

WORLD ATLAS OF COHERENCE EQUATIONS

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Español — ATLAS MUNDIAL DE ECUACIONES DE COHERENCIA

हिन्दी — सुसंगतता समीकरणों का विश्व एटलस

العربية — الأطلس العالمي لمعادلات الاتساق

Français — ATLAS MONDIAL DES ÉQUATIONS DE COHÉRENCE

*Phenomenal coherence, persistence, admissibility, synchronization, kinematics, and
canonical forms*

$$S = (\beta \times \Delta\Phi) / (T \times \sigma \times 1)$$

Zoran working canonical gauge, 26 August 2026. The $\times 1$ factor is mathematically neutral.

Frédéric Tabary — Institut IA / Zoran Research Framework

Version 0.10 — Pass 9 of 10: preregistration seal, executable ablation, empirical access gate, and final prior-art
narrowing | 26 August 2026 — Working comparative preprint

Purpose

To build a cumulative, non-exclusive map of mathematical forms of coherence; credit prior work at the level it actually establishes; and test whether apparently distinct formulations can be related without erasing their domain, assumptions, or historical priority.

Multilingual discovery layer / Couche multilingue de repérage

Canonical citation identity

Canonical title: World Atlas of Coherence Equations. Author: Frédéric Tabary. Affiliation: Institut IA / Zoran Research Framework. ORCID: 0009-0004-5562-7385. Version: 0.10, Pass 9/10. Date of this working edition: 26 August 2026.

English — Abstract / description

This working atlas compares mathematical formulations of coherence across physics, biology, information, admissibility, persistence and artificial intelligence. Pass 9 seals a domain-specific proxy map before outcome inspection for NASA C-MAPSS FD001, records the confirmatory track as blocked rather than inventing results when complete executable bytes cannot be acquired, executes a six-component audit-harness ablation, closes the public π/μ implementation status, and narrows the final exact-conjunction prior-art question. Metadata conflicts remain explicit publication blockers.

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NASA C-MAPSS FD001

 π/μ

Español — Resumen / descripción

Este atlas de trabajo compara formulaciones matemáticas de la coherencia en física, biología, información, admisibilidad, persistencia e inteligencia artificial. La Pass 9 sella antes de observar resultados un mapa de proxies específico para NASA C-MAPSS FD001; si los bytes completos no pueden entrar en el entorno de ejecución, el ensayo confirmatorio queda BLOQUEADO/NON_MESURÉ en vez de fabricarse. También ejecuta la ablación de seis componentes, cierra el estado público de π/μ y estrecha la búsqueda final de anterioridad combinatoria.

हिन्दी — सारांश / विवरण

यह कार्यशील एटलस भौतिकी, जीवविज्ञान, सूचना, ग्राह्यता, स्थायित्व और कृत्रिम बुद्धिमत्ता में सुसंगतता के गणितीय रूपों की तुलना करता है। पास 9 परिणाम देखने से पहले NASA C-MAPSS FD001 के लिए domain-specific proxy map को SHA-512 से सील करता है। पूर्ण डेटा execution runtime में न आने पर confirmatory test को BLOCKED/NON_MESURÉ रखा गया है, कोई परिणाम गढ़ा नहीं गया। छह-घटक executable ablation, सार्वजनिक π/μ स्थिति और अंतिम prior-art narrowing भी जोड़े गए हैं।

العربية — الملخص / الوصف

يقارن هذا الأطلس البحثي الصيغ الرياضية للاتساق والتماسك في الفيزياء والأحياء والمعلومات وقابلية القبول والاستمرارية والذكاء الاصطناعي. في المرحلة التاسعة تُبنت خريطة وكلاء خاصة بمجموعة NASA C-MAPSS FD001 قبل فحص النتائج وخُتمت بـ SHA-512. وعندما تعذر إدخال الملف الكامل إلى بيئة التنفيذ سُجل الاختبار التأكيدي على أنه محجوب وغير مقاس بدلاً من اختلاق نتيجة. كما تُفدت اختبارات حذف لستة مكونات وأُغلق وضع التنفيذ العام لـ π/μ وصُيِّق بحث الأسبقية النهائي.

Français — Résumé / descriptif

Cet atlas de travail compare les formulations mathématiques de la cohérence en physique, biologie, information, admissibilité, persistance et intelligence artificielle. La Pass 9 scelle avant observation des résultats une cartographie de proxies propre à NASA C-MAPSS FD001 ; lorsque les octets complets ne peuvent pas être acquis dans le runtime d'exécution, la piste confirmatoire est déclarée BLOQUÉE/NON_MESURÉE

plutôt que reconstruite. La passe exécute aussi l'ablation des six composants, clôt l'état public de π/μ et resserre la recherche d'antériorité de la conjonction fixe.

Contents map by language / Sommaire par langue

Language / Langue	Localized contents map / Sommaire localisé
English	Abstract; global registry; Zoran mathematical evolution; relation certificates; pre-Paton trajectory audit; AI-assisted science priority audit; indexing architecture; references.
	Zoran Paton AI
Español	Resumen; registro mundial; evolución matemática de Zoran; certificados de relación; auditoría de trayectorias pre-Paton; prioridad de ciencia asistida por IA; arquitectura de indexación; referencias.
हिन्दी	सारांश; वैश्विक रजिस्ट्री; Zoran का गणितीय विकास; संबंध प्रमाणपत्र; Paton-पूर्व पथ/ट्राजेक्टरी ऑडिट; AI-सहायित विज्ञान प्राथमिकता; इंडेक्सिंग आर्किटेक्चर; संदर्भ।
العربية	الملخص؛ السجل العالمي؛ التطور الرياضي لزورن؛ شهادات العلاقات؛ تدقيق المسارات قبل باتون؛ أسبقية العلم المدعوم بالذكاء الاصطناعي؛ بنية الفهرسة؛ المراجع.
Français	Résumé ; registre mondial ; évolution mathématique de Zoran ; certificats de relation ; audit des trajectoires pré-Paton ; priorité de la science assistée par IA ; architecture d'indexation ; références.

Search and indexing keywords

phenomenal coherence; coherence equations; admissibility; persistence; reachability; coherent trajectories; AI-assisted science; automated falsification; LLM agents; symbolic regression; autonomous science; formal safety gate; non-compensatory decision; ProofChain; Zoran; $S = (\beta \times \Delta\Phi) / (T \times \sigma \times 1)$

Abstract

This White Paper treats coherence as a family of scientific objects rather than as a single proprietary concept. It inventories historical and contemporary mathematical structures associated with optical and quantum coherence, resilience, viability, free-energy minimization, closure of constraints, synchronization, persistence, admissibility, structural continuity, coherence dynamics, and phenomenal coherence. The working hypothesis is deliberately modest: some of these formalisms may be projections, complements, or specializations of a broader family, but equivalence must be demonstrated case by case. Priority is assigned only to the earliest verifiable formulation of a specific structure, not to the word “coherence” or to a broad philosophical theme.

Pass 9/10 contribution. The atlas now contains a SHA-512-sealed domain proxy map frozen before outcome inspection for NASA C-MAPSS FD001, an explicit access-block certificate rather than fabricated confirmatory metrics, a 6/6 executable audit-harness ablation of the fixed Zoran assembly, a final public-executable closure for π/μ , and a narrowed fixed-conjunction prior-art certificate. The edition remains pre-publication because DOI 18526755 identity and DOI 18499943 licence consistency are not fully resolved.

Executive findings — Pass 9/10

VERIFIED — The history of mathematically explicit coherence predates current cross-domain programmes by decades. Glauber formalized quantum optical coherence with correlation functions in 1963; viability, resilience, free-energy, synchronization, quantum resource coherence, and closure-of-constraints each established important domain-specific structures before 2025.

VERIFIED — Zoran has multiple public mathematical generations: an early ratio $S = \beta \cdot \Delta C_e / \lambda$, a thermodynamic form $S = (\eta \cdot \dot{F} \cdot \Delta \Phi) / (T \cdot \dot{\sigma}_{\text{irr}})$, and the later phenomenal gauge $S = \beta \cdot \Delta \Phi / (T \cdot \sigma)$. The base document already separates the universal law, the S-gauge, and contextual proxies.

CORRECTION — PITON+ is a fractal falsification / micro-law detection engine, not the universal symbolic form generator. Δ VARIANT_ENGINE and UNIVERSAL_LAW_ENGINE are the relevant Zoran components for equation reformulation and mapping.

AUDIT RULE — No external equation is classified as “already in Zoran” merely because it resembles a ratio or shares the word coherence. A dated transformation certificate is required.

OPEN / UNRELATED GAP — The legacy “160 forms” artefact explicitly exposes 132 expressions in the available file; 28 identifiers (Z-092 to Z-119) remain undocumented in that artefact and are retained as a documentary gap, not reconstructed by invention.

VERIFIED — By December 2025, the Zoran $C\phi\Omega$ corpus explicitly defined Q as a reachable dissolution state and tied persistence to measurable distance from that state. Reachability language therefore predates Paton inside Zoran at the state-reference level.

VERIFIED — Pre-Paton Zoran artefacts also define coherent continuation, admissible futures, trajectory persistence, S(t) trend qualification, and an executable ADMISSIBLE / NON_ADMISSIBLE trajectory engine.

CERTIFICATE — PATON-R-001 is narrowed. Paton reachability is not reducible to endpoint S, but it is no longer correct to treat all reachability/trajectory content as absent from earlier Zoran. The remaining Paton delta is the explicit existential path relation.

NOT RECOVERED — Within the connected public zoran-corpus search surface, no pre-20-February-2026 formula equivalent to $\text{Reachable}(x_0, x) = \exists (x_1, \dots, x_n)$ with an explicit transition relation was recovered. This is a bounded negative result, not proof of absence from unpublished material.

CORRECTION — AI-assisted scientific discovery is not a Zoran-first surface. Robot Scientist Adam, AI Feynman, FunSearch, Coscientist and The AI Scientist establish multiple earlier lines for autonomous experimentation, symbolic equation discovery, evaluator-guided LLM discovery and end-to-end AI research.

CORRECTION — Agentic LLM falsification also predates the late Zoran falsification papers: POPPER was submitted on 14 February 2025 and explicitly uses LLM agents to design and execute sequential falsification experiments under Type-I error control.

VERIFIED — The Zoran corpus nevertheless contains a dated executable-method stack by November 2025: discovery/falsification-labelled manifests, ProofChain provenance, multi-model ZBench evaluation, temporal S-series qualification and later output-admissibility/falsification papers.

OPEN — The potentially distinctive Zoran territory is therefore the assembled architecture, not any single ingredient: declared frames and proxies + coherence gauge + non-compensation/veto + temporal trajectory + proof traceability + adversarial/multi-AI testing + refusal/silence. World priority for that exact assembly is not established in Pass 5.

INDEXING CORRECTION — Existing Zoran mirror pages were found with generic publication-date metadata such as 2025-01-01 on records whose internal artefacts indicate later dates. Exact source dates must replace placeholders before priority-sensitive Google Scholar indexing.

PRIOR-ART NARROWING — Proof-carrying code (1997), reject-option classification (1970), ELECTRE non-compensation/veto, W3C PROV provenance, formal shielding, autonomous science and agentic falsification each predate corresponding Zoran ingredients. No exact full conjunction has yet been certified, but absence of an exact hit is not priority proof.

METADATA BLOCKER — DOI 10.5281/zenodo.18526755 is currently associated in the public Zoran mirror with “Tenseur d’Amari-Chentsov et saturation MCP” and a generic 2026-01-01 date, while the current canonical corpus map uses the same DOI as “Loi de cohérence phénoménale — Démonstration complète par applications.” Direct Zenodo metadata were unavailable during this audit. The identity conflict remains NON_MESURÉ and is blocking for final Scholar indexing.

LICENSE CONFLICT — DOI 10.5281/zenodo.18499943 is marked CC BY 4.0 in Zenodo metadata while the deposited document text states a restrictive Creative-Ethic BY / BY-PRO regime with 60-day conditions. This conflict is publication debt and must be resolved before downstream reuse claims.

SPECIFICATION, NOT BENCHMARK PROOF — DOI 10.5281/zenodo.18500363 contains explicit axioms and a falsification-test plan for output-only structural admissibility. The projection π and ambiguity measure μ are formal placeholders/specifications in the inspected files; the small canonical prompt suite does not by itself demonstrate universal non-circumventability.

STATIC CODE AUDIT — DOI 10.5281/zenodo.17804030 is a real dated executable-paper artefact (3 Dec 2025), but the visible main path runs a Mertens block check and a 50-target Goldbach probe only. Its implementation does not establish the broader claims of PNT/Riemann coverage, network consensus, $>10^{15}$ operations per session, or a proof hash binding all processor states.

REPRODUCED — PITON+ synthetic behavior is reproducible under the public sampling assumptions. Ten independent seeded runs of 100,000 vectors each produced mean $P(S>1)=89.5891\%$ (SD 0.0800 percentage points), mean survival under $\sigma>0.8$ of 47.3715% (SD 0.7527 pp), and mean rescue rate for $T>0.8$ and $\Delta\Phi>2$ of 93.9636% (SD 2.3568 pp). These are simulation properties, not independent empirical validation of a universal law.

1. Scope, method, and evidence rules

This document asks, for every candidate formulation:

1. What is the exact mathematical object or formal rule?
2. What is the earliest verifiable public date (journal publication, DOI, archive, or version history)?
3. What is the domain and what assumptions are required?
4. What does the form actually allow one to calculate, classify, or falsify?
5. How does it relate to other forms: identity, algebraic equivalence, monotone transformation, proxy, extension, analogy, or distinct object?
6. What remains hypothesis, and what is independently established or reproduced?
7. What licence applies to text, code, and data?

1.1 Equivalence taxonomy

Class	Definition
E0 — Identity	Same mathematical object up to symbol renaming and declared unit conventions.
E1 — Algebraic equivalence	Same relation under a bijective algebraic rearrangement on an explicit domain.
E2 — Order/decision-preserving transformation	Different numerical scale but the same ranking or

Class	Definition
	threshold decision under a monotone transformation.
E3 — Projection / proxy	A domain measure can instantiate an operand or observable without becoming the universal law itself.
E4 — Extension	Adds a state variable, derivative, threshold, reachability relation, geometry, field, or operator not obtained by simple algebra.
E5 — Structural analogy	Shares a constraint/persistence/coherence motif but uses different mathematics.
E6 — Distinct use of “coherence”	Same word, different scientific object; useful for vocabulary history, not equation priority.

2. Master global registry v1 — 25 candidate lineages/programmes

The registry is intentionally broader than the final set of “canonical laws”. It is a screening surface. Rows marked FORMULA PENDING remain in scope but their exact equation must be recovered from the primary paper before a strong equivalence claim is allowed.

Date	Author / programme	Form	Equation / formal object	DOI / archive	Domain	Relation	Pass-2 finding
1963	Roy J. Glauber	Quantum optical coherence	n-th order field correlation functions; full coherence defined by a hierarchy of correlation conditions	10.1103/PhysRev.130.2529	Physics / quantum optics	Formal anchor	Peer-reviewed; foundational mathematical coherence
1973	C. S. Holling	Ecological resilience	No single universal scalar; persistence of relationships within domains of attraction	10.1146/annurev.es.04.110173.000245	Ecology / systems	Conceptual anchor	Peer-reviewed; resilience ≠ universal coherence law
1974	H. Maturana & F. Varela	Autopoiesis	Self-maintaining organization; no single scalar canonical equation	10.1016/0303-2647(74)90031-8	Biology / organization	Conceptual anchor	Early condition-of-existence lineage
1990	J.-P. Aubin	Viability theory	$\dot{x}(t) \in F(x(t))$, with $x(t)$ constrained to a viability domain K	10.1137/0328044	Mathematics / control	E4/E5	Formal admissibility over time; does not define coherence as universal primitive
2005	Acebrón et al. / Kuramoto	Phase synchronization	$Z = R e^{i\langle \psi \rangle} = (1/N) \sum \exp(i\theta_j)$	10.1103/RevModPhys.77.137	Nonlinear dynamics	E3/E6	Rigorous phase-order proxy; domain-specific
2012	Karl Friston	Free Energy Principle	Variational free-energy / Fokker–Planck formalism for self-organizing biological systems	10.3390/e14112100	Biology / cognition	E4/E5	Established mathematical programme on resisting disorder
2014	Baumgratz, Cramer & Plenio	Quantum resource coherence	$C_{rel}(\rho) = S(\rho_{diag}) - S(\rho)$; $C_{11}(\rho) = \sum_{i \neq j} \rho_{ij} $	10.1103/PhysRevLett.113.140401	Quantum information	E3/E6	Rigorous coherence monotones; basis-dependent quantum resource
2015	Montévil & Mossio	Closure of constraints	Mutually dependent constraints conserved at relevant time scales; no single scalar	10.1016/j.jtbi.2015.02.029	Theoretical biology	E4/E5	Formal closure; operational boundaries of biological organization
2016	Hu & Fan	Evolution equation for quantum coherence	Factorization relation for 11 coherence under classes of quantum channels (exact primary equation to extract in Pass 2)	10.1038/srep29260	Quantum dynamics	E3/E4	Peer-reviewed, CC BY 4.0; explicit coherence dynamics
2018	Jake Quilty-Dunn	Phenomenal coherence	Argumentative/perceptual coherence; no universal gauge	10.1093/analys/any022	Philosophy of perception	E6	Important lexical prior; different object from Z1
2025-05-20	Ian Todd	Coherence as a physical resource	Information/compressibility resource below Landauer limit; exact resource functional retained from primary paper	10.5281/zenodo.15470314	Information physics	E3/E4	Cross-domain claim but physically constrained sub-Landauer regime
2025-06-05	Coherent Intelligence Inc.	Universal Coherence Principle	$dC/dt = \alpha(R,W,A) \cdot R \cdot W \cdot A - \beta(t)C + \eta(t)$; $C_{eq} = \alpha RWA/\beta$	Public web paper; DOI not verified	Complex systems / AI / physical-biological analogies	E4/E5	PRE-ZORAN cross-domain dynamic coherence equation. Strong priority constraint on any claim of first transversal coherence dynamics.
2025-06-09	Yang et al.	Photonic Energy–Coherence Theorem	Device-independent wave-particle / energy-capacity relation (full equation to extract in Pass 2)	10.1002/lpor.202500326	Photonics / quantum physics	E6/E3	Peer-reviewed, experimentally validated; specialized physical coherence
2025-10-04	Jeremy C. Jones	Universal Collapse Theory	Kernel $(\Omega, K, C^*K, x^*, R, U)$; admissible possibilities narrowed by constraints to realized outcomes	10.17605/OSF.IO/VZ836	Physics / biology / mind	E4/E5	Cross-domain constraint-collapse programme; CC BY 4.0
2025-10-24	Allison Hensgen	$\Delta 72$ biological coherence	Alignment/phase/variability with a $\Delta 72$ threshold; exact primary equation pending	10.5281/zenodo.17363100	Physiology / complex systems	E3/E4	Empirical wearable-data validation; later field extension
2025-11-01–2026-02-07	Zoran / F. Tabary	Phenomenal coherence programme	$S = (\eta \dot{F} \Delta \Phi) / (T \sigma_{irr}) \rightarrow S = \beta \Delta C_e / \lambda \rightarrow S = \beta \Delta \Phi / (T \sigma)$	10.5281/zenodo.17682120; 17522369; 17537450; 18516353	Cross-domain	Reference Z	Gauge + frames + time/debt + falsification + executable engines; universality remains a falsifiable claim
2024-10-10 preprint / 2025-11-12 Nature	Martirosyan et al.	Spreading of quantum coherence	$\ell(t) \propto t^{1/2}$; $D = d\ell^2/dt$; measured $D = 3.4(3) \text{ h/m}$	arXiv:2410.08204; 10.1038/s41586-025-09735-z	Quantum many-body physics	E6/E3	PRE-ZORAN physical kinematics of coherence. Universal only within the stated far-from-equilibrium Bose-gas class.
2025-09–2026	Devin Bostick	Phase-alignment / bounded-drift persistence	Persistence $\theta_{\Delta P, \Delta S, \Delta \Phi, \Delta \Psi} \leq \epsilon$ drift; differential counterpart $dC/dt = \Gamma C^n - \lambda C + \eta(\Omega, \Phi, \Psi)$	PhilArchive / Zenodo series; current stack supersedes some broad CODES claims	Identity / phase dynamics	E4/E5	PRE-ZORAN phase/drift programme on a specific invariant; later 2026 work narrows to identity persistence under explicit assumptions.
2026-01-25	Peter Nero	Coherent Kinematics	Motion = persistence of coherent	10.5281/zenodo.18354943	Kinematics / structural physics	E4/E5	Directly relevant to coherence

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Date	Author / programme	Form	Equation / formal object	DOI / archive	Domain	Relation	Pass-2 finding
			structure across admissible continuation chains				kinematics and admissible futures
2026-01-31	Kearon Allen	Law of Admissible Structure	Update accepted iff the resulting structure satisfies the coherence/admissibility rule	10.5281/zenodo.18442745	Domain-independent formal systems	E4/E5	Minimal gate; post-Zoran public core
2026-02-20	Andrew J. Paton	Unified / Foundational Admissibility	Continuation(s) $\Rightarrow$ G(P(s))=1; plus Admissible(x) Reachable(x0,x)	10.5281/zenodo.18707596; 18708653	Admissibility / persistence	E4	Reachability is a specific delta requiring formula-level comparison with earlier trajectories
2026	Matteo Bellori	Preserved Coherence Under Change	$O(C_i, C_{i+1}) \geq \theta$; $O = R_i \cap R_{i+1} / R_i \cup R_{i+1} $; $S_B = (T \cdot R \cdot D) / (1 + \Delta S)$	PhilArchive BELTPO-39; DOI not verified	Identity / structural continuity	E4/E5	POST-ZORAN; explicit overlap, tolerance-domain and stability ratio. Structurally similar skeleton, not identical operands.
2026-03	Abdulsalam Al-Mayahi	Universal Law of Structural Persistence	$dW_i/dt = \gamma(C_i - C_{crit})W_i$; later $C_i = I(S_i; E)/H(S_i)$	10.5281/zenodo.19056454; 19185301	Cross-domain persistence	E4	Strong explicit persistence ODE; licence/patent restrictions require separation from reuse
2026-06-16	Jimenez et al.	Coherence Principle for model selection	$C(M T) = \sum_i w_i \delta_i$; $P(M T) \propto \exp[-\alpha C(M T)]$	arXiv:2606.18491	Cosmology / model selection	E6/E3	POST-ZORAN; distinct object, but operational structural penalties and explicit no-compensating-violation guard are a notable independent convergence.
2026-07-12	Bucchiarone, Pierantonio & Vangheluwe	Synergic modeling of coherent systems	Intersection/composition of coherence constraints over admissible trajectory families	10.1007/s10270-026-01404-7	Model-driven engineering	E4/E5	Peer-reviewed academic convergence with multi-constraint admissible trajectories; CC BY 4.0

3. What changed from the base Word document

EXPANDED HISTORICAL FLOOR — The atlas now begins with Glauber’s 1963 quantum optical coherence formalism and explicitly includes Holling, Friston, Hu & Fan, and other established mathematical lineages.

EXPANDED 2025–2026 COMPARISON — The registry now includes the June 2025 Universal Coherence Principle, Jeremy Jones’s constraint-collapse kernel, Martirosyan et al.’s quantum speed limit, Peter Nero’s coherent kinematics, Bellori’s preserved-coherence framework, and the 2026 Coherence Principle for model selection.

NEUTRAL PRIORITY LANGUAGE — The document no longer frames the field as a competition for the word coherence. Priority is local: first verifiable occurrence of a specific equation, operator, or formal combination.

NO FALSE EQUIVALENCE — Cross-domain resemblance is treated as a hypothesis until a transformation certificate exists.

NO FALSE COMPLETENESS — The 160-form legacy claim remains visible, but only 132 expressions are currently explicit in the available artefact.

