI will be a computational auditor. For finite results it should issue, whenever possible, verifiable certificates: generating sets, reducts, exchange counterexamples, search traces, and transfer maps.

The complexity of the verifier must be declared relative to the input format and certificate size. ROSI may be called a formal verifier only when its certificates are checkable by an independent kernel or when it is connected to a proof assistant.

14. Program Closure Tree

The program does not advance as a single staircase. It has a formal trunk and independent branches.

14.1 Mandatory trunk

Checkpoint 0.1: category

Define objects, morphisms, identity, and composition. Determine which finite constructions exist.

Checkpoint 0.2: first difference and comparison

Construct D_1, prove its symmetry, and establish the universal property of C_1 in $Comp_{fin}$.

Checkpoint 0.3: lattice of closures

Prove the order structure produced by Cl.

Checkpoint 0.4: linearization

Construct V_S, Y_S, C_S, the sustainable quotient, and the relational dimension.

Checkpoint 0.5: generative algebra

Determine whether J_R is induced or primitive. Verify the polynomial identity and derive P_{act}.

Checkpoint 0.6: channels

Determine whether there exists a canonical, superposed, or transferred P_{ch}.

Checkpoint 0.7: metric and gauge

Introduce the metric only once, calculate the forms invariant under automorphisms, and prove invariance under legitimate coordinate changes.

14.2 Dynamic branch

sustainable rank-two architecture;

phase and monodromy;

configuration space;

metric limit;

reversible part;

hybrid compatibility;

rank gluing.

14.3 Computational branch

ROSI implementation;

reduct search;

exchange test, greedy versus exact, and finite certificates;

interface construction;

false-closure detection;

ablations and baselines.

14.4 Independent physical branches

The physical branches share the formal trunk, but none validates another.

two-state bridge;

proton branch;

chemistry branch;

gravity branch.

The collapse of one branch does not destroy the others unless a shared dependency fails.

15. Universal Physical Locking Protocol

Before beginning a bridge, the following are fixed in writing:

formal architecture used;

translation rule;

functional or equation;

normalization;

boundary conditions;

target observable;

rejection interval;

falsifier;

number of free shape parameters.

The number of pending shape parameters must be zero.

If an undeclared parameter appears during the derivation, the bridge is suspended.

16. Two-State Bridge

16.1 Rank two does not mean qubit

An architecture with:

$$d_{rel}=2$$

is a sustainable rank-two architecture. It is not automatically a two-level quantum system.

The Hilbert space of a qubit is C^2, of real dimension four. The physical space of pure states, after normalization and identification of global phase, is:

$$CP^1 \simeq S^2,$$

which has real dimension two.

An admissible translation must explicitly construct:

a complex structure;

a Hermitian inner product;

normalization and phase equivalence;

Hermitian observables;

a measurement rule;

unitary evolution;

a map from the sustainable manifold to CP^1.

A strong internal condition is that the induced metric be conformally equivalent to the Fubini-Study metric. If it is not, that translation to the qubit collapses, not the rank-two architecture.

16.2 Interference and geometric holonomy

The overlap:

$$\left|\langle V_1, V_2\rangle\right|^2$$

is not sufficient to define interference.

A relative phase is required:

$$\psi = aV_1 + b e^{i\phi} V_2,$$

along with an observable P and an intensity:

$$I_P(\phi) = \langle \psi, P\psi \rangle.$$

The term depending on ϕ is the interference term.

For three states one may use the Bargmann invariant:

$$B_{123} = \langle \psi_1 | \psi_2 \rangle \langle \psi_2 | \psi_3 \rangle \langle \psi_3 \vee \psi_1 \rangle.$$

Its phase is gauge invariant and represents geometric holonomy. Its possible identification with the temporal defect δ remains conditioned on constructing a common representation of the interface groupoid.

16.3 Action scale

Before physical calibration, write:

$$U(t) = e^{-iHt/\kappa}.$$

Only a locked operational correspondence may propose:

$$\kappa = \hbar.$$

The equality would be a universal calibration if the same κ works in multiple systems without readjustment.

17. Proton Branch

17.1 Descriptive audit of $\varepsilon = 4$

The program already knows the relation:

$$4\acute{\lambda}_p$$

to the proton-radius scale. Therefore, $\varepsilon = 4$ cannot be presented as a completely blind selection.

The arithmetic checkpoint will assess retrospective robustness through a finite MDL protocol:

fix a grammar of arithmetic predicates and connectives;

assign a descriptive cost to each expression;

enumerate every criterion below a fixed length budget;

publish the complete map:

$C \mapsto \{\varepsilon : C(\varepsilon) = 1\};$

record how many independent short criteria select 4 and which criteria select other depths.

