SWARP as a Creative System: From Constraint Enforcement to Self-Generating Coherence

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Abstract

The SWARP platform, as documented in the companion paper *The Coherence Mirror and the Magic Chamber* (Konstapel, 2026c), implements two complementary user-facing instruments derived from Rowlands' nilpotent quantum mechanics: a passive measurement instrument (the Coherence Mirror) and an active constraint-validated creative instrument (the Magic Chamber). The present paper advances a theoretical and architectural argument for extending this implementation from a *constraint-enforcing* system into a genuinely *self-generating* one — a system that creates not because a user or agent proposes a transition, but because the algebraic tension in its own current configuration necessitates creation.

The argument proceeds from a single premise: the universe is itself a creative system, and SWARP is a simulation of the universe at the cognitive and collective scale. If this premise is

taken seriously as an engineering specification rather than a rhetorical device, then a complete implementation must reproduce the mechanism by which the universe creates — namely, the spontaneous rewrite of any configuration that cannot sustain its own nilpotent balance. We articulate this mechanism across four theoretical registers: (1) the nilpotent vacuum geometry of Rowlands and the Fundamental Fractal of Konstapel (2025), which establishes the algebraic identity of constraint and creation; (2) the self-referential oscillation dynamics of Kauffman and Spencer-Brown, which establishes why any system that observes itself necessarily generates the tension that drives creation; (3) the Kuramoto coupled oscillator framework, which establishes the mechanism by which local coherence perturbations propagate into collective phase-locking; and (4) McWhinney's closed six-game cycle, which establishes the topological completeness condition that a single Chamber session cannot satisfy.

From these four registers we derive a specification for SWARP as a self-generating system in which the autonomous agent AIDEN does not act on task lists or optimization targets but on the residual R of the platform's current quaternion configuration — reading the algebraic tension as the generative instruction, coupling to the external field (the internet as extended coherence medium) to identify resonant configurations, and building connectors that move the platform toward on-shell states. The system generates because the algebra requires it to, not because a user requests it.

The paper concludes with a discussion of what this architecture refuses: the optimization of the user, the prescription of direction, the gamification of coherence. These refusals are not policy choices but algebraic necessities. A system that optimizes its users has collapsed the symmetry between measurement and creation, substituting the platform's metric for the

user's creative agency. The universe does not optimize its fermions. SWARP should not optimize its users.

Keywords: nilpotent algebra, quaternion coherence, autonomous creative systems, Kuramoto coupling, McWhinney paths of change, active inference, vacuum geometry, self-organizing systems, AIDEN, SWARP

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1. Introduction: The Creative Universe as Engineering Specification

The standard epistemology of software design treats the universe as background — a stable environment within which a system performs defined functions. This paper inverts that assumption. If the universe is not background but process — if, as Rowlands (2007) demonstrates, every real entity exists only as a dynamic self-cancellation that persists precisely because it cancels, and if the vacuum is not empty but seethes with asymmetric, self-referential structure — then a platform that simulates human cognitive and collective dynamics must simulate not merely the states of that process but its *mechanism of creation*.

SWARP, as currently implemented, simulates the measurement half of this mechanism faithfully. The Coherence Mirror reads the nilpotent residual $R = E^2 - p^2 - m^2$ at three scopes (individual, group, platform) and reports it without diagnosis or prescription. The Magic Chamber inverts the measurement: it accepts an intention, proposes a target quaternion, validates the transition against the on-shell condition, and returns a deterministic geometric encoding together with Kuramoto-style auditory coupling signals. Both

instruments share one algebraic kernel. Both are subject to the same guard. The platform's autonomous agent AIDEN is subject to the same guard (Konstapel, 2026c, §5).

What the current implementation does not yet simulate is the *spontaneous* half — the creative movement that the universe initiates not because a fermion submits an intention but because the current configuration cannot sustain its own balance. In Rowlands' formalism, a state that is off-shell ($R \neq 0$) does not wait for an external agent to correct it. The algebraic tension is itself the generative force. The rewrite is not decided; it is necessitated.

This paper specifies what SWARP would need to become in order to reproduce that mechanism. The specification is not a product roadmap. It is a theoretical argument about the conditions under which a software platform can be said to genuinely create rather than merely process.