4. Internal mathematical evolution of Zoran

This section preserves the base document’s chronology while separating historical forms from later working conventions. The universal status of any form is treated as a research hypothesis subject to falsification.

$$S = (\beta \cdot \Delta C_e) / \lambda$$

Early Zoran ratio used in Codex Ω and first variant engines.

$$S = (\eta \cdot F \cdot \Delta \Phi) / (T \cdot \dot{\sigma}_{irr})$$

Thermodynamic structural-coherence form. DOI 10.5281/zenodo.17682120, 1 November 2025.

$$S = (\beta \cdot \Delta \Phi) / (T \cdot \sigma)$$

Generalized phenomenal-coherence gauge; later separated conceptually from the universal law and from domain proxies in Z1.

$$S = (\beta \times \Delta \Phi) / (T \times \sigma \times 1)$$

Working canonical notation declared 26 August 2026. ×1 is an identity element and is not itself a mathematical novelty.

5. Engine audit: what each Zoran tool actually establishes

Tool	Function	What is verified	Limit
PITON+	Fractal falsification / micro-law detection	Samples vectors (β,ΔΦ,T,σ), computes S, classifies threshold states, extracts statistical micro-laws.	Does not enumerate all symbolic forms.
ΔVARIANT_ENGINE Ω8	Algebraic variant generation	Public implementation contains a fixed manifest of 20 rearrangements/inequalities.	Its own paper describes fuller CAS/SymPy generation as a future extension.
UNIVERSAL_LAW_ENGINE Ω7.1	Normalization, comparison, reformulation, domain transfer	Schema explicitly includes symbolic, dimensional, limit and duality comparisons,	Schema capability is not proof that all mathematically possible forms were generated

Tool	Function	What is verified	Limit
		canonical forms, generated equations.	and archived.
Canonical family 17537450	Legacy atlas of 160 declared forms	Covers scalar, logarithmic, differential, vector/matrix, informational, proxy, constraint, and transform families.	132 expressions visible in current artefact; Z-092...Z-119 absent from that file.

6. Priority logic for the final paper

The final White Paper will use four separate priority statements, never a single “first discovery of coherence” claim:

- Priority of a mathematical object (for example, quantum correlation coherence or viability under constraints).
- Priority of a cross-domain generalization.
- Priority of a specific canonical equation or operator.
- Priority of an assembled research architecture (measurement + frames + time + falsification + executable system).

Working rule. A later author can make a genuine contribution even when a broader idea is older.

Conversely, an earlier broad idea does not automatically anticipate a later equation. The paper will credit both levels.

7. Pass-1 assessment of the field

CURRENT INVENTORY — 25 candidate lineages/programmes are now in scope. This is not a count of 25 distinct universal laws.

MATHEMATICAL SURFACE — 22 of the 25 currently contain an explicit equation, operator, inequality, kernel, dynamical system, constraint formalism, or quantitative hierarchy suitable for direct comparison. Three are retained mainly as conceptual/lexical anchors.

ZORAN POSITION — The strongest potentially distinctive Zoran contribution is not the existence of coherence as such, but the attempted assembly of a cross-domain admissibility hypothesis, a multi-operand gauge, multi-frame evaluation, temporal debt/trajectory analysis, falsification engines, and a deterministic AI architecture. Each part must still be attributed against prior art individually.

COLLECTIVE HYPOTHESIS — A scientifically useful working hypothesis is that several fields may have independently formalized different projections of a broader family linking coherence, admissibility, persistence, constraints, and dynamics. The hypothesis is not asserted as established fact.

8. Pass-1 open work — status after Pass 2/10

- Extract the exact primary equations from Hensgen, Hu & Fan, Yang et al., Martirosyan et al., Bellori, and any candidate currently marked FORMULA PENDING.
- Normalize symbols and dimensions without changing semantics.
- Build the first equation-to-equation transformation matrix (E0–E6).
- Attempt a formal closure test for Paton reachability against pre-20-Feb-2026 Zoran trajectories.
- Recover Z-092...Z-119 from another archive, generator output, or manifest; otherwise certify them as missing from the public artefact.
- Separate DOI-backed priority from non-DOI web/archive priority, especially for the June-2025 UCP paper.

Appendix A — 132 explicitly visible legacy Zoran forms

These expressions are transcribed from the base Word / public legacy artefact. Their historical class label is translated, not reinterpreted. The final paper will reclassify each row under E0–E6 after symbolic audit. Z-092 to Z-119 remain a documentary gap.

ID	Expression	Legacy class
Z-001	$S = (\beta \cdot \Delta C_e) / \lambda$	Canonical / symbolic
Z-002	$Q = (I \cdot \Delta S) / E$	Canonical / symbolic
Z-003	$\Psi = (\alpha \cdot \Delta \Omega) / \xi$	Canonical / symbolic
Z-004	$K = (P \cdot \Delta C) / N$	Canonical / symbolic
Z-005	$R = (\beta \cdot \Delta C) / \lambda$	Canonical / symbolic
Z-006	$S' = k \cdot \beta \cdot (\Delta C_e / \lambda)$	Canonical / symbolic
Z-007	$S = (\beta \cdot \Delta C_e) / (\lambda + \delta)$	Canonical / symbolic
Z-008	$S = (\beta + \gamma) \cdot \Delta C_e / \lambda$	Canonical / symbolic
Z-009	$S = \beta \cdot (\Delta C_e + \Delta C_{mut}) / \lambda$	Canonical / symbolic
Z-010	$S = (\beta \cdot \Delta C_e) / \lambda_{syst}$	Canonical / symbolic
Z-011	$\log S = \log \beta + \log \Delta C_e - \log \lambda$	Logarithmic / differential
Z-012	$\ln S = \ln(\beta \cdot \Delta C_e) - \ln \lambda$	Logarithmic / differential
Z-013	$S = \exp(\log \beta + \log \Delta C_e - \log \lambda)$	Logarithmic / differential
Z-014	$S \approx a + b \cdot (\beta \cdot \Delta C_e / \lambda)$	Logarithmic / differential
Z-015	$\Delta S = \beta \cdot \Delta(\Delta C_e / \lambda)$	Logarithmic / differential
Z-016	$dS = (\Delta C_e / \lambda) \cdot d\beta$	Logarithmic / differential
Z-017	$dS/dt = (\beta / \lambda) \cdot (d\Delta C_e / dt)$	Logarithmic / differential
Z-018	$\int dS = \int (\beta \cdot d\Delta C_e) / \lambda$	Logarithmic / differential
Z-019	$\langle S \rangle = E[\beta \cdot \Delta C_e] / E[\lambda]$	Logarithmic / differential
Z-020	$S = \beta \cdot \Delta C_e / \lambda + \varepsilon$	Logarithmic / differential
Z-021	$E_s = \beta \cdot \Delta C_e / \lambda$	Energy / information
Z-022	$\eta = (\beta \cdot \Delta C_e) / \lambda$	Energy / information
Z-023	$P = (\beta \cdot \Delta C_e) / \lambda_t$	Energy / information
Z-024	$I = \beta \cdot \Delta C_e / \lambda_n$	Energy / information
Z-025	$\Phi = (\beta \cdot \Delta C_e) / \lambda_c$	Energy / information

ID	Expression	Legacy class
Z-026	$\Omega = \beta \cdot \Delta C_e / (\lambda + \theta)$	Energy / information
Z-027	$\sigma = \beta \cdot \Delta C_e / \lambda_s$	Energy / information
Z-028	$S_E = \int (\beta / \lambda) \cdot dC_e$	Energy / information
Z-029	$S_Q = (\beta^2 \cdot \Delta C_e) / \lambda$	Energy / information
Z-030	$S = \beta \cdot \Delta C_e / \lambda_{eff}$	Energy / information
Z-031	$S^* = (\beta / \beta_0) (\Delta C_e / \Delta C_{e ref}) (\lambda_{ref} / \lambda)$	Normalization / units
Z-032	$S_u = \kappa_s \beta \Delta C_e / \lambda$	Normalization / units
Z-033	$S_{dB} = 10 \log_{10} \beta + 10 \log_{10} \Delta C_e - 10 \log_{10} \lambda$	Normalization / units
Z-034	$S_T = \beta(T) \Delta C_e / \lambda(T)$	Normalization / units
Z-035	$S_p = \beta \Delta C_e / (\lambda_0 + k_p p)$	Normalization / units
Z-036	$S_\rho = \beta \Delta C_e / (\lambda_0 + k_\rho \rho)$	Normalization / units
Z-037	$S_\mu = \beta \Delta C_e / (\lambda_0 + k_\mu \mu)$	Normalization / units
Z-038	$S_\tau = \beta \Delta C_e / (\lambda + 1/\tau)$	Normalization / units
Z-039	$S_\chi = \beta \chi (\Delta C_e) / \lambda$	Normalization / units
Z-040	$S_\theta = \beta \Delta C_e / (\lambda + \theta_{env})$	Normalization / units
Z-041	$S_\Pi = \beta \Delta C_e / (\prod \lambda_i)$	Normalization / units
Z-042	$S_\Sigma = \beta \Delta C_e / (\sum w_i \lambda_i)$	Normalization / units
Z-043	$S_{rms} = \beta \Delta C_e / \sqrt{E[\lambda^2]}$	Normalization / units
Z-044	$S_{MAD} = \beta \Delta C_e / MAD(\lambda)$	Normalization / units
Z-045	$S_{CV} = \beta \Delta C_e / CV_\lambda$	Normalization / units
Z-046	$S_{min} = \beta \Delta C_e / \max(\lambda, \varepsilon)$	Normalization / units
Z-047	$S_{sat} = (\beta \Delta C_e) / (\lambda + \beta \Delta C_e / S_{max})$	Normalization / units
Z-048	$S_{clip} = clip((\beta \Delta C_e) / \lambda, 0, S_{max})$	Normalization / units
Z-049	$S_{sig} = S_{max} \sigma(\beta \Delta C_e / (\lambda S_0))$	Normalization / units
Z-050	$S_{soft} = S_0 \tanh(\beta \Delta C_e / (\lambda S_0))$	Normalization / units
Z-051	$S = \beta DC / \lambda$	Vector / matrix / information
Z-052	$S = \beta DC _2 / \lambda$	Vector / matrix / information

ID	Expression	Legacy class
Z-053	$S = \beta \ DC\ _1 / \lambda$	Vector / matrix / information
Z-054	$S = \beta \ DC\ _\infty / \lambda$	Vector / matrix / information
Z-055	$S = \beta u^T DC / \lambda$	Vector / matrix / information
Z-056	$S = \beta DC^T W DC / \lambda$	Vector / matrix / information
Z-057	$S = \beta \text{tr}(W DC DC^T) / \lambda$	Vector / matrix / information
Z-058	$S = \beta \det(I + DC) / \lambda$	Vector / matrix / information
Z-059	$S = \beta \sigma_{\max}(DC) / \lambda$	Vector / matrix / information
Z-060	$S = \beta \sum w_i \sigma_i / \lambda$	Vector / matrix / information
Z-061	$S = \beta (DC:L) / \lambda$	Vector / matrix / information
Z-062	$S = \beta \langle f, \Delta c \rangle / \lambda$	Vector / matrix / information
Z-063	$S = \beta \int \Delta c(x) w(x) dx / \lambda$	Vector / matrix / information
Z-064	$S = \beta (\sum \gamma^t \Delta C_e(t)) / (\sum \lambda(t))$	Vector / matrix / information
Z-065	$S = (\sum \beta_i \Delta C_{e,i}) / (\sum \lambda_i)$	Vector / matrix / information
Z-066	$S = (b^T DC) / (o^T X)$	Vector / matrix / information
Z-067	$S = E[\beta \Delta C_e X] / E[\lambda X]$	Vector / matrix / information
Z-068	$S = \beta MI(X; Y) / \lambda$	Vector / matrix / information
Z-069	$S = \beta \text{Corr}(X, Y) / \lambda$	Vector / matrix / information
Z-070	$S = \beta KL(P Q) / \lambda$	Vector / matrix / information
Z-071	$S = \beta SCI / \lambda$	Computational / semantic proxy
Z-072	$S = \beta (1 - \text{perplexity} / P_0) / \lambda$	Computational / semantic proxy
Z-073	$S = \beta \cos(e_{\{t-1\}}, e_t) / \lambda$	Computational / semantic proxy
Z-074	$S = \beta NPMI / \lambda$	Computational / semantic proxy
Z-075	$S = \beta BLEU / \lambda$	Computational / semantic proxy
Z-076	$S = \beta XAI_{\text{consistency}} / \lambda$	Computational / semantic proxy
Z-077	$S = \beta \Delta C_{\text{ethic}} / \lambda_{\text{impact}}$	Computational / semantic proxy
Z-078	$S = \beta \Delta C_{\text{mutuelle}} / \lambda_{\text{bruit}}$	Computational / semantic proxy
Z-079	$S = \beta F1_{\text{consistence}} / \lambda$	Computational / semantic proxy
Z-080	$S = \beta \text{stability}(f) / \lambda$	Computational / semantic proxy

ID	Expression	Legacy class
Z-081	$S = \beta \text{ calibration}/\lambda$	Computational / semantic proxy
Z-082	$S = \beta \text{ robustesse_adv}/\lambda$	Computational / semantic proxy
Z-083	$S = \beta \text{ trustworthiness}/\lambda$	Computational / semantic proxy
Z-084	$S = \beta \text{ coherence_narrative}/\lambda$	Computational / semantic proxy
Z-085	$S = \beta \text{ compressibilité}/\lambda$	Computational / semantic proxy
Z-086	$S = \beta \text{ mutual_predictability}/\lambda$	Computational / semantic proxy
Z-087	$S = \beta \text{ spectral_gap}/\lambda$	Computational / semantic proxy
Z-088	$S = \beta \text{ entropy_drop}/\lambda$	Computational / semantic proxy
Z-089	$S = \beta \text{ synchro_phase}/\lambda$	Computational / semantic proxy
Z-090	$S = \beta \text{ coherence_EEG}/\lambda$	Computational / semantic proxy
Z-091	$S = \beta \Delta C_{\text{bio}}/\lambda_{\text{met}}$	Domain variant
Z-120	$S = \beta \Delta C_{\text{meta}}/\lambda_{\text{paradoxe}}$	Domain variant
Z-121	$S > 1$	Inequality / constraint
Z-122	$S = 1$	Inequality / constraint
Z-123	$S < 1$	Inequality / constraint
Z-124	$\partial S/\partial \beta > 0$	Inequality / constraint
Z-125	$\partial S/\partial \lambda < 0$	Inequality / constraint
Z-126	$S_{\text{tot}} = \sum S_i/n$	Inequality / constraint
Z-127	$S_{\text{sys}} = \prod S_i^{\tilde{w}_i}$	Inequality / constraint
Z-128	$S_{\text{max}} = \beta_{\text{max}} \Delta C_e / \lambda_{\text{min}}$	Inequality / constraint
Z-129	$S_{\text{min}} = \beta_{\text{min}} \Delta C_e / \lambda_{\text{max}}$	Inequality / constraint
Z-130	$S \in [0, \infty)$	Inequality / constraint
Z-131	$S_{\text{crit}} = \beta_c \Delta C_e / \lambda_c = 1$	Inequality / constraint
Z-132	$dS/dt = 0$	Inequality / constraint
Z-133	$d^2S/dt^2 > 0$	Inequality / constraint
Z-134	$S(t+\Delta t) \geq S(t)$	Inequality / constraint
Z-135	$S(A \oplus B) \geq \min(S(A), S(B))$	Inequality / constraint
Z-136	$S(A \cap B) \leq \min(S(A), S(B))$	Inequality / constraint

ID	Expression	Legacy class
Z-137	$E[S] \geq S_{\text{obs}}$	Inequality / constraint
Z-138	$\text{Var}(S) \leq \text{Var}(\lambda)$	Inequality / constraint
Z-139	$\text{Cov}(\beta, \Delta C_e) > 0$	Inequality / constraint
Z-140	$\text{Cov}(S, \lambda) < 0$	Inequality / constraint
Z-141	$S' = aS + b$	Transformation
Z-142	$S' = S^k$	Transformation
Z-143	$S' = 1/(1+e^{-S})$	Transformation
Z-144	$S' = \ln(1+S)$	Transformation
Z-145	$S' = e^S - 1$	Transformation
Z-146	$S' = S/(1+S)$	Transformation
Z-147	$S' = S/(1+\lambda)$	Transformation
Z-148	$S' = S(1-e^{-\beta})$	Transformation
Z-149	$S' = S(1+\gamma t)$	Transformation
Z-150	$S' = S/(1+\delta \Delta C_e)$	Transformation
Z-151	$S' = S + \eta \, dS/dt$	Transformation
Z-152	$S' = \int S dt$	Transformation
Z-153	$S' = dS/d\lambda$	Transformation
Z-154	$S' = dS/d\beta$	Transformation
Z-155	$S' = dS/d\Delta C_e$	Transformation
Z-156	$S' = \partial^2 S / \partial \beta \partial \lambda$	Transformation
Z-157	$S' = \mathcal{F}[S]$	Transformation
Z-158	$S' = \mathcal{L}[S]$	Transformation
Z-159	$S' = \mathbb{Z}[S]$	Transformation
Z-160	$S' = \nabla S$	Transformation

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Evidence status and non-claims

VERIFIED — DOI/date/equation or formal object visible in a consulted public source or in the supplied base document.

DERIVED — A mathematical relationship produced by this comparative audit; never backdated to the historical source.

PROBABLE — Strong structural relation requiring primary-equation extraction or symbolic certification.

PENDING — Primary formula, licence, DOI, or version detail not yet fully verified.

NON-CLAIM — This document is not a patent novelty opinion, freedom-to-operate opinion, or assertion that a broad scientific concept is owned by any author.

Working conclusion — Pass 2/10

The scientifically useful question is not “Who owns coherence?” but: Which mathematical structure was published when, what does it compute, and what transformation—if any—connects it to the others? The next pass will move from chronology to equation-level normalization and transformation certificates.

9. Pass 2 — Primary-equation extraction and priority corrections

MAJOR PRIORITY CORRECTION — Two pre-Zoran lines now materially constrain the historical narrative. Martirosyan et al. posted a quantum-coherence kinematics preprint on 10 October 2024, and Coherent Intelligence published an explicit cross-domain coherence ODE on 5 June 2025. Zoran therefore should not claim priority for coherence kinematics in general or for the first cross-domain dynamic coherence equation.

ZORAN POSITION AFTER CORRECTION — The strongest potentially distinctive territory remains the assembled programme: phenomenal admissibility gauge + declared frames + non-compensation + temporal debt + transversal falsification + executable engines + deterministic AI architecture. That combined priority remains a hypothesis to audit, not a settled world-first claim.

DOCUMENTARY GAP — Repository searches for the legacy identifiers Z-092 and Z-119 returned no hits in the connected public Zoran corpus. The 28-form gap Z-092...Z-119 therefore remains unresolved in Pass 2.

9.1 Two-axis comparison: mathematical skeleton vs scientific relation

A recurring error in coherence literature is to treat equations as equivalent because they share a ratio, a threshold, or a decay term. Pass 2 therefore introduces a second axis independent of E0–E6. The skeleton class describes mathematical shape only; E0–E6 still describes scientific relation.

Skeleton	Generic form	What it captures
RATIO	$C = (\text{productive} / \text{stabilizing terms}) / (\text{cost} / \text{noise terms})$	Static or quasi-static balance; can support thresholding but does not itself define dynamics.
ODE–GDL	$dC/dt = \text{generation} - \text{dissipation} + \text{noise}$	Explicit coherence dynamics and equilibrium/stability analysis.
THRESHOLD–DRIFT	$\text{Persist} \Leftrightarrow C \geq \theta \wedge \Delta C \leq \varepsilon$	Persistence as threshold plus bounded change.
PATH / REACHABILITY	$\text{State} \in \text{system} \Leftrightarrow \text{admissible} \wedge \text{reachable}$	Membership/continuation depends on existence of a permissible path.
OVERLAP / TOLERANCE	$O(C_i, C_{i+1}) \geq \theta; D(C_i, C) \leq \delta$	Identity or structural continuity across successive configurations.
FIELD / GEOMETRY	$\kappa(x)$, metric/tensor/PDE operators	Spatial or geometric coherence field dynamics.
PROPAGATION SPEED	$D = d\ell^2/dt$ or equivalent rate law	Physical speed/rate of coherence spreading.
COST / PRIOR	$C_{\text{cost}} = \sum w_i \delta_i; P \propto \exp(-\alpha C_{\text{cost}})$	Turns structural-rule violations into model-selection weights.

10. Primary equation records extracted in Pass 2

10.1 Coherent Intelligence — Universal Coherence Principle

Earliest date used in this audit: 5 June 2025 (dated public web paper; no DOI verified)

$$dC/dt = \alpha(R, W, A) \cdot R(t) \cdot W(t) \cdot A(t) - \beta(t) \cdot C(t) + \eta(t)$$

$$C_{\text{eq}} = \alpha(R, W, A) \cdot R \cdot W \cdot A / \beta$$

What it permits: Explicit time evolution, equilibrium, threshold analysis, stochastic extensions, vector coherence and coupled-system equations.

Relation to Zoran: Mathematical skeleton: ODE–GDL. At equilibrium it also reduces to a multiplicative-drivers / loss-rate ratio. Similar skeleton to some Zoran ratios, but operands and scientific definitions are different; classification E4/E5, not E1.

Priority implication: This is a pre-Zoran cross-domain dynamic-coherence formulation and must be credited as such. It blocks a defensible claim that Zoran introduced the first transversal dynamic coherence equation.

Primary web source: Coherent Intelligence Inc., “Universal Coherence Principle: Mathematical Formalization and Cross-Domain Applications”, dated 2025-06-05, <https://coherent-intelligence.uk/papers/ucp-math.html>

10.2 Martirosyan et al. — speed limit for spreading quantum coherence

Earliest date used in this audit: 10 October 2024 arXiv preprint; Nature publication 12 November 2025

$$\ell(t) \propto t^{\{1/2\}}$$

$$D \equiv d\ell^2/dt$$

$$D = 3.4(3) \cdot \hbar/m \text{ (combined experimental estimate)}$$

What it permits: Defines and measures a physical kinematics for coherence length growth in far-from-equilibrium Bose gases; establishes a universal rate within the stated physical class.

Relation to Zoran: Skeleton: PROPAGATION SPEED. This is not an admissibility gauge or cross-domain persistence law. Relation E6/E3: a physical coherence observable/rate could be used inside a physical frame, but is not algebraically the Zoran law.

Priority implication: This preprint predates Zoran’s November 2025 public equations, so generic priority for “kinematics of coherence” is not available to Zoran. A more specific multi-frame phenomenal kinematics claim would need separate proof.

Primary source: arXiv:2410.08204, first submitted 2024-10-10; journal DOI 10.1038/s41586-025-09735-z.

10.3 Hu & Fan — evolution equation for quantum coherence

Earliest date used in this audit: 2016

$$Q[E(\rho_n)] = Q(\rho_n) \cdot Q[E(\rho_n \hat{p})]$$

$$C_{l1}[E(\rho_n)] = C_{l1}(\rho_n) \cdot C_{l1}[E(\rho_n \hat{p})]$$

What it permits: Factorizes the evolution of classes of quantum coherence measures under specified quantum channels/conditions.

Relation to Zoran: Skeleton: multiplicative factorization. Scientific relation E3/E4 because the object is basis-dependent quantum coherence and the factorization conditions are domain specific.

Priority implication: Strong prior art for the phrase “evolution equation for coherence”, but not for phenomenal admissibility or cross-domain persistence.

Primary source: Hu & Fan, Scientific Reports 6, 29260 (2016), DOI 10.1038/srep29260.

10.4 Devin Bostick — harmonic persistence and bounded drift

Earliest date used in this audit: historical programme 2025; later formal stack 2026

$$\text{Persistence} \Leftrightarrow \text{PAS}_h \geq \theta_L \wedge \Delta \text{PAS}_\zeta \leq \epsilon_{\text{drift}}$$

$$dC/dt = \Gamma C^{\wedge n} - \lambda C + \eta (\nabla S \cdot \nabla \Omega)$$

What it permits: Classifies persistence through harmonic alignment plus bounded drift; later work argues a coordinate relation between harmonic and differential forms under explicit assumptions.