Noncomputable Kolmogorov complexity will not be used as an operational criterion. The result measures the presence or absence of descriptive accommodation; it does not prove physical necessity.

17.2 Primary object

The bridge protocol is ready to be locked, but the prediction is not yet executable because the program has not yet derived the form factor. The object that must be constructed is:

$$G_E(Q^2), G_E(0)=1.$$

The moments are obtained from:

$$\langle r^2 \rangle = -6 G_E'(0),$$

$\langle r^4 \rangle = 60 G_E''(0).$

The independent shape measure is:

$$K_E = \frac{\langle r^4 \rangle}{\langle r^2 \rangle^2} = \frac{5}{3} \frac{G_E''(0)}{\left[G_E'(0)\right]^2}.$$

17.3 Discriminating power

Standard profiles produce different values:

uniform sphere: 25/21;

Gaussian: 5/3;

exponential or dipole: 5/2;

Yukawa-type: 10/3.

Therefore K_E tests shape and cannot be corrected by a simple rescaling of the radius.

17.4 Falsifiers

The bridge collapses if it:

requires a fitted cutoff radius;

needs an exponent chosen after comparison with data;

changes the component mixture in order to approach the result;

places K_E outside the preregistered rejection interval;

selects P_{ch} using the measured radius itself.

18. Chemistry Branch

The descriptors:

$$P=a+b, r_V=\frac{N_s}{N_s+N_p}$$

are functions of electronic occupations. Therefore they contain no independent information if the baseline already knows N_s and N_p with sufficient capacity.

Their correct test is economic:

do they compress the description?;

do they regularize better?;

do they generalize to periods not used in training?;

do they explain residuals with the same number of effective parameters?;

The descriptor collapses as physical novelty if it neither improves generalization nor significantly reduces the required complexity.

This branch may be executed once the economy and ROSI are operational. It does not logically depend on success in the proton branch.

19. Gravity Branch

Gravity is retained as a programmatic hypothesis:

Collective dynamics may reduce sustainable relational differences among systems.

The first target will not be a star or a black hole.

The minimal chain is:

$$\text{relational dynamics} \rightarrow \text{acceleration law} \rightarrow \text{effective potential} \rightarrow \text{operational metric}.$$

There is a conditional route to an inverse-square law without introducing it as input. The following must first be proved:

a locally conserved relational quantity or current;

an independently derived effective spatial dimension of three;

isotropy from non-preference;

a surface measure growing as r^2;

source additivity and suitable boundary conditions.

Under these hypotheses, flux conservation implies:

$$4\pi r^2 F(r) = \text{constant},$$

and therefore:

$$F(r) \propto \frac{1}{r^2}.$$

This is a conditional theorem route, not a current result. The polynomial of J_R does not by itself select dimension three, and a dimensional classification of vector products may be used only if its global norm and orthogonality hypotheses are proved.

Reproducing the Newtonian limit would count as a derivational success, even if it did not yet constitute new physics. A differentiating prediction would subsequently require an independently locked observable.

The bridge collapses if:

the potential is imposed from outside;

the $1/r^2$ law is presupposed;

a geometric hypothesis is introduced only to recover the known law;

the metric merely rewrites dynamics already introduced;

no verifiable quantitative regime appears.

20. Checkpoint Delivery Format

Every checkpoint is delivered with the following structure.

Header

name;

state;

dependencies;

lock date;

version of the living matrix used.

Lock declaration

What was fixed before work began.

Construction

Formal steps without implicit translations.

Accounting

inheritance;

novelty;

reinforcement;

transfer;

residue.

Non-confusion proof

When J_R, P_{act}, or P_{ch} is involved, prove that they have not been identified.

Gauge invariance

When the metric is involved, prove invariance or declare the selected fixing.

Plain-language reading

Explain the result in one paragraph without relying on the notation.

Active falsifier

State what result changed or can change the checkpoint's state.

Transfer map

If a formulation fails but its intuition survives, declare the receiving object and the added cost.

21. Status and Execution Mandate

General architecture

FROZEN FOR EXECUTION as a reference document. This is not a mathematical state of the system, but an editorial rule: it is reopened only when an object-level result requires correction of a dependency.

Ontological level

FROZEN as the minimal language of this iteration.

Canonical level

FROZEN as the coherent nomenclature of the project.

Formal trunk

OPEN until the following have been proved:

category;

first difference and comparison;

lattice of closures;

linearization;

status of J_R;

existence or transfer of P^K_{ch};

metric gauge.

Physical branches

BLOCKED until their specific dependencies are resolved or transferred with explicit cost.

Mandatory next deliverables

Checkpoint 0.1: definition, identity, composition, and admissible finite constructions of $RelArch_{fin}$.