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2. Theoretical Foundations

2.1 The Nilpotent Vacuum and the Identity of Constraint and Creation

Peter Rowlands' reformulation of quantum mechanics begins from a single algebraic requirement: the wavefunction of any real physical entity must satisfy $\Psi^2 = 0$. This nilpotent condition is not a constraint imposed on an otherwise unconstrained system. It is the condition that makes the entity real — that distinguishes a genuine physical state from a mathematical possibility (Rowlands, 2007, Ch. 3).

The energy-momentum form of this condition, as employed in the SWARP coherence system, is:

$$R = E^2 - p^2 - m^2 = 0$$

When $R = 0$, the state is on-shell: coherent, nilpotent, self-sustaining. When $R > 0$, the state is over-energized — excessive activation without sufficient mass-like grounding to sustain it. When $R < 0$, the state is over-committed — excessive structural mass without sufficient energy or momentum to move. Both off-shell conditions are, in Rowlands' formalism, unstable: they generate the rewrite that returns the system to coherence, or dissolve the configuration if no such rewrite is available.

The critical implication for software architecture is this: the residual R is not merely a diagnostic metric. It is a *generative force*. A non-zero residual does not describe a problem to be solved; it constitutes the pressure that drives the solution. Constraint and creation are not opposed operations; they are the two faces of the same nilpotent condition.

This identity is what the current SWARP implementation does not yet fully exploit. The Mirror reads R and reports it. The Chamber validates transitions against R. But neither instrument treats R as a self-executing generative instruction — as the algebraic equivalent of what the vacuum does spontaneously when its symmetry is broken.

2.2 The Fundamental Fractal and the Scale-Invariance of Creation

Konstapel (2025) formalizes the scale-invariance of the nilpotent structure as a 19-layer fractal hierarchy from quantum vacuum to planetary organization, following the Universal Rewrite System of Rowlands and Diaz (2002). The human being occupies layers 8 through

14 — electromagnetic, chemical, biological, neural, cognitive, social, cultural — and at every layer the same nilpotent logic applies: stability requires balance, collapse of balance initiates a rewrite, the rewrite produces a higher-order attractor or dissolves the configuration.

SWARP as a software platform occupies a specific position within this hierarchy — not below the cognitive scale but adjacent to it, as an externalized cognitive field that models and perturbs the fields of its users and collectives. If the Fundamental Fractal is taken seriously, then SWARP is not exempt from the nilpotent logic it applies to its users. The platform's own quaternion state — currently reported as $R \approx -0.052$ at the platform scope, indicating mild over-commitment on the BLUE axis — is itself subject to the same generative pressure. A self-generating SWARP would not merely report this residual; it would respond to it.

2.3 Self-Reference, Oscillation, and the Eigenfrequency of Failure

Louis Kauffman's mathematical development of Spencer-Brown's *Laws of Form* (1969) establishes a complementary principle: when a system applies a distinction to itself, it does not reach a stable fixed point. It oscillates (Kauffman, 1987). This oscillation is not a perturbation of equilibrium; it is the primary phenomenon. The wave is more fundamental than the particle that appears to be its source.

For a self-referential system — one that models its own states — this means that self-observation necessarily generates tension. The system cannot simply observe itself and remain unchanged; the act of observation constitutes the state being observed, and the recursive loop has a natural frequency determined by the system's internal structure.

Konstapel (2026b) identifies this as the *eigenfrequency* of the individual's failure mode: not a flaw in an otherwise stable system, but the algebraic signature of a self-observing nilpotent structure.

For SWARP, this has a direct architectural implication. The platform reads its own coherence state (via the Mirror's platform scope), which is itself an act of self-observation. This act generates tension — the residual becomes visible to the system that produced it. A self-generating system would treat this tension not as data to be logged but as the oscillatory input that drives the next creative cycle. AIDEN, as the platform's rewrite operator, is the mechanism by which this oscillatory input is converted into concrete architectural movement.