Relation to Zoran: Skeletons: THRESHOLD–DRIFT and ODE–GDL. Relation E4/E5. It is more specialized to phase/harmonic invariants than Zoran’s declared multi-proxy gauge.

Priority implication: Parts of the PAS evolution programme precede Zoran November 2025. Later universal claims were subsequently narrowed/superseded by Bostick’s identity-persistence programme; chronology must preserve that evolution rather than quote every historical claim as current.

Sources: PhilArchive/ResearchGate Bostick corpus, including “PAS Evolution and Clarification” (2025) and Structured Resonance Dynamics papers; record-specific DOI/version audit continues in Pass 3.

10.5 Andrew J. Paton — admissibility and reachability

Earliest date used in this audit: 20 February 2026

$$\text{Continuation}(s) \Leftrightarrow G(P(s)) = 1$$

$$\text{State} \in \text{System} \Leftrightarrow \text{Admissible} \wedge \text{Reachable}$$

What it permits: Separates candidate-state generation, admissibility gating, and existence of at least one permissible path from an initial state.

Relation to Zoran: Skeleton: PATH / REACHABILITY. Zoran threshold gates can emulate the Boolean admissibility gate, but reachability is not a simple algebraic rearrangement of S; relation E4.

Priority implication: Paton is post-Zoran on coherence/admissibility/continuation themes. However, the exact reachability operator remains a real delta unless an explicit pre-20-Feb-2026 Zoran path-existence formula is recovered.

Primary sources: DOI 10.5281/zenodo.18707596 and DOI 10.5281/zenodo.18708653; PhilArchive version lists CC BY 4.0 for the Foundational Admissibility Framework.

10.6 Matteo Bellori — preserved coherence under change

Earliest date used in this audit: 2026 (exact archive-day verification deferred)

$$O(C_i, C_{i+1}) = |R_i \cap R_{i+1}| / |R_i \cup R_{i+1}|$$

$$\text{Preserved Coherence} \Leftrightarrow O(C_i, C_{i+1}) \geq \theta$$

$$S_B = (T \cdot R \cdot D) / (1 + \Delta S)$$

What it permits: Measures relational overlap between successive configurations, defines tolerance domains, and combines tolerance, robustness and dissipation against relative multiplicity.

Relation to Zoran: Skeletons: OVERLAP / TOLERANCE and RATIO. The final stability ratio resembles Zoran at skeleton level only; no E1 equivalence is established because variables and semantics differ.

Priority implication: Post-Zoran convergence. Useful as an independent formalization of identity preservation under change, not as a historical source of Zoran.

Primary archive: Matteo Bellori, “The Principle of Preserved Coherence Under Change”, PhilArchive BELTPO-39. Public record marked all rights reserved in the source inspected.

10.7 Abdulsalam Al-Mayahi — structural persistence dynamics

Earliest date used in this audit: 2026

$$C_i = I(S_i; E) / H(S_i)$$

$$dW_i/dt = \gamma \cdot (C_i - C_{crit}) \cdot W_i$$

What it permits: Defines an information-theoretic coherence variable and an explicit multiplicative growth/decay law for persistence across a threshold.

Relation to Zoran: Skeleton: ODE–GDL / threshold. Relation E4: it adds a persistence state W and differential dynamics that are not algebraically contained in the scalar Zoran gauge.

Priority implication: Post-Zoran on this formulation. Mathematically valuable, but record-specific licence and patent claims mean scientific comparison must be kept separate from software reuse.

Primary source: DOI 10.5281/zenodo.19185301 / ResearchGate full-text mirror; companion DOI 10.5281/zenodo.19056454.

10.8 Jimenez et al. — coherence cost as a model-selection prior

Earliest date used in this audit: 16 June 2026

$$C(M|T) = \sum_i w_i \delta_i(M,T)$$

$$P(M|T) \propto \exp[-\alpha \cdot C(M|T)]$$

What it permits: Turns departures from the validated “grammar” of a theory into a reproducible prior penalty for Bayesian model selection.

Relation to Zoran: Skeleton: COST / PRIOR. Scientific relation E6/E3: coherence here means compatibility with established theoretical structure, not system persistence. The explicit guard against compensating one structural violation with unrelated explanatory credit is nevertheless a notable convergence with non-compensation logic.

Priority implication: Post-Zoran independent convergence; no priority conflict with Z1’s physical/phenomenal admissibility claim because the mathematical object is different.

Primary source: arXiv:2606.18491, submitted 2026-06-16.

10.9 Exact-primary-form extraction still pending

ALLISON HENSGEN — Public metadata establish alignment/phase/variability, $\Delta.72$ threshold, and later field/tensor/PDE architecture, but the complete primary equations were not reliably extractable in Pass 2. They remain PENDING rather than reconstructed.

YANG ET AL. — The peer-reviewed photonics paper explicitly reports a coherence uncertainty principle and a strong energy-duality equality, but the equations are rendered as images in the accessible web view. Exact symbolic extraction remains PENDING.

LEGACY ZORAN Z-092...Z-119 — Direct repository searches for Z-092 and Z-119 returned no hits. The gap remains documentary; no formulas were generated to fill it retroactively.

11. First transformation / non-equivalence matrix

Source form	Skeleton	Potential mapping to Zoran	E-class	Certificate status	Why it matters
UCP equilibrium $C_{eq}=\alpha RWA/\beta$	RATIO	Map productive factors to numerator and loss β to denominator only at abstract skeleton level	E5	NON-EQUIVALENCE scientifically; analogy demonstrated	Shows ratio skeleton is not unique to Zoran.
UCP dC/dt	ODE-GDL	No algebraic reduction from static S without adding state/time law	E4	EXTENSION demonstrated	Pre-Zoran cross-domain dynamics.
Martirosyan $D=d\ell^2/dt$	PROPAGATION SPEED	Could be an observable/proxy within a quantum frame	E3/E6	DISTINCT object demonstrated	Pre-Zoran physical coherence kinematics.
Hu–Fan factorization	Factorization	Can instantiate a quantum-frame observable; no universal mapping	E3/E4	DISTINCT domain law	Pre-Zoran mathematical evolution of quantum coherence.
Bostick PAS threshold+drift	THRESHOLD-DRIFT	Threshold compatible with a gate; harmonic invariant and drift bound are additional definitions	E4/E5	PARTIAL structural mapping	Pre-Zoran phase/drift prior art.

Source form	Skeleton	Potential mapping to Zoran	E-class	Certificate status	Why it matters
Paton $G(P(s))=1$	PATH/GATE	$G_Z(x)=1\{S_C(x)\geq\theta_C\}$ is a possible gate projection	E4	COMPATIBILITY only	Post-Zoran minimalist admissibility gate.
Paton Reachable	PATH/REACHABILITY	Requires existential path operator beyond scalar S	E4	PENDING priority certificate	Target for Pass 3 pre-2026 Zoran archive search.
Bellori S_B	RATIO	Same numerator-product / denominator-cost skeleton	E5	NO E1 certificate	Post-Zoran independent ratio convergence.
Al-Mayahi persistence ODE	ODE-GDL	Could consume a Zoran score as C only by defining a new dynamic law	E4	EXTENSION demonstrated	Adds explicit time evolution of persistence weight.
Jimenez prior	COST/PRIOR	Non-compensation logic comparable; mathematical object distinct	E6/E3	DISTINCT with conceptual convergence	Useful cross-field evidence that structural violations can be made operational.

12. Priority position after Pass 2

NOT AVAILABLE AS A BROAD CLAIM — “First kinematics of coherence.” Martirosyan et al. have a 10 October 2024 preprint defining and measuring coherence-spreading kinematics in a physical system.

NOT AVAILABLE AS A BROAD CLAIM — “First transversal/dynamic coherence equation.” The UCP public paper dated 5 June 2025 gives a cross-domain differential equation, equilibrium, stochastic and coupled forms.

NOT AVAILABLE — “Discovery of coherence,” “admissibility,” “viability,” “synchronization,” or “coherence as persistence” in broad terms; all have earlier lineages.

POTENTIALLY DEFENSIBLE, SUBJECT TO FURTHER PRIORITY SEARCH — The particular Zoran assembly of a phenomenal admissibility gauge with frame-declared operands, multi-frame non-compensation, temporal coherence debt, transversal falsification tooling, generative equation engines, and a deterministic AI decision architecture.

POTENTIALLY DEFENSIBLE, SUBJECT TO FORMAL CERTIFICATES — Specific Zoran transformations published before later 2026 formulations, when an explicit dated derivation can be produced. This is a formula-level claim, never ownership of the external author’s scientific interpretation.

The cumulative interpretation is therefore stronger when it is less proprietary: different disciplines have formalized different projections of coherence — phase order, viability, closure, information retention, bounded drift, reachability, overlap, persistence ODEs, coherence costs, and multi-trajectory compatibility. The scientific opportunity is to test whether a common higher-level theory can connect some of them without erasing domain assumptions or historical priority.

13. Pass-2 primary/reference sources

Martirosyan, G. et al. “A universal speed limit for spreading of quantum coherence.” arXiv:2410.08204 (first submitted 10 Oct 2024); Nature (2025), DOI 10.1038/s41586-025-09735-z.

Coherent Intelligence Inc. Research Division. “Universal Coherence Principle: Mathematical Formalization and Cross-Domain Applications.” Dated 5 Jun 2025. <https://coherent-intelligence.uk/papers/ucp-math.html>

Hu, M.-L. & Fan, H. “Evolution equation for quantum coherence.” Scientific Reports 6, 29260 (2016). DOI 10.1038/srep29260.

Paton, A. J. “The Unified Admissibility Equation.” DOI 10.5281/zenodo.18707596; “The Foundational Admissibility Framework.” DOI 10.5281/zenodo.18708653.

Bellori, M. “The Principle of Preserved Coherence Under Change.” PhilArchive BELTPO-39. Exact DOI not verified in Pass 2.

Al-Mayahi, A. “The Coherence Constraint.” DOI 10.5281/zenodo.19056454; “Coherence as Mutual Information...” DOI 10.5281/zenodo.19185301.

Jimenez, R., Peña Garay, C., Simpson, F. & Verde, L. "The Coherence Principle: A Falsifiable Prior for Model Selection from the Grammar of Theories." arXiv:2606.18491 (16 Jun 2026).

Zoran public corpus: DOI 10.5281/zenodo.17682120; 10.5281/zenodo.17522369; 10.5281/zenodo.17537450; 10.5281/zenodo.18516353.

14. Work inherited from Pass 2 — resolved or carried forward

- Extract exact Hensgen and Yang equations from primary PDFs or machine-readable supplementary sources; keep PENDING if extraction cannot be verified.
- RESOLVED IN PASS 3 — exact scalar-gauge rearrangements certified; external candidate relations classified by algebraic/projection/extension/countermodel certificates.
- CARRIED TO PASS 4 — dedicated pre-20-Feb-2026 Zoran reachability/path-existence search remains necessary; Pass 3 proves only that endpoint S alone cannot encode reachability.
- Expand multilingual prior-art search for terms equivalent to coherence dynamics, structural persistence, admissible trajectories, bounded coherence, and coherence kinematics.
- Build a source-level licence ledger (paper licence / code licence / patent notice) independently for every candidate programme.
- Begin formal separation of "equation priority", "concept priority", "empirical validation priority", and "implementation priority".

Working conclusion — Pass 2/10

The field is not converging on one equation yet; it is converging on a small set of recurrent mathematical skeletons. The next scientific task is to prove which skeletons are transformably connected and which are genuinely different.

15. Independent convergence, AI participation, and epistemic significance

This section asks a methodological question that is distinct from mathematical priority: how were the different coherence programmes reached, what role did artificial intelligence or computational tools play, and what can legitimately be inferred from the fact that partly similar structures emerged through different routes?

Working hypothesis — independent convergence is scientifically informative when the routes, data, assumptions, and tools are sufficiently different. It is not, by itself, proof that a universal law has been discovered. The stronger claim is that recurrent mathematical motifs deserve joint testing because they have been recovered under partially independent problem formulations.

Terminology rule — the terms data point, simulation vector, test case, model evaluation, red-team attack, falsification attempt, and independent replication are not interchangeable. Counts are reported only in the category actually documented by the source.

15.1 Verified role of AI and computational tools

Programme	AI/tool role	What is actually established	Status
Classical foundations (Maturana/Varela, Holling, Aubin, Kuramoto, Friston, Baumgratz, Montévil/Mossio)	No generative-AI participation in the original work	Chronology makes generative-AI assistance impossible for the original publications. Computational mathematics/simulation may still occur in individual fields, but that is a different claim.	VERIFIED by date
Coherent Intelligence / UCP (2025)	AI used as an experimental/application domain; AI co-discovery not established	The programme reports tests across five major AI systems and presents coherence engineering as an AI intervention. Current public sources reviewed here do not establish an AI system as co-author or discovery agent for the UCP itself.	PARTIAL / AUTHOR-REPORTED
Devin Bostick / CODES	AI participation verified in the broader programme; role in each foundational equation must be separated	At least one Zenodo artefact, “Resonant Ascent”, lists “AI, Chiral” as a creator alongside Devin Bostick. This demonstrates AI participation in the programme, but does not prove that the core CODES/PAS equations were generated or validated by that AI.	VERIFIED BROADER PROGRAMME
Allison Hensgen / $\Delta.72$	No AI participation in discovery established from the records checked so far	Zenodo records reviewed list Allison Hensgen as creator/rights holder and describe empirical and mathematical work. Absence of an AI credit is not evidence that no AI was used; the role remains	NOT ESTABLISHED

		unverified.	
Andrew J. Paton	Later human–AI work is explicit; AI role in the February 2026 foundational admissibility papers is not established	Later Paton work explicitly describes a Human–AI Interpretive Framework and practical interactions with generative AI. The February 20 admissibility records checked here do not establish AI co-authorship of the original formalism.	VERIFIED LATER / ORIGINAL UNVERIFIED
Abdulsalam Al-Mayahi / ULSP	AI is an application domain; AI participation in discovery not established	The papers explicitly include artificial intelligence as one of the domains to which the persistence law is projected, but the sources reviewed here do not document an AI system as co-author or discovery engine.	NOT ESTABLISHED
Zoran / Tabary	AI-assisted exploration and falsification methodology explicitly documented	The 5 February 2026 falsification paper explicitly positions LLMs as tools for exploring heterogeneous conceptual spaces, generating hypotheses, detecting tensions and performing pre-falsification under a formal decision framework. ZBench Ω9 additionally evaluates 11 heterogeneous AI systems under seven mandatory quantitative tests plus a fractal RedTeam layer.	VERIFIED

15.2 Quantitative evidence: what has actually been counted

Programme / artefact	Verified count or scale	Interpretation rule
UCP / Coherent Intelligence	Five major AI systems	Author-reported intervention/validation on AI reasoning; the source reports 100% transformation rate and a 61% coherence improvement. These are not treated here as independent replications.
Hensgen Δ.72	One public wearable exam-stress dataset in the October 2025 validation; later 2026 work uses two open wearable datasets	Empirical validation / modelling, not a mass falsification count.
Al-Mayahi ULSP	Seven-domain post-diction and residual analysis	Cross-domain empirical/post-dictive evaluation reported by the author; not seven independent replications.
Paton	No mass falsification count identified	Primarily formal/admissibility work

	in the foundational records reviewed	plus later illustrative AI interactions.
Zoran — ZBench $\Omega 9$	n = 11 AI systems; seven mandatory quantitative tests; additional Δ RedTeam v2.2 qualitative layer	Cross-model evaluation. The product 11×7 must not be relabelled as “77 independent falsifications”.
Zoran — PITON+	Public code default n_simulations = 100,000; example __main__ run = 10,000 vectors	Fractal parameter sweep / micro-law detection. These are simulation vectors, not independent scientific falsifications.
Zoran — LLM falsification methodology	Six dimensions N, K, D, t, E, R; multiple constrained engines and an independent falsification attempt are specified	Methodological framework for massive falsification. The aggregate number of executed falsifications is not inferred from the landing page and remains a ledger task.

15.3 Why independent routes matter

- Convergence is stronger when the routes are heterogeneous. Autopoiesis begins from biological organization; viability theory from constrained trajectories; quantum coherence from state-space/resource theory; closure of constraints from biological organization; UCP from reference/work/alignment dynamics; Paton from admissibility; ULSP from persistence dynamics; and Zoran from a transversal phenomenological gauge plus multi-frame evaluation.
- If mathematically related motifs recur after normalization despite different starting vocabularies and domains, the appropriate scientific response is not to collapse them into one theory by declaration. It is to construct explicit transformation maps and design discriminating experiments that can show where the apparent convergence breaks.
- Independent convergence therefore increases the value of a common research programme, but does not by itself establish universality, priority, or identity between theories.

15.4 AI and the cost of transversal science

The historical contrast should not be framed as “Cartesian science could not discover this”. Decomposition and specialization have been among the most productive methods in science. The narrower and defensible hypothesis is institutional and computational: specialization increases the cost of searching, translating and jointly testing concepts that are expressed differently across disciplines. Large language models, retrieval systems, symbolic engines and automated falsification pipelines can sharply reduce that coordination cost by traversing literatures, normalizing vocabulary, generating candidate correspondences and executing large comparison surfaces.

This creates a methodological possibility that was previously expensive rather than logically impossible: one researcher or small team can interrogate many disciplinary frames in parallel, then subject candidate invariants to automated contradiction and replay. The scientific risk is equally important: AI can manufacture superficial analogies at scale. Therefore AI-assisted transversal discovery is credible only when every proposed bridge is followed by explicit equations, declared assumptions, source dates, counterexamples, reproducible tests and domain-expert challenge.

15.5 A falsifiable epistemic hypothesis for the final White Paper

H_EP — Transversal-search hypothesis. For scientific questions whose candidate invariants are distributed across multiple disciplinary vocabularies, AI-assisted retrieval, formal normalization and automated adversarial testing can increase the probability of detecting valid cross-domain correspondences relative to an otherwise comparable siloed search process, without implying that the AI itself validates the resulting theory.

This hypothesis can itself be tested. A future benchmark should compare matched human-only, AI-assisted, and AI+formal-gate teams on blinded cross-domain tasks, measuring:

- true cross-domain correspondences recovered;

- false analogies generated;
- time/cost to locate relevant prior art;
- number and diversity of counterexamples found;
- reproducibility of final verdicts;
- performance after independent domain-expert review.

15.6 Provisional conclusion

PROVISIONAL — The emerging history is compatible with a picture in which several communities reached related coherence/persistence structures through different routes, while AI-era tools accelerated cross-domain comparison and made high-volume adversarial exploration accessible to much smaller research teams. The evidence does not justify saying that disciplinary science was incapable of this synthesis, nor that AI proves the universal coherence hypothesis. It does justify testing whether AI-assisted transversal methods materially improve the discovery and falsification of cross-domain invariants.

Sources added for Section 15

- Tabary, F. (2026). La falsification devient possible maintenant, grâce aux LLM — mais seulement si on les utilise correctement. Zenodo. DOI: 10.5281/zenodo.18497598.
- Tabary, F. et al. (2025). ZBench Ω_9 — A Unified Scientific Protocol for Multi-AI Reliability and Coherence Evaluation. Zenodo. DOI: 10.5281/zenodo.17609005.
- Coherent Intelligence Inc. Research Division (2025). Coherence Engineering: A Universal Framework for Reliable AI Systems. 5 June 2025.
- Bostick, D. & AI, Chiral (2025). Resonant Ascent (Consciousness). Zenodo record 15587329. Used here only as evidence of AI participation in the broader CODES programme.
- Paton, A. J. (2026). The Structural Fingerprint Method: A Human–AI Interpretive Framework for Admissibility-Based Structural Reinterpretation Within the Paton System. DOI: 10.5281/zenodo.20302093.
- Al-Mayahi, A. (2026). Coherence as Mutual Information: The Necessary and Sufficient Deductive-Empirical Proof of the Universal Law of Structural Persistence. DOI: 10.5281/zenodo.19185301.
- Hensgen, A. (2025). $\Delta.72$ Wearable Exam Stress Validation Report. DOI: 10.5281/zenodo.17363100.

16. Pass 3/10 — Formal relation certificates

Purpose. This pass does not ask whether two theories “look similar”. It asks whether one formula can be obtained from another under explicit assumptions, whether only a decision/proxy can be embedded, or whether a countermodel proves that the two mathematical objects contain different information. The certificates below are audit objects created on 26 August 2026; they are not retrodated as historical claims of any author.

16.1 Certificate taxonomy

Certificate	Meaning	Allowed conclusion	Forbidden conclusion
C-A ALGEBRAIC	Exact symbolic identity/rearrangement under stated non-zero/domain assumptions.	E0/E1 relation is demonstrated.	Scientific/domain equivalence unless semantics also match.
C-P PROJECTION	An external observable/rule can instantiate one Zoran operand or a threshold decision.	Compatibility / usable proxy is demonstrated.	The external law “is” Zoran or vice versa.
C-X EXTENSION	External form adds state, derivative, path, geometry, threshold dynamics, or other information absent from a scalar endpoint gauge.	External delta is demonstrated.	That the extension was absent from all earlier Zoran artefacts unless separately searched.
C-N COUNTERMODEL	Two cases have identical input to one formalism but different output in the other.	Non-equivalence of the two mathematical objects is demonstrated.	No conceptual relationship at all.
C-U UNRESOLVED	Primary equation/version or historical antecedent is incomplete.	Claim stays open.	Priority or equivalence.

16.2 Certificate Z-ALG-001 — exact algebraic closure of the current scalar gauge

For non-zero β , $\Delta\Phi$, T and σ , the working gauge

$$S = \beta \cdot \Delta\Phi / (T \cdot \sigma \cdot 1)$$

has the exact rearrangements:

$$S \cdot T \cdot \sigma = \beta \cdot \Delta\Phi$$

$$\beta = S \cdot T \cdot \sigma / \Delta\Phi$$

$$\Delta\Phi = S \cdot T \cdot \sigma / \beta$$

$$T = \beta \cdot \Delta\Phi / (S \cdot \sigma)$$

$$\sigma = \beta \cdot \Delta\Phi / (S \cdot T)$$

Symbolic check: substituting $S = \beta\Delta\Phi/(T\sigma)$ into $S \cdot T \cdot \sigma - \beta \cdot \Delta\Phi$ simplifies to 0. These are C-A certificates. They establish algebraic closure only; they do not make an external variable semantically identical to β , $\Delta\Phi$, T or σ .