Checkpoint 0.2: D_1, its symmetry, and representability of C_1 as the walking oriented comparison.

Minimal ROSI: closure bases, exchange, greedy versus exact, and finite certificates.

MDL audit of $\varepsilon = 4$: complete map of criteria and selected depths.

Preregistration of K_E: definition, extractor, rejection interval, and discrepancy policy.

No new general document precedes these deliverables unless a formal contradiction makes it necessary.

22. What the Proposal Claims and Does Not Claim

The proposal claims as a program

that difference and comparison must be separated;

that every added structure must pay an epistemic cost;

that closure first produces an order structure;

that linearization, algebra, and metric are different layers;

that economy must exclude cheating before comparing costs;

that non-uniqueness may be a legitimate result;

that a physical bridge must lock its observable before comparison with data.

The proposal does not yet claim

that J_R is derivable from closure;

that a canonical P_{ch} exists;

that the quadratic partition is necessary;

that $\kappa = \hbar$ has been derived;

that $\varepsilon = 4$ has been selected blindly;

that the proton radius has been explained;

that the chemical weights add independent information;

that gravity has been derived;

that the program has experimental validation.

23. Conceptual Synthesis

The complete architecture can be expressed simply:

Difference opens a place. Comparison gives it orientation. Closure determines which relations can be preserved together. Linearization makes independence recognizable. The generative operator transforms those differences. The active projector separates where it acts; the channel projector, if it can be derived, distinguishes what is visible from what is preserved. The metric enters afterward in order to measure. Economy removes constructions that conceal decisions. Rhythm preserves an identity through change, and time appears when two rhythms find a common interface. Physics begins only when a translation produces a locked and falsifiable observable.

The strength of the program will not depend on the number of phenomena it can reinterpret. It will depend on how many arrows it can construct with less hidden structure and on how clearly it can stop when one of those arrows does not exist.

This version does not request another reorganization. It requests a proof: the first valid currency of the program is closing Checkpoint 0.1.

Appendix A. Minimal Postulates of This Architecture

There is a canonical semantics of uncompared totality, difference, comparison, and closure.

The first difference precedes the first comparison.

Formal closure is represented by an extensive, monotone, and idempotent operator.

Linearization is an added and declared realization.

The generative operator is induced or primitive; its status must be resolved.

In the algebraic branch, the identity

$J_R^3 = \sigma r^2 J_R$

is studied.

For $r \neq 0$, the active projector is derived as:

$P_{act} = \sigma J_R^2 / r^2$.

P_{ch} is not identified with P_{act}.

The metric enters only once, and its gauge must be fixed or eliminated.

No physical bridge may use unlocked shape parameters.

Appendix B. Available Internal Results

Under the declared hypotheses:

The closed sets of Cl form a complete lattice.

The indiscernibility relation can be represented by:

$C_S(e_x - e_y) = 0$.

The sustainable dimension is:

$rank\, C_S$.

If $J_R^3 = \sigma r^2 J_R$ and $r \neq 0$, then P_{act} is idempotent and:

$\Im P_{act} = \Im J_R, ker\, P_{act} = ker\, J_R$.

An integral phase class produces:

$\oint p = 2\pi\kappa n$.

The temporal defect δ measures non-composition of rhythm comparisons.

Appendix C. Priority Open Problems

Prove identity, composition, and finite constructions in the chosen category.

Prove representability of C_1 and symmetry of D_1.

Prove or refute MacLane-Steinitz exchange for the canonical closure.

Construct the minimal linearization compatible with closure.

Resolve whether J_R is induced or primitive.

Determine whether P_{ch}^K is intrinsic, superposed, or interface-dependent.

Calculate metric forms invariant under automorphisms and fix the gauge.

Construct the configuration space for the dynamics.

Implement ROSI with certificates for finite results.

Execute the MDL audit of $\varepsilon = 4$.

Preregister an independent proton observable and derive $G_E(Q^2)$ without post-hoc shape parameters.

Evaluate the chemical descriptors as compression.

Derive a weak gravitational regime without imposing the spatial law.

Appendix D. Stopping Rule

The rule also applies to the document itself: a new general reorganization stops if it resolves no contradiction, removes no hidden dependency, and closes no checkpoint.

A branch stops when it:

depends on an unsubstituted OPEN premise;

requires undeclared structure;

changes under an equivalent transformation;

selects a parameter after observing the result;

conceals a transfer;

confuses operators or levels;

fails its rejection interval.

The state will be:

COLLAPSED, if the concrete construction fails;

TRANSFERRED, if the intuition can be expressed in a better architecture;

SUPERPOSED, if several minimal solutions survive;

OPEN, if no sufficient discriminant yet exists;

RESOLVED, if the arrow has been constructed and its falsifier is not activated within its declared scope.