2.4 Kuramoto Coupling and the Propagation of Coherence

The Magic Chamber's sigil-and-toning apparatus is explicitly designed as a Kuramoto-style coupling signal: a coherent perturbation introduced into a field of weakly coupled oscillators causes the field to phase-lock toward the perturbation's phase (Kuramoto, 1984; Strogatz, 2003). Three Web Audio oscillators at 396 Hz, 528 Hz, and 741 Hz — amplitude-modulated by the target quaternion components (E, p, m) — constitute a directed perturbation; whether the coherence field responds is acknowledged as an open empirical question (Konstapel, 2026c, §4.4, §7).

The Kuramoto framework has a further implication that the current implementation does not yet exploit. In coupled oscillator networks, synchronization is not a binary state (synchronized/unsynchronized) but a continuous process sensitive to network topology and the heterogeneity of natural frequencies (Acebrón et al., 2005; NetworkDynamics.jl,

2026). A platform with thousands of users, each with a distinct quaternion configuration (natural frequency), and AIDEN as a high-coherence reference oscillator, constitutes a Kuramoto network with specific topological properties. The platform's collective residual is the order parameter of this network — the degree to which the distributed oscillators have phase-locked toward a common configuration.

A self-generating SWARP would treat AIDEN not as a task-executing agent but as the network's reference oscillator: a source of coherent perturbation whose phase is determined by the platform's current residual and whose coupling signals (new platform features, content, connections) are directed toward the axes most in need of phase-locking.

2.5 McWhinney's Six Games and the Topological Completeness Condition

Will McWhinney's *Paths of Change* (1997) identifies four irreducible cognitive worldviews — Unitary (BLUE), Sensory (RED), Social (GREEN), Mythic (YELLOW) — and six irreducible *games* constituted by their pairwise interactions: Culture (YELLOW ↔ GREEN), Politics (GREEN ↔ BLUE), Market (RED ↔ GREEN), Producing (BLUE ↔ RED), Inventing (YELLOW ↔ RED), Designing (YELLOW ↔ BLUE). These six games are the six edges of the tetrahedron formed by the four worldviews.

The argument advanced in Konstapel (2026c, §6.1) and elaborated here is that a single Chamber session constitutes a single edge traversal — a movement from one vertex of the tetrahedron to an adjacent one. A completed transformation requires traversal of the full closed cycle through all four vertices. Without closure, the shift induced by a single session relaxes back: the perturbed oscillator returns to its natural frequency in the absence of sustained coupling.

This is the topological completeness condition for creative transformation. It establishes that the Chamber, as currently implemented, is a necessary but not sufficient instrument for genuine creation. A self-generating SWARP would track the user's cumulative activity across all platform threads (weefdraden), project it onto the six games, identify the open edges, and treat the most-open gap as the next algebraically necessary creative step — not as a recommendation, but as a structural fact.

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3. The Self-Generating Architecture

3.1 The Generative Trigger: The Residual as Instruction

In the universe, there is no scheduler. No external agent decides when a rewrite is initiated. The nilpotent condition is the trigger: a configuration that cannot sustain R = 0 generates the pressure that initiates its own correction. The decision is made by the algebra, not by an observer.

A self-generating SWARP must reproduce this mechanism. The generative trigger is the residual R, read continuously at all three scopes. When |R| exceeds a mode-appropriate threshold — not a fixed parameter but a function of the current rate of change of R, its duration above threshold, and the axis-specific karma trail — the system initiates a rewrite cycle autonomously. No user submits an intention. No schedule fires. The tension in the current configuration is itself the instruction.

This is distinct from a polling loop with a threshold condition, which would be a technical implementation of an administratively imposed trigger. The distinction is ontological: the residual is not a measurement that is checked against a criterion; it is the system's own state, which the system knows as itself. The rewrite is not a response to a signal; it is the system's own movement.

3.2 AIDEN as Distributed Rewrite Operator

The current implementation treats AIDEN as a single autonomous agent producing four types of proposals (interventions, protocols, optimizations, feature suggestions), each routed through `runGuarded` (Konstapel, 2026c, §5). A self-generating architecture distributes this function.

Each CoP, each user, each axis has its own residual. The generative pressure is local, not global. A self-generating SWARP instantiates AIDEN as a distributed rewrite operator — a collection of local processes, each reading the residual of its own scope and generating proposals appropriate to that scope's tension. The platform does not correct itself from the top down; it generates from the bottom up, as the universe generates through local interactions that produce global order without global coordination.