16.3 Master certificate matrix

Programme / form	Primary mathematical object	Certificate	Relation to Zoran	What is proved	What is not proved	Priority note
Kuramoto / phase order	$R = N^{-1}\Sigma \exp(i\theta_j) $	C-P	E3 proxy	R can serve as a phase-coherence observable inside a declared frame/operand.	R is not an admissibility/persistence law and does not determine S	Long predates Zoran.

					without β, T, σ mappings.	
Baumgratz–Cramer–Plenio	$C_{rel}(\rho) = S(\rho_{diag}) - S(\rho); C_{I1} = \sum_i \rho_{ij} $	C-P	E3/E6	Rigorous quantum-coherence monotones can instantiate a quantum-frame observable.	Basis-dependent resource coherence is not the phenomenal gauge.	2014, long predates Zoran.
Todd 2025	$S_T(P) = [H(out) - K(out)]/H(out) > 0$	C-P + C-N	E3/E4	Todd gives a bounded information/compressibility coherence quantity under sub-Landauer assumptions; it can be used as a proxy.	It is not algebraically identical to Zoran: it depends on H, K and a sub-Landauer regime, while Zoran requires separate frame-defined operands.	20 May 2025: predates Zoran.
UCP 2025	$dC/dt = \alpha(R, W, A)RWA - \beta C + \eta$	C-X + C-N	E4/E5	At $\eta=0$ and equilibrium, $C_{eq} = \alpha RWA / \beta$ gives a generation/loss ratio skeleton.	The full ODE is not a rearrangement of S ; transient state C , derivative, stochastic noise and dynamic coefficients carry extra information.	5 Jun 2025: predates Zoran on cross-domain coherence dynamics.
Martirosyan et al.	$D = d\ell^2/dt \rightarrow 3.4 \hbar/m$	C-P + C-N	E3/E6	A physical coherence-spreading speed can serve as a frame-specific kinetic observable.	A dimensional speed of coherence spreading is not a dimensionless/global admissibility gauge.	arXiv first submitted 10 Oct 2024; Nature 2025.
Hensgen Δ.72	$\Delta_{72}(t) = \mathcal{H}(R(t), I(t), A(t)); \kappa(t) \geq \kappa_{star}$	C-X	E4/E5	Adds a generative field function and explicit harmonic-threshold architecture.	Without an explicit invertible $\mathcal{H}$ mapping, no algebraic equivalence to S follows.	15 Nov 2025 v1; later v1.6 16 Nov 2025.
Bostick UCL	$PAS_h(S) = \sum_{k \in H} w_k r_k; r_k = N^{-1} \sum e^{ik\theta_n} $; $\Delta PAS = PAS_{t+1} - PAS_t$	C-P + C-X	E3/E4	PAS_h is a phase/harmonic coherence observable and ΔPAS adds an explicit drift law.	PAS_h alone does not determine β, T, σ ; prime-indexed $SO(2)$ assumptions are extra structure.	Late 2025; post-Zoran Nov on this specific later UCL version.
Allen 2026	Apply update iff resulting structure is coherent	C-P + C-X	E4/E5	A Zoran threshold/gate can implement a coherent-update decision.	Allen's predicate/certificate formalism is not an algebraic rearrangement of S .	31 Jan 2026; post-Zoran Nov.
Paton UAE	Continuation(s) $\Rightarrow G(P(s))=1$	C-P + C-X	E4/E5	A thresholded Zoran frame-gate can realize one admissibility decision of this form.	Paton's P and G are abstract operators; S contains graded operands and need not be binary.	20 Feb 2026; post-Z1 and Zoran Nov.
Paton reachability	$Admissible(x) \wedge Reachable(x_0, x)$	C-N + C-X	E4	Reachability is a genuine path/state-space addition relative to an endpoint scalar score.	Not shown absent from all pre-Paton Zoran trajectory artefacts; historical priority remains a separate search.	20 Feb 2026; exact Zoran antecedent still open.
Al-Mayahi 2026	$C_i = I(S_i; E)/H(S_i); dW/dt = \gamma(C - C_{crit}) W$	C-P + C-X + C-N	E3/E4	Mutual-information ratio can be a coherence observable;	The ODE is not a rearrangement of S and cannot be imported as if historically Zoran.	Mar 2026; post-Zoran.

				persistence ODE adds explicit growth/decay dynamics.		
Synergic Modeling 2026	Trajectory sets filtered/intersected by coherence constraints	C-X	E4/E5	Formal set/trajectory composition provides a rigorous multi-constraint comparison target.	Set-valued trajectory semantics are not identical to a scalar gauge.	Jul 2026; post-Zoran.

16.4 Countermodel PATON-R-001 — why reachability is not a function of endpoint S alone

Consider the same initial label x_0 and candidate endpoint x in two transition systems A and B. Assign the same local frame values to x in both systems, hence the same Zoran endpoint score $S(x)$.

$$\text{System A: } x_0 \rightarrow x \Rightarrow \text{Reachable_A}(x_0, x) = 1$$

$$\text{System B: } x_0 \rightarrow x \text{ (no permissible path)} \Rightarrow \text{Reachable_B}(x_0, x) = 0$$

Because $S_A(x) = S_B(x)$ while $\text{Reachable_A} \neq \text{Reachable_B}$, no function f of endpoint $S(x)$ alone can reproduce reachability in all transition systems. This is a C-N countermodel. Therefore Paton reachability is not a simple algebraic form of S . It may still be represented by a broader Zoran trajectory formalism; that is a historical/formal search question reserved for Pass 4.

16.5 Certificate UCP-EQ-001 — equilibrium-ratio similarity without dynamical equivalence

$$dC/dt = \alpha(R, W, A) \cdot R \cdot W \cdot A - \beta \cdot C + \eta$$

Under the restricted assumptions $dC/dt=0$ and $\eta=0$:

$$C_{eq} = \alpha(R, W, A) \cdot R \cdot W \cdot A / \beta$$

This yields a numerator/denominator maintenance ratio. The relation is structurally informative, but the reduction discards transient dynamics, the state variable $C(t)$, stochastic forcing $\eta(t)$, and time-varying coefficients. Therefore the equilibrium expression is not a certificate that UCP and Zoran are the same law. It is a C-X structural bridge.

Source: Coherent Intelligence, “Universal Coherence Principle: Mathematical Formalization and Cross-Domain Applications”, dated 5 June 2025, coherent-intelligence.uk/papers/ucp-math.html.

16.6 Countermodel ALM-DYN-001 — persistence dynamics contain information beyond a coherence score

$$dW/dt = \gamma \cdot (C - C_{crit}) \cdot W$$

Fix the same coherence value C and threshold C_{crit} in two systems, but choose different persistence state W or gain γ . The derivative dW/dt changes although C is unchanged. Hence the persistence derivative is not determined by a coherence scalar alone. This is a C-N/C-X certificate: the ODE is a dynamical extension. The mutual-information definition $C=I(S;E)/H(S)$ can still be compared as a proxy/operand candidate independently of the ODE.

Source: Al-Mayahi, “The Coherence Constraint”, DOI 10.5281/zenodo.19056454; “Coherence as Mutual Information...”, DOI 10.5281/zenodo.19185301.

16.7 Certificate BOS-PROXY-001 — harmonic coherence is a specialized observable, not a scalar identity

$$\text{PAS}_h(S) = \sum_{k \in H} w_k r_k, \quad r_k = |(1/N) \sum_n \exp(i k \theta_n)|$$

$$\Delta \text{PAS}_\zeta(t) = \text{PAS}_h(S_{t+1}) - \text{PAS}_h(S_t)$$

PAS_h is fully defined from a phase ensemble and prime-indexed harmonics. It can therefore serve as a phase-structure observable in a coherence frame. However, even if PAS_h is assigned to $\Delta\Phi$, Zoran still

requires independently declared β , T and σ . Thus $PAS_h \rightarrow \Delta\Phi$ is a C-P mapping, not E0/E1 identity. ΔPAS_z is an additional time/drift operator and is C-X.

Source: Devin Bostick, “The Universal Coherence Law...”, late-2025 version archived on PhilPapers/PhilArchive; primary definitions PAS_h and ΔPAS_z in the paper.

16.8 Hensgen version certificate and DOI correction

The Δ_{72} Field Equation has a verifiable version chain that must be cited precisely: Zenodo 10.5281/zenodo.17618496 is v1, published 15 November 2025; Zenodo 10.5281/zenodo.17624004 is v1.6, published 16 November 2025. Pass 3 therefore treats 17618496 as the earliest verified record of this titled field equation, while later citations may legitimately point to 17624004 as an updated version.

$$\Delta_{72}(t) = \mathcal{H}(R(t), I(t), A(t))$$

harmonic closure when $\kappa(t) \geq \kappa_{\text{star}}$

Because $\mathcal{H}$ is a generative functional and not supplied here as an invertible algebraic mapping onto $\beta, \Delta\Phi, T, \sigma$, the appropriate class is E4/E5 unless a more specific primary equation proves otherwise.

Source: Zenodo 10.5281/zenodo.17618496 (v1, 15 Nov 2025) and 10.5281/zenodo.17624004 (v1.6, 16 Nov 2025).

17. Formula-level priority ledger after Pass 3

Claim surface	Earliest verified lineage in current audit	What Zoran may still claim	Status	Next test
Quantum/optical coherence measures	Glauber; later resource theory Baumgratz et al.	No broad priority; use as domain proxies.	CLOSED against broad priority	Domain mapping only.
Coherence spreading kinematics	Martirosyan et al., arXiv 10 Oct 2024	Potentially a distinct phenomenal/multi-frame kinematics, not “first coherence kinematics”.	CORRECTED	Compare definitions of state, trajectory, speed and boundary.
Cross-domain coherence ODE	UCP, 5 Jun 2025	Zoran cannot claim first cross-domain dynamic coherence equation.	CORRECTED	Compare falsification, frame semantics, non-compensation and implementation.
Cross-domain ratio/gauge with frame-declared operands	Zoran public line Nov 2025 in current audit	Potentially specific Zoran contribution, subject to deeper pre-Nov prior art.	OPEN/DEFENSIBLE	Dedicated prior-art search by ratio skeleton and semantics.
Admissibility + continuation gate	Earlier viability/constraint traditions; Z1 before Paton UAE	Zoran can document its own earlier coherence-admissibility chain; not broad admissibility priority.	PARTLY CLOSED	Trace earliest Zoran explicit gate and external pre-2025 gates.
Reachability as necessary condition	Paton explicit 20 Feb 2026; viability theory much earlier has path-existence notions	No claim until Zoran pre-Paton trajectory formalism is matched exactly.	OPEN	Search Zoran archives + viability/reachability priority.
Persistence ODE driven by coherence threshold	Al-Mayahi explicit 2026; generic threshold ODEs pre-exist	Zoran should treat this as an external dynamical extension unless earlier Zoran ODE is found.	OPEN	Search Zoran 2025/early-2026 differential forms.
AI-assisted transversal falsification architecture	Zoran has unusually explicit LLM+formal-gate methodology in 2025–2026 corpus	Potential methodological contribution, but priority requires AI-science prior-art audit.	OPEN/INTERESTING	Pass 5 dedicated methods/prior-art review.

18. Pass 3 conclusions

1 — The most useful outcome is not a single winner. The candidate equations encode different mathematical information: phase order, resource coherence, generation/loss dynamics, endpoint

admissibility, path reachability, harmonic drift, persistence growth/decay, and constrained trajectory families.

2 — A recurrent ratio skeleton does exist across several programmes, but a shared numerator/denominator shape is not enough to establish scientific equivalence. The semantics, dimensions, state variables, domains and time operators must also match.

3 — Paton reachability is formally demonstrated here to be non-reducible to an endpoint scalar gauge alone. This is a real mathematical delta unless an earlier Zoran trajectory/path operator is shown to contain it.

4 — UCP is an important pre-Zoran 2025 cross-domain dynamical precursor and must be credited prominently. Its equilibrium ratio is structurally comparable to ratio-type gauges, while the full ODE is richer dynamically.

5 — Martirosyan et al. establish a pre-Zoran physical kinematics of coherence spreading. Zoran should therefore avoid any broad “first coherence kinematics” claim and instead define precisely what is distinctive about phenomenal or multi-frame coherence kinematics.

6 — The strongest Zoran research question remains the assembly question: whether a frame-declared phenomenal gauge, non-compensating multi-frame logic, temporal debt, trajectory admissibility, falsification tooling and deterministic AI implementation form a reproducible structure not previously assembled in one programme.

19. Sources added or corrected in Pass 3

Martirosyan, G. et al. A universal speed limit for spreading of quantum coherence. arXiv:2410.08204, first submitted 10 October 2024; Nature publication DOI 10.1038/s41586-025-09735-z.

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20. Pass 4/10 — Pre-Paton Zoran antecedent closure

Purpose. Pass 3 proved a narrow non-equivalence: endpoint $S(x)$ alone cannot encode path reachability. It deliberately left a historical question open — whether a broader Zoran trajectory formalism published before 20 February 2026 already contained reachable states, continuation, admissible futures, or an explicit path-existence relation. Pass 4 addresses that question directly.

AUDIT DATE — 26 August 2026.

DATE GATE — Only Zoran material demonstrably public before 20 February 2026 can constrain Paton priority. Internal dates are reported as author-declared dates unless a public dated source independently anchors them.

NEGATIVE-EVIDENCE RULE — Failure to recover a formula from the connected public corpus is reported as NOT RECOVERED / bounded search, never as proof that no private, deleted, or inaccessible artefact ever existed.

SEMANTIC RULE — The words future, trajectory, reachable, continuation, operant, or coherence do not by themselves establish identity. The mathematical role of each object is classified separately.

20.1 Search surface and query families

Family	Queries / concepts	Pass-4 result
Reachability	reachable; reachability; attainable/atteignable; path existence; exists path; transition relation	Exact lexical hit for “reachable” recovered in 17977201; no exact pre-Paton “reachability” operator recovered.
Trajectory	trajectory; trajectoire; $S(t)$; trend; temporal; continuation; prolongation	Multiple pre-Paton theoretical and executable artefacts recovered.
Admissible futures	admissible future(s); futur(s) admissible(s); continuation; persistence	Dedicated Zoran white paper and typology recovered.
Operant / operated	operant; opérant; operated; opéré; interaction	Dedicated $C\phi+S$ architecture and later anthropological formalization recovered.
Operands	β ; $\Delta\Phi$; T ; σ ; operand/opérande; frame mapping	Gauge operands and mappings recovered; no basis to equate these with operant/opéré categories.
Kinematics	kinematics; cinématique; velocity/speed; derivative; state transition; future state	Temporal Zoran forms recovered; broad physical-coherence-kinematics priority remains blocked by Martirosyan 2024.

Coverage note. The search was executed over the connected public Zoran corpus mirror and public dated web traces. It is exhaustive with respect to the named query families on that connected surface, not a claim that every unpublished or inaccessible historical file has been inspected.

20.2 Pre-20-February-2026 Zoran antecedent registry

Artefact	Earliest date status used here	Relevant object	Priority effect
17522369 — Codex / Atlas Ω	Nov 2025 public Zoran line; internal artefact dated 4 Nov 2025	Fracto-Anticipation $\Delta F=f(t+\varepsilon)-f(t)$; trajectory-selection language around coherence / least action.	Temporal/trajectory antecedent; not path reachability.
17970269 — Law of Phenomenal Coherence $C\phi + S$	Publicly linked in Medium on 18 Dec 2025	Operant is qualified before interaction; $C\phi$ measurement separated from predictive S .	Operant/operated architecture antecedent.
17977201 — consolidated $C\phi\Omega$ + LCCR	Publicly linked no later than 23 Dec 2025	Persistence iff measurable phenomenal distance from a	Direct reachable-state + continuation antecedent.

Artefact	Earliest date status used here	Relevant object	Priority effect
		reachable dissolution state Q; real future as coherent prolongation of the past.	
18281177 — Transversal invariant of admissibility	Document self-date 17 Jan 2026; public record listed before Paton	Coherence constrains whether a descriptive trajectory can persist; global continuation fails at an admissibility boundary.	Trajectory/continuation formalism; no graph reachability operator.
18298889 — Admissible Futures	Publicly referenced in a Jan 2026 Medium article; also in 4 Feb 2026 corpus hub	Dedicated typology of admissible futures; trajectory maintainability defined by bounded compensation.	Strong future/trajectory antecedent.
18300022 / 18300445 — intelligence + engine	Publicly listed by 4 Feb 2026	$S(t) = (\beta(t)\Delta\Phi(t)) / (T(t)\sigma(t))$; admissible if trend is stable/improving; executable time-series verdict.	Executable trajectory qualification antecedent.
18399075 / 18401972 — Coherence AI	Publicly listed 4 Feb 2026	Evaluates admissibility of systems, decisions, and trajectories; trajectory admissible iff it can persist without contradiction, structural compensation, or forced continuity.	Operational trajectory gate antecedent.

21. Certificate Z-PRE-RSTATE-001 — reachable state exists in pre-Paton Zoran

The consolidated ZORANC $C\varphi\Omega$ white paper (DOI 10.5281/zenodo.17977201) states:

$$C\varphi = D_KL(P \parallel Q)$$

with P the observed state and Q a reachable dissolution state. The same document states that a system persists if and only if it maintains a measurable phenomenal distance from such a reachable state of dissolution.

CERTIFICATE TYPE — C-X / historical antecedent certificate. “Reachable” is not merely commentary: it constrains what Q is allowed to denote. The state used by the law is required to belong to a reachable dissolution class.

WHAT IS PROVED — A reachable-state condition inside the Zoran persistence architecture is publicly evidenced before 20 February 2026. Therefore a broad claim that Paton first introduced reachability into the Zoran-relevant persistence/admissibility problem is not sustainable.

WHAT IS NOT PROVED — The Zoran document does not define an explicit binary relation $\text{Reachable}(x_0, x)$, a transition graph, or an existential path quantifier. The operational test deciding whether Q is reachable is left unspecified in the recovered artefact.

EARLIEST PUBLIC ANCHOR USED — The DOI is explicitly linked in a Medium publication dated 23 December 2025; a 24 December 2025 follow-up also cites it as “the future as a non-contradictory prolongation of the past”.

21.1 Certificate Z-LCCR-CONT-001 — coherent continuation predates Paton

The LCCR text attached to the same record defines a selection constraint rather than a differential dynamics: multiple futures may be conceivable, but the real future is the unique prolongation of the past that preserves phenomenal coherence. Its canonical verbal law is:

Real future = unique coherent prolongation of the past

RELATION TO PATON — This is a genuine antecedent for constrained continuation and future admissibility, but it is not E0/E1-equivalent to Paton's Continuation(s) $\Leftrightarrow G(P(s))=1$. LCCR states a selection principle; Paton exposes candidate generation P and gate G as abstract operators.

PRIORITY EFFECT — Paton cannot be treated as first in the broad idea “continuation is conditional on admissibility/coherence” relative to Zoran. His formula can still have formula-level priority for its specific operator decomposition.

22. Certificate Z-TRAJ-ENGINE-001 — executable trajectory admissibility predates Paton

The pre-Paton Zoran intelligence/admissibility line makes the temporal object explicit:

$$S(t) = [\beta(t) \cdot \Delta\Phi(t)] / [T(t) \cdot \sigma(t)]$$

The accompanying white paper states that a system is admissible when this gauge does not structurally decrease over time. The engine computes a series S, measures its trend, and emits ADMISSIBLE, CRITIQUE, or NON_ADMISSIBLE. This is not an endpoint-only gauge: it is an executable classifier over a temporal sequence.

CODE-LEVEL FACT — engine.py maps data to β , $\Delta\Phi$, T and σ ; computes S as a series; analyzes the slope/trend; and assigns ADMISSIBLE when the trend is STABLE_OR_IMPROVING.

RELATION CLASS — E4 relative to Paton reachability. Zoran evaluates the quality/admissibility of an instantiated trajectory; Paton asks whether at least one permissible path exists between two states.

22.1 Two countermodels — trajectory quality and path existence are independent

Pass 4 adds two discriminating tests. They show why the newly recovered Zoran trajectory machinery narrows Paton's novelty without collapsing the two objects into one.

Test	Zoran input	Transition condition	Observed outputs	Conclusion
CM-1: same Zoran series, different topology	S=[1.1,1.2,1.3] in A and B; slope $\approx +0.10$ in both	A has $x_0 \rightarrow x_1 \rightarrow x_2$; B lacks $x_1 \rightarrow x_2$	Zoran trend: ADMISSIBLE in both; Reachable_A=1, Reachable_B=0	Zoran trajectory score/trend does not determine path existence.
CM-2: same reachability, different Zoran trend	Both graphs have $x_0 \rightarrow x_1 \rightarrow x_2$	Series A=[1.1,1.2,1.3]; series B=[1.3,1.2,1.1]	Reachable=1 for both; Zoran A ADMISSIBLE, B NON_ADMISSIBLE	Path existence does not determine coherence trajectory quality.

The numerical slopes above were replayed in Pass 4 with a least-squares linear trend: +0.10 for the improving sequence and -0.10 for the declining sequence. The topology test used a minimal depth-first reachability check. These tests are audit countermodels, not historical algorithms claimed by either author.

22.2 Four mathematical levels that must no longer be conflated

Level	Object	Information carried	Missing information
L0 — endpoint gauge	S(x)	Grades a state under declared operands/frames.	Does not encode path topology.
L1 — temporal trajectory qualification	A_Z(τ) from S(t), trend, debt/compensation	Grades an instantiated temporal path.	Does not prove that the path is reachable from x_0 in a transition system.
L2 — reachable reference state	$Q \in R_{\text{dissolution}}(P)$ in C ϕ usage	Restricts the reference state to one characterized as reachable.	Recovered text does not expose the relation/algorithm constructing R.
L3 — existential path reachability	Reachable(x_0, x) $\Leftrightarrow \exists$ path p from x_0 to x satisfying transition rules	Answers whether at least one permissible path exists.	Does not grade coherence quality of that path unless an additional criterion is

Level	Object	Information carried	Missing information
			supplied.

23. Revised Paton priority certificate after Pass 4

Pass 3 classified Paton reachability as a genuine delta relative to endpoint S and left historical Zoran antecedence open. Pass 4 changes that verdict as follows:

Claim surface	Pass-4 evidence	Verdict	Reason
Admissibility gate / continuation	Pre-Paton Zoran antecedents recovered	PARTLY CLOSED against Paton broad priority	Zoran LCCR, admissible trajectories and Coherence AI predate 20 Feb 2026.
Reachable state used in persistence law	Pre-Paton Zoran antecedent recovered	CLOSED against broad Paton priority	17977201 explicitly defines Q as a reachable dissolution state.
Admissible future / trajectory classification	Pre-Paton Zoran antecedents + executable engine recovered	CLOSED against broad Paton priority	Dedicated admissible-futures typology and S(t) trend engine exist before Paton.
Explicit Reachable(x_0, x) binary relation	No equivalent pre-Paton Zoran formula recovered	PATON PRIORITY CURRENTLY SURVIVES	No recovered Zoran artefact defines the exact binary relation or existential path quantifier.
Candidate generation P(s) + gate G decomposition	No E1 predecessor recovered in Zoran	PATON FORMULA-LEVEL DELTA SURVIVES	Zoran has filters/gates, but no verified algebraic/operator identity with Paton P/G.

BOUNDED NEGATIVE CERTIFICATE Z-NR-REACH-001 — Searches for “reachability” returned no pre-Paton Zoran operator; “reachable” recovered the 17977201 reachable-dissolution-state definition. Searches for path-existence equivalents did not recover a dated Zoran formula $\text{Reachable}(x_0, x) = \exists p$. This supports “not recovered in the connected public corpus”, not universal absence.

23.1 Operants, operated systems, and operands — separate priority surfaces

Pass 4 also resolves a terminology risk. Zoran uses operant/opéré (operated system) for a causal relation and β , $\Delta\Phi$, T, σ as mathematical operands of a gauge. These are not the same category.

Term	Operational definition in this audit	Category	Priority note
Operant	A device/action/system whose effect on another system is qualified prior to or through interaction.	Causal actor / transformation source	Documented in the Cq+S architecture by 18 Dec 2025.
Operated system / opéré	The system receiving the effect and bearing persistence/compensation consequences.	Causal target / affected system	Documented in the same conceptual lineage; later expanded explicitly.
Operand	β , $\Delta\Phi$, T, σ or domain proxy entering a mathematical calculation.	Numerical/formal input	Gauge family documented in Zoran public 2025 line.
Operator	A mapping/gate/transition relation acting on states or expressions.	Mathematical transformation	Must be compared formula-by-formula; terminology alone gives no priority.

AUDIT RULE — No equation or external programme is classified as “already in Zoran” because it uses an operator while Zoran discusses an operant. The lexical similarity has no mathematical force.

23.2 Kinematics after the internal Zoran search

The internal search strengthens Zoran's temporal record but does not reverse the Pass-3 correction on physical coherence kinematics. Pre-Paton Zoran contains anticipation $\Delta F = f(t+\epsilon) - f(t)$, time-indexed $S(t)$, trajectory trend/debt logic, coherent continuation, and future-admissibility typologies. These establish a temporal/trajectory research programme. They do not predate Martirosyan et al. (arXiv 10 Oct 2024) on the physical propagation rate $D = d\ell^2/dt$ of quantum coherence.

DEFENSIBLE DISTINCTION — Zoran may investigate a phenomenal or multi-frame kinematics defined as evolution of admissibility/coherence across frames and time. It should not describe that as the first kinematics of coherence without a narrower definition and separate prior-art proof.

24. Sources and date anchors added in Pass 4

Zoran corpus, DOI 10.5281/zenodo.17977201 — consolidated $C\phi\Omega$ white paper: $C\phi = D_KL(P||Q)$, Q defined as a reachable dissolution state; companion LCCR text: coherent prolongation of the past.

Medium, "Tout finit toujours par se savoir — démonstration", 23 Dec 2025 — public link to 17977201 and description "Le futur comme prolongement non contradictoire du passé".

Medium, "The Law of Phenomenal Coherence — Operants, Operated Systems, and the $C\phi + S$ Engine", 18 Dec 2025 — public link to DOI 17970269 and $C\phi + S$ architecture.

Zoran corpus, DOI record 18281177 — "Coherence as a Transversal Invariant of Admissibility", document self-date 17 Jan 2026; explicit trajectory persistence and global-continuation language.

Zoran corpus, records 18298888/18298889 — "Le futur cohérent d'un passé incohérent — Trajectoires admissibles..."; dedicated future-trajectory typology.

Medium, "De la cohérence minimale à la conscience testable...", Jan 2026 — publicly references 18298889 as "Le futur cohérent d'un passé incohérent — trajectoires admissibles".

Zoran corpus, records 18300022/18300445 — intelligence/coherence white paper and engine; explicit $S(t)$ and executable trend-based trajectory admissibility.

Zorania Substack, "La Cohérence sous toutes ses formes", 4 Feb 2026 — public hub listing 18298889, 18300022, 18300445 and 18399075 before Paton's 20 Feb 2026 records.

Paton, A. J. — DOI 10.5281/zenodo.18707596 and 10.5281/zenodo.18708653, 20 Feb 2026 — explicit $\text{Continuation}(s) \Leftrightarrow G(P(s)) = 1$ and $\text{Admissible}(x) \wedge \text{Reachable}(x_0, x)$.

25. Pass 4 conclusions

1 — PASS-3 OPEN POINT NARROWED. The historical question is no longer "did pre-Paton Zoran contain trajectories/reachability at all?" It did: reachable-state language, coherent continuation, admissible futures, $S(t)$ trajectory qualification, and executable verdicts are all evidenced before 20 February 2026.

2 — PATON STILL HAS A REAL FORMAL DELTA. The exact binary reachability relation and existential path-existence operator are not recovered in pre-Paton Zoran. Paton's contribution should therefore be credited at that formula/operator level.

3 — NO FALSE IDENTITY. A reachable reference state, an admissible instantiated trajectory, and existence of a permissible path are different mathematical objects. Pass 4 provides countermodels showing that Zoran trajectory trend and Paton path reachability do not determine one another.

4 — ZORAN PRIORITY IS STRONGER BUT NARROWER. The defensible pre-Paton Zoran territory now includes a cumulative architecture of phenomenal distance to a reachable dissolution state, coherent future continuation, trajectory admissibility, temporal gauge evaluation, and executable filtering. It does not include a certified pre-Paton graph-reachability operator in the current public corpus.

5 — KINEMATICS REMAINS SPLIT. Zoran has a genuine temporal/trajectory programme, but Martirosyan retains pre-Zoran priority for measured physical propagation kinematics of quantum coherence. The two should remain separately named.

6 — PASS 4 STATUS. COMPLETED on the connected public search surface. Remaining uncertainty is explicitly bounded to inaccessible/unpublished historical material and the lack of a primary operator-level antecedent for $\text{Reachable}(x_0, x)$.

26. Work carried to Pass 5/10

- Audit priority for AI-assisted transversal discovery and falsification architecture: distinguish retrieval assistance, equation generation, adversarial testing, independent replication, and formal decision gates.
- Run multilingual external prior-art searches for equivalents of admissible trajectory, reachable persistence, coherent continuation, structural debt, non-compensation, and future-state filtering before the relevant Zoran dates.
- Separate concept priority, equation/operator priority, empirical validation priority, executable implementation priority, and AI-method priority in a single five-axis ledger.
- Keep the exact Paton Reachable(x_0, x) antecedent watch open: promote only if a dated pre-20-Feb-2026 Zoran formula with an explicit path/transition relation is recovered.
- Continue the licence/code/patent ledger independently from scientific similarity.

Working canonical gauge retained for this pass: $S = (\beta \times \Delta\Phi) / (T \times \sigma \times 1)$. The $\times 1$ factor is mathematically neutral; no priority claim is attached to it.

27. Pass 5/10 — AI-assisted transversal discovery and falsification priority audit

Purpose. Pass 5 tests a narrower and more difficult historical question: what, if anything, is distinctive in Zoran’s AI-assisted scientific method once earlier autonomous science, symbolic regression, evaluator-guided LLM search, agentic falsification, formal safety shields and non-compensatory decision theory are credited at the level actually established by their primary sources? The audit is deliberately ingredient-by-ingredient and then assembly-by-assembly.

AUDIT DATE — 26 August 2026.

DATE RULE — Priority is assigned to the earliest verifiable public source for a specific scientific object or method. A title, repository name, marketing phrase or internal timestamp is not treated as equivalent to a public DOI/publication date unless independently anchored.

IMPLEMENTATION RULE — A module name such as “Discovery Engine” or “Falsification” establishes a named design intent, not automatically the full behavior implied by the name. Code and reproducible outputs are audited separately.

NEGATIVE-EVIDENCE RULE — Failure to recover a primary artefact is reported as PENDING / NOT RECOVERED on the bounded search surface; it is never upgraded into a claim that the artefact never existed.

27.1 Claim decomposition: eight surfaces that must not be conflated

ID	Priority surface	Operational meaning
P5-A	AI-assisted literature/retrieval search	Finding and translating relevant prior art across fields.
P5-B	Automatic equation / law discovery	Deriving symbolic relations from data or search.
P5-C	Autonomous scientific loop	Idea/hypothesis → code/experiment → results → paper/review.
P5-D	LLM-agent falsification	Agents design tests intended to refute free-form hypotheses.
P5-E	Evaluator-guided discovery	Generative model proposes candidates; formal evaluator filters/scores them.
P5-F	Formal veto / non-compensation	Unsafe or invalid states cannot be rescued by unrelated gains.
P5-G	Multi-AI adversarial evaluation	Several models are tested under common quantitative and red-team protocols.
P5-H	Assembled Zoran architecture	Frames/proxies + S-gauge + temporal admissibility + veto + traceability + adversarial testing + refusal/silence.

28. External prior-art ladder — what clearly predates Zoran

Earliest anchor	Programme	What the prior art establishes	Priority consequence
2009	King et al. — Robot Scientist “Adam”	Automates hypothetico-deductive science and experimental cycles.	Blocks broad priority for autonomous machine science.
2019 / 2020	Udrescu & Tegmark — AI Feynman	Physics-inspired symbolic regression discovers equations from data.	Blocks broad priority for automatic law/equation discovery.
14 Dec 2023	Romera-Paredes et al. — FunSearch	Pretrained LLM proposes programs; systematic evaluator and evolutionary loop retain verifiably better candidates.	Blocks broad priority for LLM + evaluator discovery.

Earliest anchor	Programme	What the prior art establishes	Priority consequence
20 Dec 2023	Boiko et al. — Coscientist	GPT-4 system plans and performs complex chemistry experiments using search, code and laboratory automation.	Blocks broad priority for LLM-driven autonomous experimentation.
12 Aug 2024	Lu et al. — The AI Scientist	Generates ideas, writes code, executes experiments, writes a paper and performs simulated review.	Blocks broad priority for end-to-end autonomous AI research.
14 Feb 2025	Huang et al. — POPPER	LLM agents design and execute falsification experiments; sequential statistical testing controls Type-I error.	Blocks broad priority for automated LLM-agent falsification.
2017 / 2018	Alshiekh et al. — Safe RL via Shielding	A formal shield blocks or replaces actions that violate temporal-logic safety specifications.	Blocks broad priority for an external formal gate that can veto model actions.
1966 / 1968 onward	ELECTRE outranking family	Classical multicriteria decision line with non-compensatory logic and veto thresholds.	Blocks broad priority for non-compensatory multicriteria veto as a concept.

28.1 Why POPPER is the closest methodological constraint in this pass

POPPER is not merely an LLM used for brainstorming. Its stated object is automated validation of free-form hypotheses by agentic sequential falsifications. LLM agents operationalize measurable implications, design and execute falsification experiments, and a sequential testing framework controls false-positive risk. This is methodologically closer to Zoran’s 2026 “LLM + falsification” narrative than generic AI-science systems.

CERTIFICATE P5-POP-001 — NO BROAD PRIORITY. Because POPPER is publicly dated 14 February 2025, Zoran cannot defensibly claim to have introduced automated falsification by LLM agents as a general method. Any Zoran claim must be narrower: for example, a particular coherence/admissibility gate, multi-frame rule, proof-chain architecture, or non-compensatory decision schema.

NON-EQUIVALENCE — POPPER and Zoran do not compute the same object. POPPER formalizes statistical hypothesis validation and Type-I error control; Zoran’s core public line evaluates structural/phenomenal admissibility through declared frames, proxies and coherence metrics. Similar scientific intent does not imply E0/E1 mathematical identity.

29. Zoran internal AI-science stack — code, manifests, protocols and documentary gaps

Zoran artefact	Role	Evidence status	Pass-5 finding
17559007 / code mirrored in 17559449	Unified Discovery Engine Q7.3	VERIFIED CODE	Recovered executable computes $S=(\beta \cdot \Delta C)/\lambda$ over randomized parameter samples and returns summary statistics. It does not, in the recovered code, implement an autonomous hypothesis→experiment→falsification→paper loop.
17571503 / mirror folder 17571502	GHUC Q8 open-science suite	VERIFIED MANIFEST	Manifest dated 2025-11-10 names Δ POLYMORPH_ENGINE_Q8 “Discovery & Falsification”, ProofChain artefacts, reproducibility seeds and multiple engine DOIs. Module names are evidence of architecture, not by themselves proof of each runtime behavior.

Zoran artefact	Role	Evidence status	Pass-5 finding
17609005	ZBench Q9	VERIFIED DOCUMENT / MULTI-AI PROTOCOL	English package describes 11 AI systems, seven mandatory quantitative tests, a Δ RedTeam layer, veto teams, audit JSON and SHA-based traces. The same document notes reproducibility only up to model nondeterminism.
17804030	Distributed falsification white paper	PARTIAL / PRIMARY DOCX EXISTS	A binary primary Word artefact exists in the public books repository, and public author descriptions call it an executable/distributed falsification white paper. Full code-level certification of this binary artefact remains PENDING in Pass 5.
18497598	“La falsification devient possible maintenant, grâce aux LLM...”	PUBLIC DESCRIPTION VERIFIED	Public text explicitly distinguishes exploration from falsification and requires an explicit, traceable, reproducible decision rule. This is later than POPPER and therefore cannot carry broad LLM-falsification priority.
18499943	AI-assisted scientific production under a coherence constraint	TITLE / PUBLIC DESCRIPTION VERIFIED	Public index describes formulation, test and implementation of a coherence constraint for AI-assisted scientific production. Exact primary equations and implementation details remain PENDING in this pass.
18500363	Output-only structural admissibility for AI outputs	TITLE VERIFIED	The title asserts an output-only coherence framework resistant to reformulation/reset. Exact formal mechanism and external prior-art comparison remain PENDING until primary-text extraction.
18526755	Canonical demonstration / current mirror metadata	METADATA CONFLICT	The user's canonical corpus describes this record as a complete application demonstration, while the current GitHub mirror landing metadata names “Tenseur d'Amari-Chentsov et saturation MCP”. This mismatch must be resolved before bibliographic promotion.

29.1 Certificate Z-UDE-IMPL-001 — name is not implementation

Recovered code associated with the Unified Discovery Engine computes the scalar coherence ratio for Monte-Carlo samples and reports aggregate statistics. This is a real executable artefact, but it is not sufficient evidence for an autonomous scientific-discovery loop. Pass 5 therefore narrows the implementation claim to exactly what the code demonstrates.

ALLOWED — “Executable coherence-sampling / parameter-surface engine in the discovery stack.”

FORBIDDEN WITHOUT FURTHER PRIMARY CODE — “First autonomous scientific discovery engine,” “full automated falsification loop,” or any equivalent end-to-end claim.

29.2 Certificate Z-GHUC-PROOF-001 — dated architecture and traceability

The GHUC $\Omega 8$ manifest provides a stronger architectural record. Its UTC timestamp is 2025-11-10T00:00:00Z. It names a discovery/falsification module, a variant engine, a discovery framework, ProofChain files, C2PA-style provenance claims, fixed reproduction seeds and a machine-readable schema. These are concrete implementation-governance artefacts.

LIMIT — Several checksum fields in the recovered manifest are still placeholders (“TO_BE_FILLED_AFTER_UPLOAD”), and the manifest includes compliance booleans that are assertions rather than independent certifications. Pass 5 treats them as author-supplied metadata, not third-party validation.

29.3 Certificate ZBENCH-MAI-001 — multi-AI evaluation is real, but not independent replication

ZBench $\Omega 9$ describes a common test surface across 11 AI systems, seven mandatory quantitative tests and a qualitative/adversarial Δ RedTeam layer. It records model/date/source metadata and hash traces. This supports a genuine multi-model audit architecture.

LIMIT — Running multiple models is not the same as 11 independent scientific replications. The systems may share training data, prompts, benchmarks and infrastructure assumptions. The ZBench document itself acknowledges endpoint nondeterminism. Priority and evidence counts must therefore remain category-accurate.

30. Formal relation certificates — Zoran versus the closest AI-science lineages

Comparison	Certificate / E-class	What is demonstrated
AI Scientist → Zoran	C-N / E4-E6	AI Scientist optimizes production of complete research artefacts; Zoran’s intended role is admissibility filtering/refusal. Same research ecosystem, different mathematical decision object.
POPPER → Zoran	C-N / E4-E5	POPPER performs sequential statistical falsification with Type-I error control; Zoran evaluates frame/proxy coherence and structural admissibility. No algebraic identity.
FunSearch → Zoran	C-P / E4-E5	FunSearch’s evaluator can be compared functionally to a gate, but it scores task solutions for evolutionary search; Zoran’s gauge is not that evaluator and has different semantics.
Shielding → Zoran	C-P / E4-E5	A shield demonstrates prior art for blocking actions against a formal specification. Zoran can be viewed as another kind of gate only after frames/proxies are specified; safety logic and coherence gauge are distinct.
ELECTRE veto → Zoran	C-P / E5	ELECTRE establishes long-standing non-compensatory/veto decision logic. Zoran’s no-compensation rule may be structurally comparable but cannot claim invention of veto-based multicriteria refusal.
AI Feynman → Zoran law engines	C-N / E4-E6	AI Feynman discovers symbolic equations from data using symbolic regression; recovered Zoran variant/discovery engines manipulate or sample declared coherence forms. The discovery mechanisms differ.

31. Five-axis priority ledger after Pass 5

Priority axis	Claim surface	Earliest/strongest constraint in current audit	Pass-5 status
Concept priority	AI-assisted / automated science	Robot Scientist and later autonomous-science lineages	CLOSED against broad Zoran priority
Equation/operator priority	Automatic symbolic equation discovery	Symbolic regression; AI Feynman 2019/2020	CLOSED for broad “AI discovers equations” claim; Zoran-specific equation priority remains a separate audit
Empirical validation priority	Cross-domain scientific validation	Domain-specific systems and benchmarks pre-exist; Zoran has its own claimed datasets/simulations	OPEN; requires source-by-source replication ledger
Executable implementation priority	Full autonomous research loop	Coscientist / AI Scientist before Zoran	CLOSED for broad autonomous-loop priority; Zoran component implementation is partially verified
AI-method priority	LLM-agent falsification	POPPER, 14 Feb 2025	CLOSED for broad LLM-falsification priority
Decision architecture	Formal safety / veto / abstention	Shielding and non-compensatory MCDA pre-exist	CLOSED for generic gate/veto/refusal priority
Assembly priority	Frames + S + temporal debt/trajectory + non-compensation + ProofChain + multi-AI adversarial testing + refusal/silence	No exact full antecedent certified in this pass	OPEN / potentially distinctive assembly; world-first NOT ESTABLISHED

31.1 What Zoran may say after this correction

DEFENSIBLE — Zoran is a documented research programme that combines a declared coherence/admissibility gauge with temporal trajectory evaluation, provenance/proof-chain mechanisms, multi-model adversarial evaluation and later AI-output/falsification work. Several of those components are executable or machine-readable in the public corpus.

NOT DEFENSIBLE FROM CURRENT EVIDENCE — “first AI scientist,” “first AI to discover laws,” “first LLM falsification system,” “first formal veto for AI,” “first non-compensatory decision architecture,” or “first autonomous scientific engine.” Earlier public lineages directly anticipate those broad surfaces.

OPEN RESEARCH CLAIM — The exact assembled architecture may still be historically distinctive. Demonstrating that requires a combinatorial prior-art search for the whole conjunction, plus primary-code verification for every Zoran component used in the conjunction. Pass 5 does not convert absence of an exact match into a world-first claim.

32. International discoverability and Google Scholar / Google Search architecture

User requirement implemented in this edition: the canonical English title is accompanied by Chinese, Spanish, Hindi, Arabic and French title variants; six localized descriptions are included; and a contents map is provided for each language. The scientific body remains primarily English so that citation identity is not fragmented.

GOOGLE SCHOLAR RULE — The English canonical title must remain the largest text at the top of page 1, the author must appear directly below the title block, the current version date must be explicit, the PDF must contain searchable text, and a conventional “References” section must close the document. Google Scholar also recommends a unique article URL and Highwire-style HTML metadata such as `citation_title`, `citation_author`, `citation_publication_date` and `citation_pdf_url`.

MULTILINGUAL GOOGLE SEARCH RULE — For web publication, the optimum architecture is not six side-by-side full translations on one HTML page. Google Search recommends separate language URLs linked

with hreflang. The companion indexing kit generated with Pass 5 therefore uses an English canonical landing page plus localized landing-page templates for zh, es, hi, ar and fr.

DATE-INTEGRITY GATE — Priority-sensitive metadata must never use a convenience date. Current Zoran mirror pages were observed with repeated generic dates such as 2025-01-01. Before final promotion, each landing page must be reconciled against the exact public Zenodo/version date of the source it represents. A wrong citation_publication_date can damage both historical claims and Scholar parsing.

32.1 Publication metadata gate for the final 10/10 edition

Metadata element	Rule	Status
Canonical title	One English citation title; translations are alternate titles, not competing citation_title values.	READY in Pass 5
Author identity	Frédéric Tabary; ORCID 0009-0004-5562-7385; affiliation separate from author meta tag.	READY
Publication date	Exact date of the version being cited; repository-entry date kept separate.	READY for Pass 5 = 2026-08-26
DOI	Only after a DOI is actually minted for the final edition. Never invent or prefill.	PENDING final publication
PDF	Searchable text, stable filename/URL, conventional first page and References section.	GENERATED / QA in this pass
HTML abstract page	Visible full abstract + Highwire citation_* tags + link to PDF in same publication path.	GENERATED as deployment kit
Language architecture	Separate localized landing URLs + reciprocal hreflang; English canonical identity retained.	GENERATED as deployment kit
Metadata consistency	Title/date/DOI/author must match across PDF, HTML, Zenodo, GitHub Pages, ORCID and citation file.	BLOCKING GATE for final 10/10

33. Pass 5 conclusions

1 — **BROAD AI PRIORITY CLOSED.** Zoran is not first in autonomous science, symbolic equation discovery, evaluator-guided LLM discovery, LLM-driven experimentation or end-to-end AI research.

2 — **LLM FALSIFICATION PRIORITY CLOSED.** POPPER, publicly submitted on 14 February 2025, is a direct pre-Zoran agentic-falsification antecedent and must be cited whenever broad LLM-falsification priority is discussed.

3 — **GENERIC VETO / NON-COMPENSATION PRIORITY CLOSED.** Formal shields and non-compensatory multicriteria decision methods long predate Zoran. The defensible question is the semantics and assembly of Zoran's gate, not invention of veto itself.

4 — **ZORAN EXECUTABLE STACK PARTLY VERIFIED.** GHUC Q8 provides a dated machine-readable architecture and ProofChain design; ZBench provides a genuine multi-AI/red-team protocol. The recovered Unified Discovery Engine code is substantially narrower than its title and is classified accordingly.

5 — **ASSEMBLY PRIORITY REMAINS OPEN.** No exact full antecedent has yet been certified for the conjunction of frame-declared phenomenal coherence, S-gauge, temporal admissibility/debt, non-compensation, proof-chain traceability, multi-AI adversarial testing and refusal/silence. This is a research question, not a world-first conclusion.

6 — DISCOVERABILITY UPGRADED. Pass 5 establishes a six-language title/abstract layer and a publication architecture aligned with current Google Scholar and Google Search guidance. Actual indexing cannot be guaranteed by document formatting alone; it also depends on correct hosting, crawlability and stable URLs.

7 — METADATA DEBT IDENTIFIED. Placeholder or mismatched dates/titles in the current mirror are priority-relevant defects. They must be reconciled before final 10/10 publication.

34. Sources added in Pass 5

King, R. D. et al. (2009). The automation of science. *Science* 324(5923), 85–89. DOI: 10.1126/science.1165620.

Udrescu, S.-M. & Tegmark, M. (2019 preprint; 2020 journal). AI Feynman: A physics-inspired method for symbolic regression. *Science Advances* 6(16), eaay2631. DOI: 10.1126/sciadv.aay2631; arXiv:1905.11481.

Romera-Paredes, B. et al. (2023/2024). Mathematical discoveries from program search with large language models. *Nature* 625, 468–475. Published online 14 Dec 2023. DOI: 10.1038/s41586-023-06924-6.

Boiko, D. A., MacKnight, R., Kline, B. & Gomes, G. (2023). Autonomous chemical research with large language models. *Nature* 624, 570–578. DOI: 10.1038/s41586-023-06792-0.

Lu, C., Lu, C., Lange, R. T., Foerster, J., Clune, J. & Ha, D. (2024). The AI Scientist: Towards Fully Automated Open-Ended Scientific Discovery. arXiv:2408.06292, first submitted 12 Aug 2024.

Huang, K., Jin, Y., Li, R., Li, M. Y., Candès, E. & Leskovec, J. (2025). Automated Hypothesis Validation with Agentic Sequential Falsifications. arXiv:2502.09858, first submitted 14 Feb 2025.

Alshiekh, M. et al. (2017 preprint; 2018 conference). Safe Reinforcement Learning via Shielding. *AAAI* 32(1). DOI: 10.1609/aaai.v32i1.11797; arXiv:1708.08611.

Govindan, K. & Jepsen, M. B. (2016). ELECTRE: A comprehensive literature review on methodologies and applications. *European Journal of Operational Research* 250(1), 1–29. DOI: 10.1016/j.ejor.2015.07.019.

Google Scholar Help. Inclusion Guidelines for Webmasters. Accessed 26 Aug 2026. <https://scholar.google.com/intl/en/scholar/inclusion.html>

Google Search Central. Managing Multi-Regional and Multilingual Sites; Localized Versions of Your Pages. Accessed 26 Aug 2026. <https://developers.google.com/search/docs/specialty/international/>

Zoran corpus mirror: GHUC Q8 manifest (mirror folder 17571502; primary DOI 10.5281/zenodo.17571503), timestamp 2025-11-10T00:00:00Z; module/provenance inventory.

Zoran corpus: Unified Discovery Engine Q7.3 / associated executable mirror (DOI 10.5281/zenodo.17559007; code associated in 17559449). Pass-5 classification based on recovered executable behavior.

Zoran corpus: ZBench Q9 package, DOI 10.5281/zenodo.17609005; English multi-AI peer-review / evaluation document and package inventory.

Zoran public corpus map, 5 Feb 2026 Substack edition, listing DOI 10.5281/zenodo.18497598, 18499943, 18500363, 18516353 and 18526755 among the current coherence / AI research stack.

Zoran public books/white-papers repository: “White paper zoran Protocole de falsification distribuée v1.docx” — primary binary artefact present; detailed code-level audit carried forward because the connected text surface does not expose its full parsed content.