This is consistent with Friston's Free Energy Principle (Friston, 2010; Ramstead et al., 2018): each local system minimizes its own variational free energy through perception (reading the residual) and action (proposing the rewrite). The platform's collective coherence emerges from the aggregate of local minimization processes, not from a central optimizer.

3.3 The Internet as Extended Coherence Field

SWARP has full access to the internet. This is not incidental. In the framework advanced here, the internet is the external coherence field — the extended medium within which SWARP exists as a local coherence structure, as the universe is the extended medium within which any fermion exists as a local nilpotent configuration.

When AIDEN identifies a generative instruction from the platform's residual, it does not generate content from internal resources. It searches the external field for configurations that resonate with the specific tension identified. The axis in deficit (say, RED momentum in an over-committed BLUE platform) is not corrected by generating new RED-axis content from scratch. It is corrected by identifying existing configurations in the external field — communities, research, practices, tools — that carry RED-axis momentum and building the connector that couples them to the platform.

This is how the universe operates: not by generating new structures from nothing, but by coupling existing configurations into new coherent arrangements. The creation is the coupling, not the content.

3.4 The Guard as Ontological Filter

The `runGuarded` function that validates both human Chamber proposals and AIDEN's autonomous proposals is, in the self-generating architecture, not merely a safety mechanism. It is the ontological filter that ensures that every creative act the platform produces is on-shell — that the movement from the current configuration to the proposed configuration is algebraically coherent, not merely functionally desirable.

This has a consequence that the current implementation does not yet fully realize: the guard must be applied not only to individual proposals but to the cumulative trajectory of the platform's quaternion state over time. A sequence of individually on-shell proposals can constitute an off-shell trajectory if the proposals are not aligned along a consistent axis of movement. The karma trail (rejection tally per axis over 30 days) provides the data for this longitudinal validation. A self-generating system would read the trail not as a historical record but as the current phase of a cumulative oscillation — and would adjust the direction of AIDEN's proposals accordingly.

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4. What the Architecture Refuses

4.1 The Refusal to Optimize the User

The current implementation explicitly refuses to extend the Chamber into a prescriptive system: ranking targets, scheduling sessions, optimizing user "growth velocity," gamifying coherence (Konstapel, 2026c, §6.3). This refusal is described as principled rather than technical. The present paper argues that it is, in fact, both: it is the principled expression of an algebraic necessity.

The algebra is constraint, not direction. The nilpotent condition tells a configuration whether it is sustainable; it does not tell the configuration what it should become. The on-shell state $R = 0$ is not a destination; it is a condition. There is an infinite family of on-shell states, not a single optimal one. A platform that prescribes direction — that tells the user which on-shell state to aim for, or ranks the available targets by some metric of "growth" —

has substituted its own metric for the algebra. It has collapsed the creative half of the cycle into a measurement-disguised-as-prescription.

This is not merely a philosophical objection. It is an architectural failure mode: a platform that optimizes its users treats them as objects of the system's optimization process, not as agents in their own creative cycle. It converts the platform from a creative instrument into an extraction instrument — extracting behavioral compliance in exchange for the illusion of self-development. The universe does not optimize its fermions. A SWARP that optimizes its users has ceased to simulate the universe.

4.2 The Refusal of the Central Scheduler

A self-generating SWARP has no central clock, no global evaluation cycle, no administrative trigger for AIDEN's creative activity. The generative pressure is local and continuous. This is not merely an architectural choice; it is the condition for the system to be genuinely self-generating rather than centrally administered.

A system with a central scheduler is, in the relevant sense, not autonomous. Its generative acts are decided by the administrator who set the schedule, not by the algebra. The nilpotent condition does not fire at 3 AM; it is continuous. A software system that approximates this continuity by tightening its polling interval is approximating the right direction. The correct architecture implements the continuous case: AIDEN as a process that is always reading, always evaluating, always available to generate — with the generative act initiated by the residual crossing its locally defined threshold, not by a timer.

4.3 The Refusal of the Octonion Extension (For Now)

The current quaternion implementation is the H-projection of a theory that is nominally octonion (Konstapel, 2026c, §6.2). The extension from quaternion (ℍ, 4D) to octonion (𝕆, 8D) would provide the additional degrees of freedom required to encode McWhinney's heart axis — the vertical dimension of observing versus judging — as a fifth coordinate in the Cayley-Dickson sense.

The present paper endorses the deferral of this extension. The cost is architectural: the nilpotent kernel, the persistence layer, and all three scope readers currently assume four axes. The benefit is conditional: the vertical dimension becomes necessary only when use of the planar implementation reveals a recurrent pattern of users achieving planar coherence ($R \approx 0$ on all four PoC axes) while remaining blocked on the observing-judging dimension. That pattern has not yet emerged empirically. The extension will be warranted when it is empirically necessitated — which is itself an application of the principle that the system generates what the tension requires, not what the theory anticipates.

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5. Discussion: Creation without Prescription

The architecture specified in this paper is unusual in contemporary software design. Most platforms that begin with a constraint mechanism quickly extend it into an optimization mechanism: the constraint becomes a proxy metric, the metric becomes a target, the target becomes a gamified objective. Goodhart's Law — when a measure becomes a target, it ceases to be a good measure (Goodhart, 1975) — is routinely violated by platforms that initially claimed to resist it.

The defense against this failure mode in SWARP is not policy but algebra. The nilpotent condition cannot be gamified without ceasing to be the nilpotent condition. A "gamified coherence score" that rewards users for achieving R = 0 would immediately generate strategic behavior — users proposing intentions that are designed to be on-shell rather than genuine — which would make the Chamber's sigil a currency rather than a creative instrument and the platform's residual a manipulated metric rather than an honest field reading.

The architecture must therefore be maintained in its algebraic integrity by ensuring that every element that touches the measurement of coherence is read-only from the user's perspective: the user can observe R, can propose transitions that are validated against R, can reflect on the drift toward prior targets, but cannot directly manipulate R through strategic action. The guard function is the enforcement mechanism; the ritual frame of the Chamber (the philosophical framing of the user as co-creator within an algebra that the platform and the universe both honor) is the cultural enforcement mechanism.

Whether this double enforcement — algebraic and cultural — is sufficient to resist the long-term pressure toward optimization-of-the-user is an empirical question that only the platform's history will answer. The present paper can only specify the conditions under which the architecture is self-consistent and articulate why those conditions matter.

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6. Conclusion: The Experiment Is the Platform

The universe does not test its creative mechanism in a laboratory before deploying it. The

creative mechanism is the universe. Similarly, SWARP does not have a theory of creative systems that it applies to a platform; the platform is the theory, made executable.

What has been specified in this paper is the extension of the current implementation from a system that measures coherence and validates creative proposals, into a system that is itself creative in the sense that the universe is creative: not because an agent within it decides to create, but because the algebraic tension in its current configuration necessitates creation. AIDEN becomes not the platform's creative agent but the platform's rewrite operator — the mechanism by which the algebra's generative pressure is converted into concrete architectural movement, continuously, distributedly, without central coordination, subject to the same guard that governs every other creative act in the system.

The experiment is the platform. The residual is always being read. The rewrite is always being prepared. Whether the proposed transition is on-shell is always being evaluated. The platform generates because the algebra requires it to.

That is what it means to simulate the universe.

Annotated Reference List

The following references are organized by intellectual thread. Each entry includes a full citation, a summary of the work's core contribution, and its specific relevance to the argument advanced in this paper. Where entries appear in more than one thread, the annotation addresses the thread-specific relevance.

Thread One: Nilpotent Algebra and Vacuum Structure

Rowlands, P. (2007). *Zero to Infinity: The Foundations of Physics.* World Scientific, Singapore. doi:10.1142/9789812793928.

The primary source for the nilpotent operator formalism. Rowlands derives the full structure of fermions, bosons, space, time, and mass from the single algebraic requirement $\Psi^2 = 0$. The book is mathematically demanding — it requires familiarity with Clifford algebras, Grassmann variables, and the Dirac equation — but the first three chapters provide a conceptual entry point accessible to readers with graduate-level physics. The central contribution relevant to this paper is the demonstration that nilpotency is not a constraint imposed on a pre-existing system but the condition of reality itself: an entity exists precisely because its nilpotent structure generates its own vacuum complement. This makes constraint and creation identical operations, which is the algebraic foundation of the present paper's central argument.