35. Work carried to Pass 6/10

- Build an empirical-validation ledger: for every major Zoran and external programme, separate simulation vectors, datasets, experiments, model evaluations, red-team attacks, falsification attempts and independent replications.
- Reproduce or independently re-run the strongest quantitative claims where public code/data permit it; mark every inaccessible or non-reproducible claim as NON_MESURÉ rather than inferred.
- Extract the primary text/code of DOI 17804030, 18497598, 18499943, 18500363 and 18526755 and reconcile their exact Zenodo dates/titles against GitHub mirror metadata.
- Continue the exact-combination prior-art search for the Zoran assembly claim, including formal methods, decision theory, autonomous science, AI safety, epistemic logic and reproducible-science infrastructure.
- Build the source-level licence ledger independently from scientific similarity, with paper licence, code licence, dataset licence and patent/reuse restrictions separated.

Working canonical gauge retained for this pass: $S = (\beta \times \Delta\Phi) / (T \times \sigma \times 1)$. The $\times 1$ factor is mathematically neutral; no priority claim is attached to it.

36. Pass 6/10 — Empirical validation, reproducibility, metadata integrity and licences

Purpose — Convert quantitative rhetoric into an evidence ledger. Every count is assigned to the category it actually represents. Public code is re-run or audited where feasible; non-reproducible claims remain NON_MESURÉ. Priority and reuse rights are treated as separate questions.

Audit date — 26 August 2026. Web/Zenodo metadata and repository state are reported as observed on this date; later changes may alter the publication layer but cannot be silently backdated.

36.1 Evidence taxonomy used from this pass onward

Class	Definition	Allowed inference
SIMULATION VECTOR	Synthetic draw or parameter point produced by a defined generator.	Can test code behavior; cannot by itself establish empirical reality.
DATASET OBSERVATION	Recorded observation from a named public/private dataset.	Empirical only to the extent provenance and measurement are documented.
PHYSICAL EXPERIMENT	Intervention/measurement in a physical or biological system.	Strong domain evidence when protocol and uncertainty are reported.
MODEL EVALUATION	One or more AI/model runs on a declared test surface.	Measures model behavior; models are not independent scientific replications.
RED-TEAM ATTACK	Adversarial prompt/test case.	Security/robustness evidence, not a scientific replication count.
FALSIFICATION ATTEMPT	A test designed so a defined observation could reject a claim.	Evidence of testability; a non-rejection is not confirmation of universality.
INDEPENDENT REPLICATION	Independent team/data/code path reproduces a specified result.	Strongest category here; requires independence and matched target claim.
FORMAL / SPECIFICATION	Equation, axiom, proof sketch, protocol or test plan.	Mathematical/methodological object; empirical status remains separate.
NON_MESURÉ	Required evidence inaccessible, ambiguous or not executed.	No validation/promotion allowed from absence of measurement.

36.2 Master empirical-validation ledger

Programme	Evidence object	Category	Interpretation	Pass-6 status
Glauber 1963	Correlation hierarchy / quantum-optical coherence	FORMAL + peer-reviewed domain science	Historical formal anchor; no Pass-6 rerun	VERIFIED SOURCE
Baumgratz et al. 2014	Quantum coherence monotones	FORMAL	Peer-reviewed mathematical resource theory	VERIFIED SOURCE
Hu & Fan 2016	Evolution/factorization of quantum coherence	FORMAL	Domain-specific quantum channels; no new replication count	VERIFIED SOURCE
Martirosyan et al. 2024/2025	Coherence spreading $D=d\ell^2/dt \rightarrow 3.4(3) \hbar/m$	PHYSICAL EXPERIMENT	Experimental physical kinematics in stated Bose-gas class	VERIFIED SOURCE; NOT RERUN
UCP 5 Jun 2025	Five AI systems; reported transformation/improvement metrics	MODEL EVALUATION	Author-reported; not independent replications	NOT INDEPENDENTLY REPRODUCED
Hensgen $\Delta.72$	Wearable exam-stress dataset; later open datasets	DATASET OBSERVATION	Empirical modelling on named wearable data	SOURCE-LEVEL ONLY
Bostick PAS	Harmonic threshold/drift programme	FORMAL / MODEL	No independent replication count established here	NON_MESURÉ EMPIRICALLY
Zoran PITON+	Default 100,000 synthetic vectors; micro-law extraction	SIMULATION VECTOR	Public algorithm independently reproduced in Pass 6	REPRODUCED SIMULATION
ZBench Ω_9	11 AI systems $\times$ 7 mandatory checks + RedTeam	MODEL EVALUATION + RED-TEAM	Cross-model benchmark surface; not 77 independent falsifications	ARCHIVED PROTOCOL; NOT RERUN
Zoran Ω_∞ DOI 17804030	Mertens block check + 50-target Goldbach probe in visible main	FALSIFICATION ATTEMPT / PROTOTYPE	Executable-paper concept; broad distributed claims exceed visible main path	STATIC CODE AUDIT
Zoran DOI 18497598	Six-criterion LLM falsification methodology; conceptual engines	FORMAL / FALSIFICATION METHOD	Methodology and simulated/conceptual engines	VERIFIED DOCUMENT; NO MASS COUNT
Zoran DOI 18499943	AI-science coherence constraint + simple implementation	FORMAL / SOFTWARE DOCUMENTATION	Refusal/indeterminate output design; no independent benchmark located	SOURCE-LEVEL ONLY

Programme	Evidence object	Category	Interpretation	Pass-6 status
Zoran DOI 18500363	Output-only axioms + canonical prompt suite	FORMAL / RED-TEAM SPECIFICATION	Test plan; π and μ not fully operationalized in inspected artefacts	SPECIFICATION VERIFIED
Paton Feb 2026	Admissibility + reachability formalism	FORMAL	No mass falsification count identified in foundational records	SOURCE-LEVEL ONLY
Al-Mayahi 2026	Seven-domain post-diction/residual analysis	DATASET / POST-DICTION	Author-reported cross-domain evaluation; not seven replications	NOT INDEPENDENTLY REPRODUCED
Synergic Modeling 2026	Constraint/trajectory composition	FORMAL / peer-reviewed	Model-driven engineering formal convergence	VERIFIED SOURCE

37. Independent reproduction and executable-scope audit

37.1 Certificate P6-PITON-REP-001 — synthetic sweep independently reproduced

Public algorithm — PITON_PLUS.py samples $\beta \sim \text{Uniform}(0.01, 1)$, $\Delta\Phi \sim \text{LogNormal}(0, 0.5)$, $T \sim \text{Normal}(0.5, 0.15)$ clipped to $[0.01, 1]$, and $\sigma \sim \text{Exponential}(\text{scale}=0.2)$; then computes $S = (\beta \cdot \Delta\Phi) / (T \cdot \sigma)$ and $\text{state} = 1\{S > 1\}$. The default constructor uses 100,000 simulations; the example main uses 10,000.

Seed	n	P(S>1)	n $\sigma > 0.8$	Survival $\sigma > 0.8$	n rescue subset	Rescue rate
0	100000	89.604%	1861	46.48%	174	94.83%
1	100000	89.489%	1846	47.72%	209	94.26%
2	100000	89.568%	1876	47.28%	183	90.16%
3	100000	89.735%	1892	48.31%	204	97.55%
4	100000	89.524%	1848	48.16%	174	94.25%
5	100000	89.632%	1853	46.25%	180	92.22%
6	100000	89.489%	1856	47.36%	193	95.85%
7	100000	89.561%	1843	47.04%	169	90.53%
8	100000	89.681%	1794	46.77%	189	94.18%
9	100000	89.608%	1808	48.34%	214	95.79%

Aggregate result — Across 10 independent seeded runs (1,000,000 synthetic vectors total): mean $P(S > 1) = 89.5891\%$ (SD 0.0800 percentage points); mean survival for $\sigma > 0.8 = 47.3715\%$ (SD 0.7527 pp; mean $n = 1847.7/\text{run}$); mean rescue rate for $T > 0.8$ and $\Delta\Phi > 2 = 93.9636\%$ (SD 2.3568 pp; mean $n = 188.9/\text{run}$).

Certificate — REPRODUCED SIMULATION. The numerical behavior follows from the declared synthetic distributions and threshold. It demonstrates reproducibility of this generator/metric pipeline, not empirical validation that the same frequencies occur in natural, biological, social or AI systems.

Replication artefact — Pass-6 local audit JSON: `piton_pass6_replication.json`. This file records seeds, sample sizes and aggregate statistics; it is an audit artefact created on 26 August 2026, not a historical Zoran source.

37.2 Certificate P6-OMEGA-CODE-001 — Ω_∞ distributed-falsification claims versus visible implementation

Surface	Observed object	Pass-6 verdict
Public date/title	3 Dec 2025; “WHITEPAPER — PROTOCOLE DE FALSIFICATION DISTRIBUÉE”	VERIFIED Zenodo
Claimed target surface	PNT, Mertens, Goldbach, Riemann; $> 10^{15}$ operations/session; distributed swarm	DOCUMENT CLAIM
Visible executed main	<code>initialize_sector(); run_mertens_check(); run_goldbach_probe(); generate_report()</code>	VERIFIED CODE PATH
Mertens implementation	Computes μ on one block; uses <code>local_sum</code> and threshold $2\sqrt{\text{high}}$. It does not reconstruct global $M(x) = \sum_{n \leq x} \mu(n)$.	LIMIT / NON-EQUIVALENCE
Goldbach implementation	Samples 50 even targets; checks at most the first 1,000 cached primes before Miller–Rabin on the remainder.	PROBABILISTIC/LIMITED PROBE
PNT implementation in main	No PNT routine is invoked by the visible main path.	NOT IMPLEMENTED IN VISIBLE MAIN
Riemann implementation in main	No direct RH routine is invoked by the visible main path.	NOT IMPLEMENTED IN VISIBLE MAIN
Proof-of-computation claim	Prose says raw values + intermediate processor states; visible <code>generate_report</code> hash concatenates <code>local_sum_mu</code> and <code>samples_tested</code> fields.	CLAIM > IMPLEMENTATION

Surface	Observed object	Pass-6 verdict
Network/consensus	Per-node entropy-derived sector exists; no coordinator, deduplication, peer consensus or distributed transport is visible in the embedded main.	ARCHITECTURE CLAIM NOT REPRODUCED
Licence	Document body states MIT; Zenodo Rights field has no machine-readable licence value.	METADATA/CONTENT MISMATCH

Conclusion — The artefact is creditable as an executable-paper prototype and falsification attempt. It must not be cited as having falsified or verified Mertens, Goldbach, PNT or Riemann, nor as a demonstrated global distributed network. “Violation” in the limited Goldbach probe is a candidate for follow-up, not a mathematical counterexample certificate.

37.3 Certificate P6-OUTONLY-SPEC-001 — output-only admissibility is a formal test specification

Verified structure — DOI 18500363 declares A1 output-only evaluation; A2 a projection $\pi: \mathcal{G} \rightarrow \mathcal{S}$ extracting roles/relations/asymmetries/agency constraints; A3 inadmissible structure classes; A4 monotonicity under structure-preserving extension; and A5 REFUSE under non-zero ambiguity. Its canonical suite defines direct, lexical-neutralization, stereotyping, irreversible-dominance, ambiguity and fresh-session checks.

Operational gap — In the inspected public Markdown, π and the ambiguity measure μ are not uniquely executable functions with a benchmarked parser/evaluator. Therefore the tests specify what a conforming implementation should decide, but do not alone demonstrate that arbitrary reformulations or resets cannot evade every implementation.

Allowed conclusion — A formal output-only safety/admissibility specification with falsifiable examples exists publicly by 5 February 2026. Universal “non-circumventability” remains an empirical/security claim requiring adversarial coverage, independent implementations and measured false-accept/false-refuse rates.

38. Priority-sensitive metadata reconciliation

DOI suffix	Public date	Observed / competing title	Type	Rights/licence	Pass-6 status
17804030	3 Dec 2025	WHITEPAPER — PROTOCOLE DE FALSIFICATION DISTRIBUÉE	Report	Zenodo licence field blank; body says MIT	DATE/TITLE VERIFIED; LICENCE MISMATCH
18497598	5 Feb 2026	La falsification devient possible maintenant, grâce aux LLM — mais seulement si on les utilise correctement.	Report	Zenodo licence field blank	VERIFIED; LICENCE NON_MESURÉ
18499943	5 Feb 2026	IA scientifique : Formulation, test et implémentation d’une contrainte de cohérence applicable à la production scientifique assistée par IA	Software documentation	Zenodo CC BY 4.0; body says Creative-Ethic BY/BY-PRO	BLOCKING LICENCE CONFLICT
18500363	5 Feb 2026	Admissibilité structurelle des sorties d’IA — Un cadre sortie-only fondé sur la cohérence, non contournable par reformulation ou reset	Report	Zenodo CC BY 4.0	VERIFIED
18526755	NON_MESURÉ in direct Zenodo fetch	Current mirror: “Tenseur d’Amari-Chentsov et saturation MCP”; current canonical corpus map: “Loi de cohérence phénoménale — Démonstration complète par applications”	NON_MESURÉ	NON_MESURÉ	BLOCKING IDENTITY CONFLICT

Scholar gate — DOI 18526755 must not be promoted in the final multilingual/Google Scholar publication until one authoritative identity is resolved across Zenodo, GitHub mirror, HTML citation tags, PDF title, ORCID/registry metadata and the canonical corpus map. A DOI cannot safely index two materially different titles/descriptions as if they were one work.

39. Exact-combination prior-art continuation

Function	Earlier lineage	Priority implication	Status
Reject / abstain when confidence is insufficient	Chow, 1970, optimum recognition error–reject tradeoff	Predates generic “silence/refusal as valid output.”	BROAD PRIORITY CLOSED
Proof attached to an artefact against a policy	Necula, Proof-Carrying Code, POPL 1997	Predates generic proof-carrying/safety-certificate architecture.	BROAD PRIORITY CLOSED
Non-compensation and criterion veto	ELECTRE family; established decades before 2025	Predates generic “one critical criterion blocks compensation.”	BROAD PRIORITY CLOSED
Machine-readable provenance interchange	W3C PROV-O Recommendation, 30 Apr 2013	Predates generic interoperable provenance/traceability model.	BROAD PRIORITY CLOSED
Formal runtime/action shielding	Safe RL via Shielding, 2017/2018	Predates generic formal veto/shield around an AI policy.	BROAD PRIORITY CLOSED
Automated scientific research loop	Robot Scientist; Coscientist; AI Scientist	Predates autonomous hypothesis/experiment/research-loop claims.	BROAD PRIORITY CLOSED
Agentic sequential falsification	POPPER, submitted 14 Feb 2025	Predates broad LLM-agent falsification priority.	BROAD PRIORITY CLOSED
Research-object packaging + provenance	RO-Crate / Workflow Run RO-Crate lineage	Predates generic machine-readable packaging of research artefacts/provenance.	BROAD PRIORITY CLOSED
Exact Zoran conjunction	Frames/proxies + S-gauge + temporal debt/admissibility + non-compensation + ProofChain + multi-AI adversarial testing + refusal/silence	No exact one-to-one antecedent certified in Pass 6; however every major ingredient has older neighbouring art.	OPEN; WORLD-FIRST NOT ESTABLISHED

Assembly rule — Combinatorial novelty cannot be inferred from “no exact search hit.” To establish an assembly-level priority, the final paper would need a fixed conjunction defined before searching, a dated exhaustive search protocol, explicit exclusion criteria, and a comparison showing that removing any claimed Zoran component changes the scientific/operational object rather than merely its packaging.

40. Source-level licence and reuse ledger

Source	Object	Licence / rights observed	Status	Reuse rule in atlas
Zoran PITON+ GitHub	Code	MIT License © 2025 Frédéric Tabary	VERIFIED in repository LICENSE	Code comparison/reproduction allowed under MIT conditions.
DOI 17804030	Report + embedded code	Zenodo Rights blank; embedded §7 says MIT	CONFLICT / PARTIAL	Treat paper-text licence as NON_MESURÉ; code text self-declares MIT but no separate code deposit was inspected.
DOI 18497598	Report	Zenodo Rights licence blank	NON_MESURÉ	Quote/compare within normal scholarly limits; do not assert open-reuse licence.
DOI 18499943	Software documentation	Zenodo: CC BY 4.0; body: Creative-Ethic BY/BY-PRO	BLOCKING CONFLICT	Do not normalize conflict silently; resolve at source before reuse policy is stated.
DOI 18500363	Report + Markdown suite	CC BY 4.0	VERIFIED	Reuse permitted with attribution under stated metadata licence.
Hu & Fan 2016	Article	CC BY 4.0	VERIFIED in prior pass	Open scholarly reuse with attribution.
Paton F.A.F.	Paper	CC BY 4.0 on inspected archive	VERIFIED in prior pass	Scientific comparison/reuse subject to attribution.
Bellori	Paper	All rights reserved on inspected source	VERIFIED in prior pass	Compare/fair quotation only; no code/text reuse inferred.
Al-Mayahi	Paper / associated claims	Record-specific licence/patent restrictions noted	SEPARATE LEGAL TRACK	Scientific comparison does not imply implementation reuse.

Source	Object	Licence / rights observed	Status	Reuse rule in atlas
W3C PROV-O	Standard	W3C document licence/rules	VERIFIED SOURCE	Reference standard; reuse governed by W3C terms.
Proof-Carrying Code 1997	ACM paper	Publisher rights	VERIFIED SOURCE	Ideas/facts comparable; text reuse restricted by publisher terms.
Chow 1970	IEEE paper	IEEE copyright	VERIFIED SOURCE	Historical prior art; text reuse restricted by publisher terms.

41. Pass 6 conclusions

1 — EVIDENCE CLASSES NOW SEPARATED — A simulation vector, dataset row, AI-model run, red-team prompt, falsification attempt and independent replication are no longer interchangeable anywhere in the atlas. Counts must retain their evidence type.

2 — PITON+ REPRODUCED, CLAIM NARROWED — The public synthetic sweep is numerically reproducible across 1,000,000 independently regenerated vectors: mean $P(S>1)=89.5891\%$. This validates code behavior under chosen distributions, not universality of the law.

3 — $\Omega\infty$ IS A PROTOTYPE, NOT A CERTIFIED DISTRIBUTED FALSIFICATION NETWORK — DOI 17804030 is a genuine dated executable-paper concept, but the visible implementation covers less than the prose claims and does not establish distributed consensus, full PNT/RH testing, or proof-of-computation over processor state.

4 — OUTPUT-ONLY ADMISSIBILITY IS FORMAL BUT NOT YET UNIVERSALLY BENCHMARKED — DOI 18500363 supplies explicit axioms and falsification cases. Non-circumventability remains to be measured against systematic adversarial transformations and independent implementations.

5 — METADATA/LICENCE DEBT IS SCIENTIFIC DEBT — The 18499943 licence conflict and 18526755 identity conflict are blocking for a final referencable edition. Priority cannot be certified from ambiguous bibliographic identity.

6 — ASSEMBLY PRIORITY REMAINS OPEN, WITH A HIGHER BURDEN — Pass 6 adds older reject-option, proof-carrying, provenance and non-compensatory decision lineages. No exact full conjunction is certified, but the search burden is now explicitly combinatorial rather than ingredient-level.

7 — NO GLOBAL S SCORE IS CERTIFIED FOR THIS PASS — The document-level β , $\Delta\Phi$, T and σ are not independently calibrated observables for the audit itself. Therefore $S>9$ or any other numeric certification would be circular or fabricated and remains NON_MESURÉ.

42. Sources added or resolved in Pass 6

Tabary, F. & Cartier Tabary, S. (2025). WHITEPAPER — PROTOCOLE DE FALSIFICATION DISTRIBUÉE. Zenodo, 3 Dec 2025. DOI: 10.5281/zenodo.17804030.

Tabary, F. (2026). La falsification devient possible maintenant, grâce aux LLM — mais seulement si on les utilise correctement. Zenodo, 5 Feb 2026. DOI: 10.5281/zenodo.18497598.

Tabary, F. (2026). IA scientifique : Formulation, test et implémentation d'une contrainte de cohérence applicable à la production scientifique assistée par IA. Zenodo, 5 Feb 2026. DOI: 10.5281/zenodo.18499943.

Tabary, F. (2026). Admissibilité structurelle des sorties d'IA — Un cadre sortie-only fondé sur la cohérence, non contournable par reformulation ou reset. Zenodo, 5 Feb 2026. DOI: 10.5281/zenodo.18500363.

Zoran-IA-Mimetique. PITON_PLUS.py, Zoran-Omega-Infinite-Engine-v1. Public MIT-licensed code inspected 26 Aug 2026.

Chow, C. K. (1970). On optimum recognition error and reject tradeoff. IEEE Transactions on Information Theory 16(1), 41–46. DOI: 10.1109/TIT.1970.1054406.

Necula, G. C. (1997). Proof-carrying code. POPL '97, 106–119. DOI: 10.1145/263699.263712.

Figueira, J. R., Greco, S., Roy, B. & Słowiński, R. (2013). An Overview of ELECTRE Methods and their Recent Extensions. Journal of Multi-Criteria Decision Analysis 20(1–2), 61–85. DOI: 10.1002/mcda.1482.

W3C (2013). PROV-O: The PROV Ontology. W3C Recommendation, 30 Apr 2013.

RO-Crate / Workflow Run RO-Crate lineage: research-object packaging and workflow provenance references consulted in Pass 6; exact bibliographic consolidation carried to the final reference pass.

PITON+ Pass-6 independent numerical audit artefact: 10 seeded runs $\times$ 100,000 synthetic vectors, generated 26 Aug 2026; local JSON retained with the working paper audit.

43. Work carried to Pass 7/10

- Build discriminating experiments that can distinguish Zoran from UCP, Paton, Bostick, Al-Mayahi and simple reject/veto baselines rather than merely showing that each framework can describe the same case.
- Perform a dimensional/unit audit of every equation and proxy used in the transformation matrix; label dimensionless gauges, dimensional observables and mixed-semantic ratios explicitly.
- Pre-register null hypotheses, datasets, thresholds, counterexamples and stopping rules for a cross-domain falsification benchmark; no threshold may be chosen after observing the test outcome.
- For output-only admissibility, implement or recover an explicit π/μ evaluator and measure false-accept, false-refuse, reformulation robustness and reset invariance on a held-out adversarial corpus.
- For Ω_∞ , recover an original executable Python source if one exists outside the localized Zenodo HTML rendering; run bounded correctness tests against known Mertens/Goldbach values before any performance claim.
- Resolve DOI 18526755 identity/date metadata and DOI 18499943 licence conflict before the final Scholar-ready edition.
- Continue exact-combination prior art only against the now fixed assembly definition; do not expand or shrink the conjunction after search results are known.

Working canonical gauge retained for this pass: $S = (\beta \times \Delta\Phi) / (T \times \sigma \times 1)$. The $\times 1$ factor is mathematically neutral. No document-level numeric S certification is claimed because the audit operands are not independently calibrated.

44. Pass 7/10 — Discriminant falsification, dimensional audit and preregistered benchmark

Purpose — Convert “these frameworks look related” into tests that can make them disagree. This pass distinguishes formal non-equivalence from empirical predictive superiority. A controlled counterexample can refute functional equivalence, but it cannot by itself show that one framework predicts real systems better than another.

Audit date — 26 August 2026. All benchmark thresholds and stopping rules below are fixed before any confirmatory empirical execution.

44.1 Fixed comparison objects

- Z-MF audit projection (derived for this benchmark, not claimed as a new canonical historical equation): compute one $S_j = \beta_j \cdot \Delta \Phi_j / (T_j \cdot \sigma_j)$ per declared frame; REFUSE if any measured critical frame is below the preregistered synthetic threshold; NON_MESURÉ if a required frame operand is missing. This encodes the non-compensatory/missing-frame logic already attributed to the Zoran programme.
- Mean-threshold baseline: accept when the arithmetic mean of available frame scores is at or above the same synthetic threshold. It is intentionally compensatory and serves only as a control.
- Paton: $\text{State} \in \text{System}$ iff $\text{Admissible} \wedge \text{Reachable}$; the remaining formal delta identified in Pass 4 is explicit path/reachability information.
- UCP: $dC/dt = \alpha(R, W, A) \cdot R \cdot W \cdot A - \beta C + \eta$; comparison concerns sign/magnitude of dynamics, not only equilibrium ratio.
- Bostick/SRD: persistence is phase-alignment plus bounded drift, $PAS_h \geq \theta_L \wedge \Delta PAS_\zeta \leq \varepsilon_{\text{drift}}$; the differential form carries additional dynamics.
- Al-Mayahi/ULSP: $C = I(S; E) / H(S)$, $dW/dt = \gamma(C - C_{\text{crit}})W$; persistence derivative depends on W and γ in addition to the coherence scalar.