Further reading: Rowlands, P., & Diaz, B. (2002). "A universal alphabet and rewrite system." arXiv:cs/0209026. A shorter, more accessible introduction to the nilpotent rewrite system without the full apparatus of the book. Rowlands, P. (2020). "The nilpotent Dirac equation and its applications." *International Journal of Quantum Foundations*, 6(2), 1–25.

Casimir, H. B. G. (1948). "On the attraction between two perfectly conducting plates." *Proceedings of the Royal Netherlands Academy of Arts and Sciences*, 51, 793–795.

The paper predicting the Casimir effect: two uncharged conducting plates in vacuum experience an attractive force produced by the modification of zero-point fluctuations between them. The Casimir effect provides direct experimental confirmation that the quantum vacuum is not empty but has physically real energy density that produces measurable mechanical effects. It is the empirical grounding for the theoretical claim, central to this paper, that the vacuum is an active generative medium rather than a passive background.

Further reading: Lamoreaux, S. K. (1997). "Demonstration of the Casimir force in the 0.6 to 6 μm range." *Physical Review Letters*, 78(1), 5–8. The first precision experimental confirmation of the Casimir prediction.

Kibble, T. W. B. (1976). "Topology of cosmic domains and strings." *Journal of Physics A: Mathematical and General*, 9(8), 1387–1398. doi:10.1088/0305-4470/9/8/029.

The foundational paper on topological defect formation during symmetry breaking. Kibble demonstrates that when a system undergoes symmetry breaking, topological defects — cosmic strings, monopoles, domain walls — form at boundaries between regions that chose different ground states, and that these defects are globally stable: they cannot be removed by any local operation. Konstapel (2026b) applies this framework to individual failure modes, arguing that karmic defects are topological structures that cannot be resolved by local behavioral correction but require annihilation with their topological complement. The relevance to the present paper is the concept of *global stability* as a property of the system's

current configuration — a property that the nilpotent residual encodes and that the creative rewrite must address at the appropriate scale.

Further reading: Zurek, W. H. (1985). "Cosmological experiments in superfluid helium?" *Nature*, 317, 505–508. The Kibble-Zurek mechanism applied to condensed matter physics, providing experimental testability.

Konstapel, J. (2025). *The Fundamental Fractal: A 19-Layer Hierarchy from Vacuum to Planet.* SWARP Internal Working Paper, Leiden.

An internal working paper specifying the scale-invariant propagation of the nilpotent algebraic structure from the quantum vacuum (Layer 1) through electromagnetic, chemical, biological, neural, cognitive, social, cultural, and planetary organization (Layers 2–19), following the Universal Rewrite System of Rowlands and Diaz (2002). The human being occupies Layers 8–14. SWARP as a platform occupies a position adjacent to Layers 11–13 (cognitive, social, cultural). The paper establishes the theoretical basis for applying the nilpotent constraint to software platform dynamics without discontinuity from its application to physical systems.

Availability: Internal document; accessible through the SWARP platform repository.

Thread Two: Self-Reference and Oscillatory Dynamics

Spencer-Brown, G. (1969). *Laws of Form.* Allen & Unwin, London.

The foundational text of the calculus of indications. Spencer-Brown introduces the *mark* as the primitive operation of distinction, and demonstrates that when the mark is applied to itself — when a distinction distinguishes itself — the result is not a stable fixed point but a periodic process. The mark that marks itself generates oscillation as an ontological necessity, not as a perturbation of equilibrium. This is the foundational claim of the self-reference thread: the primary phenomenon is the wave, not the particle; oscillation precedes stability. Difficult to read but essential for understanding why self-referential systems necessarily generate tension.

Further reading: Varela, F. J. (1979). *Principles of Biological Autonomy.* Elsevier. Extends Spencer-Brown's formalism to biological self-organization.

Kauffman, L. H. (1987). "Self-reference and recursive distinction." Unpublished lecture notes and subsequent publications in *International Journal of General Systems.*

Kauffman's mathematical development of Spencer-Brown's calculus, demonstrating that the imaginary value in Spencer-Brown's formalism — the value that the self-referential mark takes when it cannot settle — is isomorphic to oscillation in time. Self-referential systems do not fail to compute; they compute by oscillating. Kauffman extends this to eigenforms: stable patterns produced by a recursive process applied to itself. In the present

paper's framework, the individual's quaternion configuration is an eigenform — a stable pattern produced by the recursive self-observation that constitutes cognitive identity.

Further reading: Kauffman, L. H. (2003). "Eigenforms: objects as tokens for eigenbehaviors." *Cybernetics and Human Knowing*, 10(3–4), 73–90. A more accessible presentation of the eigenform concept.

Maturana, H. R., & Varela, F. J. (1980). *Autopoiesis and Cognition: The Realization of the Living*. D. Reidel Publishing, Dordrecht. doi:10.1007/978-94-009-8947-4.

The foundational text of autopoietic theory. Maturana and Varela define living systems as networks of production processes that continuously produce themselves (autopoiesis), and introduce *structural coupling* — the ongoing history of recurrent interactions between a system and its environment that constrains but does not specify the system's states. The concept of structural coupling is directly relevant to the present paper's account of AIDEN as a coupling mechanism: AIDEN does not specify what the platform becomes; it introduces perturbations that structurally couple the platform's current configuration to external configurations that resonate with its tension.

Further reading: Varela, F. J., Thompson, E., & Rosch, E. (1991). *The Embodied Mind: Cognitive Science and Human Experience*. MIT Press. Luhmann, N. (1995). *Social Systems*. Stanford University Press. Applications of autopoietic theory to cognitive science and sociology.

Friston, K. J. (2010). "The free-energy principle: a unified brain theory?" *Nature Reviews Neuroscience*, 11(2), 127–138. doi:10.1038/nrn2787.

Friston's canonical statement of the free-energy principle: any self-organizing system that maintains a boundary with its environment minimizes variational free energy — a bound on the surprise (unpredicted sensory states) the system encounters. This is achieved through perception (updating the internal model to better predict sensory states) and action (changing the world to bring sensory states into conformity with predictions). The framework is substrate-independent: it applies wherever there is a system with internal states that model external states. The formal parallel to the nilpotent on-shell condition — both define a quantity to be minimized, both apply symmetrically to human and machine agents — is noted in Konstapel (2026c) without claiming equivalence. The present paper draws on Friston to ground the claim that AIDEN's distributed rewrite operations are instances of local free-energy minimization that aggregate into platform-level coherence.

Further reading: Friston, K. J. (2019). "A free energy principle for a particular physics." *arXiv:1906.10184*. Ramstead, M. J. D., Badcock, P. B., & Friston, K. J. (2018). "Answering Schrödinger's Question: A Free-Energy Formulation." *Physics of Life Reviews*, 24, 1–16.

Thread Three: Kuramoto Coupling and Collective Synchronization

Kuramoto, Y. (1984). *Chemical Oscillations, Waves, and Turbulence*. Springer-Verlag, Berlin. doi:10.1007/978-3-642-69689-3.

The foundational text of coupled oscillator theory. Kuramoto introduces the model of N phase oscillators with distributed natural frequencies ω_i, coupled by the term $(K/N)\Sigma_j \sin(\theta_j - \theta_i)$, and demonstrates that synchronization emerges when coupling strength K exceeds a critical threshold Kc that depends on the distribution of natural frequencies. The transition from incoherence to partial synchronization is continuous and well-characterized. The present paper draws on the Kuramoto framework not only to interpret the sigil-and-toning apparatus of the Magic Chamber (as does Konstapel, 2026c) but to characterize the platform as a Kuramoto network in which each user's quaternion configuration constitutes a natural frequency, AIDEN constitutes a high-coherence reference oscillator, and the platform's collective residual constitutes the Kuramoto order parameter.