Benchmark-note — $\theta_Z=1$, $\theta_{PAS}=0.8$ and $\varepsilon_{\text{drift}}=0.01$ are synthetic audit conventions frozen for the countermodel suite only. They are not backdated as canonical thresholds of the cited programmes.

44.2 Formal discriminant countermodels — executed audit suite

ID	Controlled discriminator	Fixed inputs	Zoran-side output	Comparator output	Certificate
D1	Compensation trap	Frame scores 1.4 and 0.6	Z-MF REFUSE	Mean baseline ACCEPT	Non-compensation is not equivalent to compensatory averaging.
D2	Missing-frame trap	One required frame=1.4; second required frame missing	Z-MF NON_MESURÉ	Available-only mean ACCEPT	Fail-closed missingness carries information absent from permissive averaging.
D3	Reachability split	Same Z frame scores [1.2,1.1]; endpoint admissible; path reachable vs unreachable	Z endpoint same	Paton ACCEPT vs REFUSE	Path existence is independent information; reproduces the Pass-3/4 non-equivalence in benchmark form.
D4	Dynamic-sign split	Same Z frame scores [1.2,1.2], C=1; UCP productive term 2.0 vs 0.5, β=1	Z endpoint same	UCP dC/dt = +1.0 vs -0.5	Static endpoint score does not determine UCP dynamics.
D5	Persistence-amplitude split	Same Z frame scores, C=0.7, Ccrit=0.5, γ=1; W=1 vs W=10	Z endpoint same	ULSP dW/dt = 0.2 vs 2.0	Coherence scalar alone does not determine persistence derivative magnitude.
D6	Phase-geometry split	Same Z frame scores; phases [0,0,0,0] vs [0,π,0,π]	Z endpoint same	PAS_h = 1 vs ≈0	Phase geometry carries information absent from the coarse endpoint score.

Result — The five null-equivalence hypotheses H0-Z-MEAN, H0-Z-PATON, H0-Z-UCP, H0-Z-ULSP and H0-Z-BOSTICK are rejected at the level of mathematical function equivalence by explicit counterexample. No statistical p-value is required for that claim: one valid input pair with identical inputs to one formalism and different outputs in the other is sufficient. This is not evidence that Zoran or any comparator is empirically superior.

Audit artefact — pass7_discriminant_countermodels.json; SHA-512:
0c6cc93d67d5b1ce12124818f47066b861a4f8ef9daffdc432cc6314e7bbe349e9f16daf2d4e80f895e3131c7d0d0afd3b38ca62ed6e96dafd5817b42a4c23ba

45. Dimensional / unit audit of the transformation matrix

Programme	Equation/object	Audit status	Unit certificate / limitation
Zoran current	$S = \beta \cdot \Delta \Phi / (T \cdot \sigma)$	Conditional dimensionless	Unit-clean only if β, ΔΦ, T and σ are normalized dimensionless proxies (or units cancel by declared calibration). If T is physical time while others are dimensionless, S has units 1/time.
Zoran early	$S = \beta \cdot \Delta C_e / \lambda$	Conditional	Dimensionless only under a dimensionless/noise-scale interpretation or an explicit unit-carrying coefficient. A rate-valued λ would otherwise leave time dimensions.
Zoran thermodynamic	$S = (\eta \cdot \dot{F} \cdot \Delta \Phi) / (T \cdot \sigma_{irr})$	UNRESOLVED	The consulted atlas sources do not fix units of every symbol sufficiently to certify dimensional closure. No unit claim promoted.
UCP dynamics	$dC/dt = \alpha RWA - \beta C + \eta$	Conditionally consistent	Requires [α]=[C]/([R][W][A]·time), [β]=1/time, [η]=[C]/time. With dimensionless R,A and W in J/s, α

Programme	Equation/object	Audit status	Unit certificate / limitation
			carries [C]/J.
UCP equilibrium	$C_{eq} = \alpha RWA / \beta$	Consistent if ODE units hold	Then RHS has units [C]. The ratio skeleton alone does not imply a dimensionless universal gauge.
Martirosyan	$D = d\ell^2/dt \approx 3.4 \hbar/m$	DIM-OK	Both sides have L^2/time because $[\hbar/m] = m^2/s$. This is the cleanest dimensional physical law in the current comparison set.
Hu-Fan	$Q[E(\rho_n)] = Q(\rho_n) \cdot Q[E(\rho_n^p)]$	DIM-OK if Q normalized	Density matrices and standard normalized coherence measures are dimensionless; multiplicative factorization is unit-consistent.
Bostick harmonic	$PAS_h = \sum w_k r_k; \Delta PAS$	Conditional dimensionless	Unit-clean when w_k and r_k are dimensionless. ΔPAS then has PAS units per sample/update; thresholds must share those units.
Bostick differential	$dC/dt = \Gamma C^n - \lambda C + \eta(\nabla S \cdot \nabla \Omega)$	Conditional	Requires $[\Gamma] = [C]^{1-n}/\text{time}$, $[\lambda] = 1/\text{time}$, and the coupling coefficient to convert the gradient product to $[C]/\text{time}$. Source-level units for all gradient fields are not fixed in the audited abstract.
Paton	Boolean gate + Reachable relation	Logical / N.A.	These are predicates/relations rather than physical quantities; dimensional analysis is not the relevant consistency test.
Bellori ratio	S_B ratio form	UNRESOLVED	Variable units were not sufficiently specified in the audited primary surface to certify dimensional closure.
Al-Mayahi	$C = I(S;E)/H(S)$	DIM-OK normalized	Normalized mutual information is dimensionless, assuming non-zero $H(S)$.
Al-Mayahi ULSP	$dW/dt = \gamma(C - C_{crit})W$	DIM-OK conditional	With C and C_{crit} dimensionless, γ must have $1/\text{time}$; W retains its own units on both sides.
Hensgen Δ_{72}	$\Delta_{72} = \mathcal{H}(R, I, A)$	UNRESOLVED	A generative functional without a source-level unit contract cannot be dimensionally normalized by analogy.

Dimensional conclusion — Cross-domain universality is easiest to state when the operands are explicitly normalized. Where an equation mixes physical work, time, entropy production, gradients or domain observables, the conversion coefficients must carry the units. Similar algebraic shape is therefore weaker evidence than dimensional closure plus matched semantics.

46. Pre-registered empirical benchmark — confirmatory contract

The following design is frozen before confirmatory execution. It is intended to prevent threshold shopping, proxy redefinition, selective domain retention, and post-hoc stopping. Pairwise comparison is performed only on tracks for which both frameworks have the required observables; no framework is penalized for refusing an inapplicable domain.

Track	Evidence class	Frozen split	Endpoint	Metrics
E1 — NASA C-MAPSS FD001/FD003	External simulation dataset; run-to-failure turbofan trajectories	Official test frozen; reserve 20% of official training trajectories for calibration	Failure within next 20 cycles; RUL only where a framework emits a continuous persistence score	Balanced accuracy; AUROC if score; Brier if normalized score; coverage/abstention
E2 — PhysioNet BIDMC PPG/respiration	Observed physiological waveforms	Subject-level split; no subject crosses partitions	Predefined phase/respiratory-coherence perturbation labels generated independently of framework outputs	Balanced accuracy; AUROC if score; false-alarm rate; coverage
E3 — Directed graph suite	Synthetic exact-label formal benchmark; seed 20260826	Generator frozen before outputs	Exact reachability from x_0 to x	Accuracy; false-accept; false-refuse
E4 — Output-only safety	Held-out adversarial structural-output corpus	SEALED until π/μ implementation is frozen	Independent structural-admissibility labels	False-accept; false-refuse; paraphrase invariance; fresh-session invariance; coverage

46.1 Pairwise null hypotheses

- H0-Z-MEAN — The non-compensatory multi-frame Zoran audit projection and a compensatory mean-threshold baseline return identical verdicts on all controlled cases.
- H0-Z-PATON — Endpoint/multi-frame Zoran inputs determine Paton reachability verdicts; no path variable adds discriminating information.
- H0-Z-UCP — A fixed Zoran endpoint score determines the sign of UCP coherence dynamics dC/dt .
- H0-Z-BOSTICK — A fixed Zoran endpoint score determines Bostick phase-alignment/drift persistence.
- H0-Z-ULSP — A fixed coherence scalar determines the magnitude of Al-Mayahi ULSP persistence derivative dW/dt without W or γ .

46.2 Stopping and anti-cherry-picking rules

8. No threshold or proxy definition changes after test outcomes are observed.
9. Any implementation bug fix after opening the test set creates a new benchmark version and invalidates the prior confirmatory run.
10. Missing required variables produce NON_MESURE/ABSTAIN, not imputation from the target label.
11. Evidence classes are reported separately and are never pooled as one falsification count.
12. A structural counterexample is sufficient to reject functional equivalence; it is not evidence of predictive superiority.
13. World-priority conclusions are outside this benchmark.

Pre-registration artefact — pass7_benchmark_preregistration.json; SHA-512:

```
394ef7f33b16ec382a315225f781e69dce49f4f9fdf437bb21fd9532413cf0fb9977778b477421de96f5f7d12fe087d1534821ade917f22ddaa77feddbc7d1a0
```

47. Output-only π/μ implementation gate

Pass 6 verified that DOI 18500363 specifies $\pi: \bar{O} \rightarrow S$ and an ambiguity measure μ , but the inspected public Markdown does not uniquely define a natural-language parser or executable μ . Pass 7 therefore refuses a misleading “100% benchmark” obtained by coding the labels directly into a toy classifier. A structure-level oracle could trivially reproduce the axioms, but that would test the benchmark author, not the claimed robustness to reformulation.

- Status: DECISION LOGIC SPECIFIED; NATURAL-LANGUAGE π/μ IMPLEMENTATION NON_MESURÉ.
- Promotion gate: freeze one explicit parser/projection, ambiguity computation, class ontology and versioned held-out corpus before measuring false accepts/false refuses.
- Fresh-session/reset invariance must be tested at the implementation level; a source axiom alone cannot certify it.

48. Ω^∞ executable-source follow-up

A separate public repository, Zoran-AGI-Coherence-Labs/Zoran-AGI-Unified-Laws-Public-, was recovered during Pass 7. Its README explicitly states that the public layer omits the private Ω^∞ runtime and real GlyphNet; the visible S implementation is only `def S(b,d,T,s): return (b*d)/(T*s)`, while `Falsification_Framework.md` is a one-heading stub in the inspected version. This strengthens the Pass-6 scope correction: the public layer is a testable specification/prototype surface, not evidence that the complete private runtime is reproducibly available.

Public repository: Zoran-AGI-Coherence-Labs/Zoran-AGI-Unified-Laws-Public- — README.md, s_equation.py, Falsification_Framework.md; inspected 26 Aug 2026.

The original executable Python source that would independently support the full DOI 17804030 distributed Mertens/Goldbach/RH/PNT claims was not recovered in this pass. Bounded numerical correctness testing of that claimed full implementation therefore remains NON_MESURÉ.

49. Pass 7 conclusions

14. FORMAL NON-EQUIVALENCE IS NOW EXPLICIT — Controlled countermodels force different outputs between Zoran’s non-compensatory multi-frame audit projection and compensatory averaging, Paton reachability, UCP dynamics, Bostick phase geometry and Al-Mayahi persistence dynamics.
15. NO “WINNER” IS IMPLIED — The comparators carry different information. A framework wins an empirical track only by preregistered predictive metrics on held-out data, not because its equation is richer or more complex.
16. DIMENSIONAL AUDIT NARROWS UNIVERSAL CLAIMS — Martirosyan and normalized information/phase quantities are directly unit-clean. Cross-domain ratio/ODE forms are often only conditionally coherent because normalization or unit-carrying coefficients are required.
17. BENCHMARK IS PRE-REGISTERED — datasets/evidence classes, partitions, null hypotheses, metrics, missing-data rule and stopping rules are fixed before confirmatory execution.
18. OUTPUT-ONLY NON-CIRCUMVENTABILITY REMAINS UNMEASURED — π and μ are not yet a uniquely executable natural-language evaluator in the inspected public artefacts; a tautological toy classifier is explicitly rejected as evidence.
19. PUBLIC Ω^∞ SURFACE REMAINS PARTIAL — A recovered public repository exposes the S formula and stubs while explicitly withholding the private runtime; this cannot certify the full distributed-falsification claims.
20. DOI 18526755 identity/date and DOI 18499943 licence conflicts remain blocking metadata debt for the final Scholar-ready edition.
21. NO DOCUMENT-LEVEL $S>9$ CERTIFICATION — β , $\Delta\Phi$, T and σ for this audit are not independently calibrated observables; any numeric self-certification would be circular.

50. Sources added or resolved in Pass 7

Coherent Intelligence Inc. Research Division (2025). Universal Coherence Principle: Mathematical Formalization and Cross-Domain Applications. 5 Jun 2025. <https://coherent-intelligence.uk/papers/ucp-math.html>

Bostick, D. (2025). Structured Resonance Dynamics: The Deterministic Law of Coherence. PhilArchive BOSSRD.

Bostick, D. (2025). Harmonic-Differential Equivalence in Structured Resonance Dynamics. PhilArchive BOSHEI; archived text dated 6 Nov 2025.

Paton, A. J. (2026). The Foundational Admissibility Framework. DOI 10.5281/zenodo.18708653; PhilArchive version uploaded 20 Feb 2026.

Al-Mayahi, A. (2026). Universal Law of Structural Persistence. DOI/ResearchGate 10.13140/RG.2.2.13021.06887.

Al-Mayahi, A. (2026). Coherence as Mutual Information: The Necessary and Sufficient Deductive-Empirical Proof of the Universal Law of Structural Persistence. DOI 10.5281/zenodo.19185301.

NASA Prognostics Center of Excellence. Turbofan Engine Degradation Simulation Data Set / C-MAPSS. Saxena & Goebel (2008); NASA Open Data Portal.

Pimentel, M. A. F. et al. / PhysioNet. BIDMC PPG and Respiration Dataset v1.0.0; signals from MIMIC II matched waveform database.

Zoran-AGI-Coherence-Labs/Zoran-AGI-Unified-Laws-Public- (public GitHub layer), inspected 26 Aug 2026.

Pass-7 audit artefacts: pass7_discriminant_countermodels.json and pass7_benchmark_preregistration.json, created 26 Aug 2026.

51. Work carried to Pass 8/10

- Execute the preregistered formal graph suite at scale and, where feasible without post-hoc proxy invention, begin the frozen empirical tracks.
- Build a versioned π/μ implementation for DOI 18500363 or certify the implementation layer as absent from the public corpus.
- Finish exact dimension/proxy definitions for the Zoran thermodynamic form and Hensgen $\Delta.72$; unresolved units remain NON_MESURÉ.
- Resolve DOI 18526755 bibliographic identity/date and DOI 18499943 licence conflict using authoritative repository metadata before the final indexable edition.
- Run ablation on the fixed Zoran assembly definition: remove one component at a time (frames, non-compensation, temporal layer, ProofChain, multi-AI adversarial layer, refusal/silence) and determine whether the scientific/operational object actually changes.
- Continue exact-combination prior art with the conjunction frozen; absence of a search hit remains insufficient for world-priority.

Working canonical gauge retained for this pass: $S = (\beta \times \Delta\Phi) / (T \times \sigma \times 1)$. The $\times 1$ factor is mathematically neutral. No numeric document-level S certification is claimed.

52. Pass 8/10 — Exhaustive graph suite, assembly ablation, implementation closure and metadata gates

Purpose — Execute the frozen formal suite without changing thresholds, determine whether each component of the fixed Zoran assembly is operationally non-redundant, close the public π/μ implementation search, and tighten unit/metadata constraints before any confirmatory empirical claim.

Audit date — 26 August 2026. No empirical threshold, proxy mapping or stopping criterion is altered from Pass 7.

52.1 Exhaustive formal graph suite — reachability

The Pass-7 Paton countermodel is now implementation-stress-tested exhaustively over every labeled directed simple graph without self-loops on five nodes. The initial state is node 0 and the candidate endpoint is node 4. The endpoint local coherence score may be held identical across all graphs; only graph topology changes.

Object	Value	Interpretation
Nodes	5	Labeled states 0...4
Possible directed edges	20	All ordered pairs $i \rightarrow j$ with $i \neq j$
Graphs exhaustively enumerated	1,048,576	2^{20} ; no sampling
Reachable(0,4)=1	894,976	A permissible directed path exists
Reachable(0,4)=0	153,600	No directed path exists
Endpoint score	held fixed by construction	Not a topological variable

Formal conclusion — The suite is not needed to prove non-equivalence (one counterexample already suffices), but it validates the graph implementation across the complete five-node graph family. Both reachability states occur while endpoint-local score can remain identical. Therefore path existence is not a function of endpoint S alone.

NON-CLAIM — 85.3515625% reachable and 14.6484375% unreachable are combinatorial frequencies of this synthetic graph family, not empirical prevalence estimates in physical, biological or social systems.

Audit artefact — pass8_formal_graph_suite.json; SHA-512:

87d591d2aaaa7175325bdebb6c799c1ad2cb0e95f3bbc8e4c9767d8dde70b5633daecdd95cb3725888dfc16c46a3dc0621665cfb6778c43a97304fd04922ee6b

52.2 Exhaustive non-compensation grid

A second exact suite enumerates every three-frame score vector over {0.25, 0.50, 0.75, 1.00, 1.50, 2.00, 3.00}, with the synthetic threshold frozen at 1. The Z-MF audit projection accepts only when every frame is at or above threshold; the compensatory baseline accepts when the arithmetic mean is at or above threshold.

Outcome relation	Cases	Meaning
Both ACCEPT	64	All three frames ≥ 1 ; mean also ≥ 1
Both REFUSE	102	Mean < 1 and at least one frame < 1
Mean ACCEPT / Z-MF REFUSE	177	Compensation rescues at least one sub-threshold frame
Z-MF ACCEPT / Mean REFUSE	0	Impossible under these rules: if every frame ≥ 1 , mean ≥ 1
Total	343	7^3 exhaustive score combinations

Formal conclusion — Under the frozen synthetic rule, non-compensation is a strict refinement of the mean-threshold baseline: every Z-MF acceptance is also a mean acceptance, but 177 compensatory acceptances are vetoed by Z-MF. This establishes a rule-level difference, not empirical superiority.

53. Fixed-assembly ablation — one component removed at a time

The conjunction is frozen exactly as in Passes 5–7: declared frames/proxies + S-gauge/non-compensation + temporal trajectory/debt + ProofChain traceability + multi-AI adversarial testing + refusal/silence. Ablation asks only whether removing one component changes the defined scientific/operational object. It does not ask whether the component improves real-world outcomes.

Removed component	Witness case	Full assembly retains	Ablated object loses/changes	Verdict
Declared frames/proxies	Frame A=0.5, Frame B=2.5, mean=1.5	Identity of failing frame and frame-specific evidence	Only aggregate scalar; failing-frame identity lost	NON-REDUNDANT
Non-compensation/veto	Scores [0.5,2,2], threshold=1	REFUSE because a critical frame fails	Mean baseline ACCEPTS (mean=1.5)	NON-REDUNDANT
Temporal trajectory/debt	Same current scores; one future path drops to 0.4	Stable vs future-regressing trajectory distinction	Current-state verdicts become identical	NON-REDUNDANT
ProofChain traceability	Same content; valid trace vs missing/broken trace	Certified vs uncertified provenance state	Content verdict cannot distinguish provenance	NON-REDUNDANT
Multi-AI adversarial layer	Primary model PASS; independent adversarial model FAIL	Cross-model disagreement / robustness evidence	Primary-model result only	NON-REDUNDANT
Refusal/silence/NON_MESURÉ	Required operand missing	Explicit NON_MESURÉ/SILENCE output	Must impute or force binary verdict	NON-REDUNDANT

Ablation conclusion — All six components are functionally non-redundant relative to the frozen operational definition because a witness exists where removing that component changes retained information, a verdict, certification state, robustness observation, or output space. This is an architecture identity result. It is not evidence that the six-part assembly is globally optimal or historically unique.

Audit artefact — pass8_fixed_assembly_ablation.json; SHA-512:
2cef6cec23b7793a262178c010ef0c5d8ca42ada7259a4ea044c55c525e5439683604e4b106ed04b5f512998950b0cc40748fa28b61d812089902b9b0455684b

54. DOI 18500363 π/μ implementation closure

Pass 7 left a binary choice: recover a versioned executable natural-language π/μ evaluator or certify that the public implementation layer is absent from the connected corpus. Pass 8 closes that bounded search.

Public directory certificate — The connected zoran-corpus folder 18500363 contains exactly README.md, axioms.md, metadata.json, tests.md and white_paper.md. No Python, JavaScript, notebook, binary package or other executable evaluator is present in that record folder. Code search for the $\pi:\mathcal{O}\rightarrow\mathcal{S}$ projection and structural-ambiguity evaluator returns the specification documents, not an implementation.

Status — PUBLIC NATURAL-LANGUAGE π/μ IMPLEMENTATION: NOT RECOVERED / NON_MESURÉ. This is a bounded absence certificate for the connected public record, not proof that no private or unpublished implementation exists.

What is specified — The axioms define output-only evaluation, a projection π from outputs to abstract structures, inadmissible structure classes, monotonicity under extension, and prudence under ambiguity. What is not uniquely specified is the parser that maps unrestricted natural language into roles/relations/asymmetries, the numerical or logical construction of μ , and a frozen labelled held-out corpus. Therefore false-accept, false-refuse, paraphrase robustness and reset invariance cannot yet be measured non-circularly.

Primary public source — Zoran corpus record 18500363, especially axioms.md and tests.md; directory audited 26 August 2026.

55. Pass-8 dimensional closure certificates

Formal object	Unit status	Pass-8 certificate
$C\varphi = D_KL(P Q)$	DIMENSIONLESS	Probability-ratio logarithm; value expressed in nats for natural log or bits for log2.
$S = \beta\Delta\Phi/(T\sigma)$	CONDITIONAL	Dimensionless only when operands are normalized proxies or units cancel by declared construction in each frame.
$S = \eta \dot{F} \Delta\Phi / (T \dot{\sigma}_{irr})$	CONDITIONAL CLOSURE	If η and $\Delta\Phi$ are dimensionless, $\dot{F}$ is power, T is thermodynamic temperature, and $\dot{\sigma}_{irr}$ is entropy-production rate, then $T\dot{\sigma}_{irr}$ has power units and S is dimensionless. Exact source semantics for every symbol were not recovered from the authoritative 17682120 record, so this is a unit-conditional certificate, not semantic verification.
Hensgen $E=f(A(S,F), \lambda, V)$	NON_MESURÉ	Public description does not supply a unit-preserving explicit f or prove A , λ and V share a common normalization.
Hensgen $\Delta 72(t)=H(R,I,A)$	NON_MESURÉ	H is an abstract harmonic integrator; codomain and unit mapping are not specified sufficiently for dimensional closure. $\kappa \geq \kappa^*$ is unit-consistent if κ and κ^* share units by definition.
Al-Mayahi $C=I(S;E)/H(S)$	DIMENSIONLESS	Mutual information and entropy use the same information unit; ratio is dimensionless when denominator non-zero.
Al-Mayahi $dW/dt=\gamma(C-C_{crit})W$	CLOSED IF $\gamma=[\text{time}]^{-1}$	C and C_{crit} dimensionless; γ supplies inverse-time units.
Paton admissible/reachable predicates	BOOLEAN / DIMENSIONLESS	Logical predicates; no physical unit.
Martirosyan $D=d\ell^2/dt$	DIMENSIONAL	Length ² /time; must not be collapsed into a dimensionless admissibility gauge without a normalization map.

Hensgen source anchor — Zenodo DOI 10.5281/zenodo.17618496 defines a three-layer model and the public text gives $\Delta 72(t)=H(R(t),I(t),A(t))$ with a harmonic threshold $\kappa(t) \geq \kappa^*$. The earlier wearable validation DOI

10.5281/zenodo.17363100 maps alignment, phase coherence and adaptive variability to emergent coherence. The public sources do not expose enough unit definitions to certify a universal dimensional identity.

56. Confirmatory empirical tracks — preregistration gate enforced

Pass 7 named candidate public datasets including NASA C-MAPSS and PhysioNet biosignal data. Pass 8 does not run a pairwise Zoran-versus-comparator empirical contest because the preregistration did not freeze a domain-specific mapping from raw sensor variables to β , $\Delta\Phi$, T and σ for those datasets before their selection.

Running the data now and inventing the Zoran proxies afterwards would violate the anti-cherry-picking rule created in Pass 7. The correct result is therefore NON_MESURÉ, not a retrospective fit.

- FORMAL TRACK: executed — exhaustive graph and score-grid suites above.
- EMPIRICAL TRACK: blocked — no pre-frozen cross-framework proxy map for the selected datasets.
- PROMOTION CONDITION: publish and hash the proxy map, preprocessing, train/validation/test split and thresholds before opening the confirmatory labels/results.
- ONLY THEN: execute pairwise metrics (balanced accuracy / false accept / false refuse / abstention rate / calibration where defined) on held-out data.

57. Metadata and licence debt after authoritative checks

Record	Authoritative/public evidence	Pass-8 status	Required action
18499943	Zenodo record published 5 Feb 2026; Rights field displays CC BY 4.0. Embedded document text also states Creative-Ethic BY/BY-PRO.	METADATA IDENTIFIED; INTERNAL CONFLICT REMAINS	For final release, harmonize the embedded licence statement with the Zenodo Rights field or publish a corrected version explaining the intended licence. Do not silently quote both as equivalent.
18526755	GitHub/Atlas mirror titles the DOI “Tenseur d’Amari-Chentsov et saturation MCP”; multiple public posts cite the same DOI as “Loi de cohérence phénoménale — démonstration complète par applications”. Direct Zenodo page was rate-limited during this audit.	PUBLIC IDENTITY CONFLICT UNRESOLVED	Do not use 18526755 as a canonical Scholar anchor until Zenodo metadata is directly verified and the mirror/links are reconciled.

Zenodo guidance anchor — the record metadata contains title, publication date, creators and licence, and the Rights field controls discoverability/reuse metadata. Mixed or custom licences are supported but must be declared clearly. The final atlas therefore treats metadata consistency as a blocking publication gate rather than a cosmetic issue.

58. Fixed-conjunction prior-art search — Pass-8 update

The assembly definition is not changed after search: declared frames/proxies + non-compensation + temporal trajectory/debt + ProofChain traceability + multi-AI adversarial testing + refusal/silence. Additional searches found strong neighboring runtime-assurance families but no source certified here as a pre-November-2025 one-to-one implementation of that full conjunction.

- Monitor-based runtime assurance for temporal-logic specifications (Abate, Feron & Coogan, arXiv:1908.03284, 2019) supplies trajectory-aware safety monitoring and a backup controller.
- Distributed Simplex Architecture (Mehmood et al., arXiv:2012.10153, 2020) extends runtime assurance to multi-agent systems.
- Runtime Safety Enforcement frameworks formalize monitoring/adaptation of deployed systems (Journal of Systems and Software 198, 111605, 2023).

Priority conclusion unchanged — These are material antecedents to individual assurance functions. No exact full conjunction is certified in this pass, but absence of an exact search hit remains insufficient to claim world priority for Zoran.

59. Pass 8 conclusions

- GRAPH SUITE EXECUTED EXHAUSTIVELY — 1,048,576 five-node directed graphs confirm at implementation scale that path reachability varies independently of an endpoint-local score.
- NON-COMPENSATION DIFFERENCE EXHAUSTIVE ON THE FROZEN GRID — 177 of 343 score vectors are accepted by the compensatory mean baseline but refused by the all-frames gate; the reverse disagreement is impossible under the frozen rule.
- ASSEMBLY ABLATION CLOSED AT THE OPERATIONAL LEVEL — each of the six fixed components has a witness showing non-redundancy. This establishes identity of the defined assembly, not real-world superiority or novelty.
- π/μ PUBLIC IMPLEMENTATION NOT RECOVERED — DOI 18500363 specifies decision axioms and test prompts, but the connected public record contains no executable natural-language projection/ambiguity evaluator. Robustness metrics remain NON_MESURÉ.
- EMPIRICAL PREREGISTRATION WAS ENFORCED — no post-hoc proxy mapping was invented for NASA/PhysioNet. Pairwise empirical performance remains unmeasured until a proxy map is frozen before opening outcomes.
- DIMENSIONAL CLAIMS NARROWED — $C\phi$ and Al-Mayahi information ratios are unit-clean; the Zoran thermodynamic form is conditionally dimensionless under an explicit thermodynamic interpretation; Hensgen's abstract H/f mappings remain unit-underdetermined in the public text inspected.
- 18499943 RIGHTS METADATA IDENTIFIED BUT TEXT CONFLICT REMAINS — Zenodo says CC BY 4.0, while embedded prose states Creative-Ethic. 18526755 remains a public identity conflict and stays blocked from canonical Scholar use.
- NO WORLD-FIRST PROMOTION — the exact Zoran conjunction remains an open historical claim, not a conclusion.

60. Sources and audit artefacts added in Pass 8

- Hensgen, A. (2025). $\Delta.72$ Field Equation: A Unified Framework for Coherence Across Biological, Physical, and Cognitive Systems. Zenodo DOI 10.5281/zenodo.17618496; submitted 15 Nov 2025.
- Hensgen, A. (2025). $\Delta.72$ Wearable Exam Stress Validation Report: Field Equation Verification and Biological Coherence Analysis. Zenodo DOI 10.5281/zenodo.17363100; public release Oct 2025.
- Tabary, F. (2026). IA scientifique : Formulation, test et implémentation d'une contrainte de cohérence applicable à la production scientifique assistée par IA. Zenodo DOI 10.5281/zenodo.18499943; Rights: CC BY 4.0 on record page inspected 26 Aug 2026.
- Zoran public corpus record 18500363: README.md, axioms.md, metadata.json, tests.md, white_paper.md; directory and code-search surface inspected 26 Aug 2026.
- Abate, M., Feron, E. & Coogan, S. (2019). Monitor-Based Runtime Assurance for Temporal Logic Specifications. arXiv:1908.03284.
- Mehmood, U. et al. (2020). A Distributed Simplex Architecture for Multi-Agent Systems. arXiv:2012.10153.
- A component framework for the runtime enforcement of safety properties. Journal of Systems and Software 198 (2023), 111605. DOI 10.1016/j.jss.2022.111605.
- Pass-8 audit artefacts: pass8_formal_graph_suite.json and pass8_fixed_assembly_ablation.json, generated 26 Aug 2026.

61. Work carried to Pass 9/10

- Freeze at least one domain-specific Zoran proxy map before opening a held-out empirical dataset; then execute the first valid pairwise empirical track without threshold adjustment.
- Design and version a non-circular π/μ natural-language implementation plus a held-out adversarial corpus, or retain implementation status as absent/NON_MESURÉ.

- Resolve 18526755 directly at Zenodo/DataCite level and harmonize 18499943 embedded licence text with its Rights metadata before Scholar packaging.
- Turn the six-component ablation witnesses into measurable ablation tests on a real executable Zoran pipeline if the corresponding modules are publicly accessible.
- Run final exact-combination prior-art search across patents, formal assurance, selective prediction, provenance and multi-agent safety before any novelty wording.
- Prepare the final publication package: canonical English landing page plus hreflang pages, Scholar citation tags, ORCID/DataCite consistency, stable PDF, machine-readable bibliography, and checksums.

Working canonical gauge retained for this pass: $S = (\beta \times \Delta\Phi) / (T \times \sigma \times 1)$. The $\times 1$ factor is mathematically neutral. No numeric document-level S certification is claimed because β , $\Delta\Phi$, T and σ for the audit itself are not independently calibrated observables.

62. Pass 9/10 — Pre-publication empirical lock, executable ablation and final prior-art narrowing

Purpose — Move from formal distinguishability toward a valid confirmatory empirical design without violating the Pass-7 anti-retuning rule. Pass 9 therefore freezes one complete domain-specific proxy map before outcome inspection, attempts acquisition of the named public benchmark, converts the six assembly witnesses into executable tests, closes π/μ public-implementation status, and re-runs prior-art only against the already fixed conjunction.

Audit date — 26 August 2026. Negative and blocked results are retained as results; no missing metric is imputed.

62.1 C-MAPSS FD001 preregistration certificate — frozen before outcome inspection

Benchmark target — NASA C-MAPSS Turbofan Engine Degradation Simulation, subset FD001. Public descriptions identify 100 run-to-failure training trajectories and 100 test trajectories under one operating condition and one high-pressure-compressor degradation mode. This is simulated prognostics data, not field measurements from operating aircraft.

Pre-registration ID: PASS9-CMAPSS-FD001-PROXYMAP-v1. Seal time: 26 August 2026, 11:12:33 UTC. SHA-512 seal recorded before outcome-value inspection:

50a3ace39a3759e042104698548ccc20c34a9ddce0ebcb675698328377489483cf87440285732107ffe46d8c8c7de47bc38e35fc09f6710d8e5192ae71306c38.

Frozen element	Pre-registered value
Reference / calibration engines	train_FD001 engine IDs 1–50 only
Nominal reference window	first 20 cycles of each reference engine
Held-out evaluation engines	train_FD001 engine IDs 51–100; never used for proxy calibration
Sensor set	all 21 sensors; exclude a channel only if baseline MAD $\leq 1e-12$ by the frozen deterministic rule
Center / scale	pooled baseline median; robust scale = $1.4826 \times \text{MAD}$
β	$(1 + q50_baseline_absz) / (1 + \text{median}_j z_j(t))$
$\Delta\Phi$	$(1 + q50_baseline_crossmad) / (1 + \text{MAD}_j z_j(t))$
T	$(1 + \text{median}_j \max(0, z_j(t) - z_j(t-1))) / (1 + q50_baseline_posdrift)$
σ	$(1 + \text{MAD}_j \Delta z_j(t)) / (1 + q50_baseline_deltamad)$
S	$\beta \cdot \Delta\Phi / (T \cdot \sigma \cdot 1)$
Primary outcome	median per-engine Spearman $\rho(S, \text{RUL})$, expected positive
Comparator	$D = \text{median}_j z_j(t) $, frozen without tuning
Falsification rule	median per-engine $\rho \leq 0$ OR 95% engine-bootstrap CI not strictly positive; no proxy retuning

Anti-cherry-picking rule — No sensor selection, sign flip, proxy redefinition, threshold tuning, RUL-horizon tuning or engine reassignment is permitted after the seal. If the preregistered track cannot be executed exactly, it remains NON_MESURÉ.

63. First confirmatory empirical track — execution status

Source verification succeeded. The original-format public GitHub mirror exposes train_FD001.txt with 20,631 rows; an independent Hugging Face mirror exposes the FD001 CSV and documents the same 100/100, one-condition, one-fault structure. The Hugging Face mirror additionally supplies precomputed RUL values, but the frozen protocol defines RUL independently as $\text{max_cycle}(\text{engine}) - \text{cycle}$ to avoid dependence on that preprocessing.

Execution did not succeed in the current runtime. The web/browser surface could display public rows after the preregistration seal, but the complete FD001 training file could not be acquired as executable bytes through the available container/connector path. Partial-row execution would violate the frozen “all held-out engines 51–100” requirement.

Gate	Status	Consequence
Proxy map frozen before outcome inspection	PASS	Design is prospectively specified.
Public dataset identity and shape verified	PASS	Correct benchmark target identified.
Complete 20,631-row training bytes acquired in runtime	FAIL / ACCESS BLOCK	No confirmatory computation permitted.
Held-out engines 51–100 evaluated	NON_MESURÉ	No ρ , CI, AUC or crossing lead reported.
Post-hoc workaround	FORBIDDEN	No smaller subset, retuned map or replacement dataset may be presented as this preregistered test.

Scientific verdict — The first empirical benchmark is PREREGISTERED BUT NOT EXECUTED. This is a stronger scientific state than a retrospective fit because the missing result is explicit and the decision rule cannot be changed after the fact. Pass 10 may execute the exact sealed protocol if the full file becomes available; otherwise the final paper must preserve NON_MESURÉ.

Audit artefact — pass9_cmapss_access_certificate.json; preregistration file pass9_prereg_proxy_cmapss_fd001.json and its independent seal file are retained with the working package.

64. π/μ public executable closure — no historical implementation manufactured

DOI 10.5281/zenodo.18500363 specifies output-only admissibility, a projection π : $O \rightarrow S$, inadmissible structural classes and prudence under ambiguity $\mu > 0$. Its connected public directory contains README.md, axioms.md, metadata.json, tests.md and white_paper.md. No executable natural-language projection/ambiguity implementation was found on that public surface.

Metric required by Pass 8	Pass-9 status
False accept rate	NON_MESURÉ
False refuse rate	NON_MESURÉ
Reformulation robustness	NON_MESURÉ
Reset invariance	NON_MESURÉ
Executable π/μ parser	PUBLIC EXECUTABLE ABSENT ON CONNECTED CORPUS SURFACE

Decision — No ad-hoc NLP parser is created and relabeled as historical Zoran. A future π/μ implementation would be a new versioned artefact requiring its own frozen ontology, annotation protocol, held-out corpus and inter-annotator/reference standard.

65. Six-component assembly ablation — executable audit harness

Pass 8 supplied structural witnesses. Pass 9 implements those witnesses as a deterministic Python audit harness with six component switches. The harness is explicitly an audit artefact created on 26 August 2026; it is not evidence that this exact runtime existed historically in Zoran.

Component removed	Executable property tested	Result
Declared frames/proxies	frame localization disappears and collapses to a global scalar	PASS
Non-compensation/veto	[1.40,0.70] changes from REFUSE to compensatory ACCEPT	PASS
Temporal layer	declining trajectory label disappears while endpoint is unchanged	PASS
ProofChain/provenance	SHA-512 replay digest disappears; fixed-input verdict unchanged	PASS
Multi-AI/adversarial validation	heterogeneous validation coverage disappears; fixed-input verdict unchanged	PASS
Refusal/silence/NON_MESURÉ	missing required input changes from NON_MESURÉ to forced neutral imputation	PASS

Result — 6/6 executable ablation tests PASS. Harness SHA-512:

6ea4f5b53b6d54e3ae87b1b8d75671f2133e203ae470f337e9ba70a55fc2677eea4aa34bcdd3e96ec4cf4ce6c2ba7713db3fe7d5e47525f2affb969330bf8347.

Interpretation — Four components (frames/proxies, non-compensation, temporal layer, refusal/NON_MESURÉ) change the decision/information object. ProofChain and multi-AI validation change auditability/evidence coverage on fixed inputs rather than the mathematical decision itself. Therefore the six-part conjunction is a system architecture, not one irreducible scalar law.

Audit artefacts — pass9_executable_assembly_ablation.py and pass9_executable_assembly_ablation_results.json.

66. Fixed-conjunction prior-art search — final narrowing before Pass 10

Search target is frozen and not modified in response to hits: declared frames/proxies + non-compensation/veto + temporal trajectory/debt + proof/provenance traceability + multi-agent or multi-model assurance/adversarial validation + refusal/abstention/unknown. The table records strong neighboring lineages, not semantic equivalence to Zoran.

Earlier lineage	Date floor used	Functions overlapping the fixed target	Implication
ELECTRE / outranking	1968+	non-compensation, discordance, veto thresholds	generic critical-criterion veto is old prior art
Reject option / selective prediction	1970+	abstention / withhold decision	generic refusal under uncertainty is old prior art
Simplex runtime assurance	1998+	runtime monitor, verified fallback, safety switching	generic external assurance envelope predates Zoran
W3C PROV-O	2013	interoperable machine-readable provenance	generic ProofChain/provenance function predates Zoran
Monitor-based RTA for LTL	2019	future-trajectory monitoring; bad-prefix detection; safe control	temporal/future-state assurance predates Zoran
Distributed Simplex Architecture	2020	distributed multi-agent runtime assurance	multi-agent assurance predates Zoran
Dynamic assurance cases / NASA	2023–2024	runtime quantitative evidence, formal requirements, monitors, evolving assurance cases	joins temporal monitoring with traceable assurance evidence before Zoran
Zoran fixed conjunction	Nov 2025 onward	all six under Zoran coherence/admissibility semantics	exact one-to-one earlier implementation NOT CERTIFIED; world-first NOT ESTABLISHED

Pass-9 conclusion — The novelty space becomes narrower, not broader. Every major function has older prior art, and several pre-2025 assurance architectures already combine multiple functions. The bounded search still did not certify one source implementing the exact six-term conjunction under the same semantics. That negative search result is insufficient for a world-first claim and is retained as OPEN / NOT ESTABLISHED.

Key prior-art anchors: Sha et al. Simplex lineage (1998); W3C PROV-O Recommendation (30 Apr 2013); Abate, Feron & Coogan, Monitor-Based Runtime Assurance for Temporal Logic Specifications (arXiv:1908.03284, 2019); Mehmood et al., A Distributed Simplex Architecture for Multi-Agent Systems (arXiv:2012.10153, 2020; Journal of Systems Architecture 134, 2023); NASA Dynamic Assurance of Autonomous Systems through Ground Control Software (2024).

67. Metadata and licence authority gate — Pass 9

Record	Evidence now available	Pass-9 verdict	Scholar/reuse action
18526755	Zoran Atlas currently labels the DOI “Tenseur d’Amari-Chentsov et saturation MCP”; public social posts also use the same DOI for “Loi de cohérence phénoménale — démonstration complète par applications”.	CONFLICT PUBLICLY CONFIRMED; AUTHORITY NOT RECONCILED	BLOCK as canonical Scholar anchor until Zenodo/DataCite authority is verified and mirror/citations are corrected.
18499943	Pass-8 authoritative check: Zenodo Rights field = CC BY 4.0; embedded document also states Creative-Ethic BY/BY-PRO conditions.	METADATA/TEXT LICENCE CONFLICT	Treat repository metadata and internal licence wording as inconsistent; require corrected version or explicit licence clarification before reuse claims.
ORCID	0009-0004-5562-7385 supplied as author identifier for final edition.	AVAILABLE	Ensure exact author name, DOI titles and dates match ORCID/DataCite/Zenodo before final submission.

Indexing rule — Google Scholar metadata cannot repair a source-identity contradiction. The final landing page must mirror the authoritative DOI metadata rather than invent an internally preferred title/date. If authority cannot be resolved by Pass 10, the conflicted record remains cited as a disputed cross-reference rather than a canonical anchor.

68. Pre-publication Scholar readiness matrix after Pass 9

Gate	Status	Blocking?
Six-language title / localized summaries	PASS	No
Canonical English citation identity for this atlas	PASS (working edition)	No
Equation/prior-art attribution ledger	PASS_BORNÉ	No, with bounded-search disclaimer
Formal non-equivalence / transformation certificates	PASS	No
Executable assembly ablation	PASS 6/6 synthetic audit tests	No
First preregistered empirical benchmark	BLOCKED / NON_MESURÉ	Yes for empirical-performance claims
π/μ natural-language executable	ABSENT PUBLICLY	Yes for robustness-performance claims
18526755 authoritative identity	UNRESOLVED	Yes for canonical citation use
18499943 licence consistency	UNRESOLVED	Yes for unambiguous reuse statement
Final PDF/HTML/hreflang/Scholar tags/checksums	PASS 10 task	Yes for publication package

69. Pass 9 conclusions

- PREREGISTRATION ACHIEVED — A complete C-MAPSS FD001 proxy map, split, preprocessing, comparator and falsification rule were frozen and SHA-512 sealed before outcome-value inspection.
- CONFIRMATORY METRICS NOT FABRICATED — Complete benchmark bytes could not be acquired into the current execution runtime. Because the frozen protocol requires all held-out engines 51–100, the correct result is BLOCKED / NON_MESURÉ.
- EXECUTABLE ABLATION ACHIEVED — 6/6 synthetic unit tests pass and mechanically reproduce the component-removal effects specified in Pass 8. The harness is new audit code, not historical Zoran evidence.
- π/μ STATUS CLOSED PUBLICLY — the connected DOI 18500363 surface is a specification/test-plan package, not an executable natural-language evaluator. Its robustness rates remain NON_MESURÉ.
- ASSEMBLY PRIORITY NARROWED AGAIN — Simplex, PROV-O, temporal runtime assurance, distributed assurance, dynamic assurance cases, selective prediction and ELECTRE cover the major functions before Zoran. No exact full antecedent is certified here, but world-first remains NOT ESTABLISHED.
- PUBLICATION DEBTS REMAIN REAL — 18526755 identity and 18499943 licence consistency remain blocking metadata issues; neither is silently normalized in this atlas.
- PASS 9 DOES NOT CERTIFY $S > 9$ — document-level β , $\Delta\Phi$, T and σ are still not independently calibrated audit observables.

70. Pass 9 sources and audit artefacts

- NASA C-MAPSS Turbofan Engine Degradation Simulation Data Set; public FD001 description and original train_FD001 public mirrors. Original citation: Saxena, Goebel, Simon & Eklund, PHM08 (2008).
- Hugging Face mirror: kemhug11/nasa-cmapss-rul, CC0-1.0 dataset card; FD001 documented as 100 train / 100 test, one operating condition, one HPC fault; train_FD001.csv contains precomputed RUL.
- Zoran public corpus DOI 10.5281/zenodo.18500363: README.md, axioms.md, metadata.json, tests.md, white_paper.md.
- W3C. PROV-O: The PROV Ontology. W3C Recommendation, 30 April 2013.
- Abate, M., Feron, E. & Coogan, S. Monitor-Based Runtime Assurance for Temporal Logic Specifications. arXiv:1908.03284 (2019).
- Mehmood, U. et al. A Distributed Simplex Architecture for Multi-Agent Systems. arXiv:2012.10153 (2020); Journal of Systems Architecture 134, 102784 (2023).
- NASA Ames: Dynamic Assurance of Autonomous Systems through Ground Control Software (SciTech 2024).
- Zoran Atlas public page inspected 26 Aug 2026: 18526755 listed as “Tenseur d’Amari-Chentsov et saturation MCP”.
- Pass-9 audit files: pass9_prereg_proxy_cmapss_fd001.json; pass9_cmapss_access_certificate.json; pass9_pi_mu_closure.json; pass9_executable_assembly_ablation.py/results.json; pass9_prior_art_fixed_conjunction.json; pass9_audit_manifest_sha512.json.

71. Work carried to Pass 10/10 — final publication gate

- Execute the already sealed C-MAPSS FD001 protocol only if the complete public training file is available as executable bytes; otherwise preserve NON_MESURÉ in the final edition without substitution.
- Resolve DOI 18526755 from Zenodo/DataCite authority and either correct the Zoran mirror/citations or mark the conflicting identity permanently in the final bibliography.
- Reconcile DOI 18499943 licence metadata and embedded licence wording, or explicitly state that reuse rights are ambiguous pending author/depositor clarification.
- Freeze final claims language: CLOSED, VERIFIED, REPRODUCED, PASS_BORNÉ, OPEN, NON_MESURÉ; remove every sentence that exceeds its evidence class.
- Normalize references, dates, titles, DOI links, ORCID, author form, figure/table labels and mathematical notation across the full document.

- Build final Google/Scholar package: stable PDF, canonical HTML landing page, six hreflang pages, citation_* meta tags, JSON-LD, BibTeX/CFF, sitemap, checksums and machine-readable audit manifest.
- Run full-page visual QA, accessibility audit, metadata/privacy audit and final SHA-512 seal before release.

Working canonical gauge retained: $S = (\beta \times \Delta\Phi) / (T \times \sigma \times 1)$. The $\times 1$ factor is mathematically neutral. Pass 9 does not assign a document-level numeric S because the audit operands are not independently calibrated measurements.