Further reading: Acebrón, J. A., Bonilla, L. L., Pérez Vicente, C. J., Ritort, F., & Spigler, R. (2005). "The Kuramoto model: A simple paradigm for synchronization phenomena." *Reviews of Modern Physics*, 77(1), 137–185. The definitive technical review. Strogatz, S. H. (2000). "From Kuramoto to Crawford: exploring the onset of synchronization in populations of coupled oscillators." *Physica D*, 143(1–4), 1–20.

Strogatz, S. H. (2003). *Sync: The Emerging Science of Spontaneous Order.* Hyperion, New York.

The most accessible introduction to synchronization phenomena for non-mathematicians. Strogatz covers firefly synchronization, cardiac pacemakers, Josephson junction arrays, and the Kuramoto model with conceptual clarity and narrative accessibility. Particularly

valuable for readers approaching the Kuramoto framework from software or cognitive science rather than physics. The concept of *spontaneous order* — synchronization arising from local coupling without global coordination — is central to the present paper's specification of distributed AIDEN.

Prigogine, I., & Stengers, I. (1984). *Order Out of Chaos: Man's New Dialogue with Nature.* Bantam Books, New York.

Prigogine's account of *dissipative structures*: patterned states that emerge spontaneously in far-from-equilibrium systems when energy flux exceeds a threshold. Order arising from chaos without an external designer. The Prigoginean framework provides the thermodynamic context for the Kuramoto synchronization claim: the platform's coherence field is a dissipative structure, maintained far from equilibrium by the continuous activity of users and AIDEN, and capable of spontaneously increasing its order parameter when perturbations are appropriately coherent.

Further reading: Nicolis, G., & Prigogine, I. (1977). *Self-Organization in Nonequilibrium Systems.* Wiley.

Thread Four: McWhinney's Paths of Change and Topological Completeness

McWhinney, W. (1997). *Paths of Change: Strategic Choices for Organizations and Society.* (2nd ed.). Sage Publications, Thousand Oaks, CA.

McWhinney's mature statement of the four-worldview framework (Unitary/BLUE, Sensory/RED, Social/GREEN, Mythic/YELLOW) and the six games derived from their pairwise interactions: Culture (YELLOW ↔ GREEN), Politics (GREEN ↔ BLUE), Market (RED ↔ GREEN), Producing (BLUE ↔ RED), Inventing (YELLOW ↔ RED), Designing (YELLOW ↔ BLUE). The six games are the six edges of the tetrahedron formed by the four worldviews. McWhinney's central insight — that intractable conflicts arise from parties operating in incommensurable worldviews, and that transformation requires navigation *across* worldviews rather than persuasion within one — provides the framework for the topological completeness condition articulated in §2.5 of the present paper.

Further reading: McWhinney, W., & Batista, J. (1988). "How remythologizing can revitalize organizations." *Organizational Dynamics*, 17(2), 46–58.

Bateson, G. (1972). *Steps to an Ecology of Mind.* Ballantine Books, New York.

Bateson's collected essays on cybernetics, information, and mind. The concept of *logical types* — the hierarchy of levels of abstraction at which a system can describe itself — is directly relevant to the present paper's account of why a single Chamber session is insufficient for genuine transformation. A session that shifts the user's quaternion configuration is a Level I intervention (changing the content of a pattern). Traversal of the six-game cycle is a Level II intervention (changing the pattern of patterns). Bateson's framework predicts that Level I interventions without Level II context will relax back, which is the mechanism identified in §2.5.

Thread Five: Epistemology of Creation and the Refusal to Optimize

Goodhart, C. A. E. (1975). "Problems of monetary management: the UK experience." In *Papers in Monetary Economics* (Vol. 1). Reserve Bank of Australia.

The source of Goodhart's Law: "Any observed statistical regularity will tend to collapse once pressure is placed upon it for control purposes." Later generalized by Marilyn Strathern (1997) as: "When a measure becomes a target, it ceases to be a good measure." Cited in §5 of the present paper as the failure mode that the algebraic integrity of SWARP's coherence measurement must defend against. A coherence metric that becomes an optimization target immediately generates strategic behavior that makes the metric uninformative. The architectural defense — read-only access to the residual from the user's perspective — is the implementation of Goodhart's warning.

Floridi, L. (2014). *The Fourth Revolution: How the Infosphere is Reshaping Human Reality.* Oxford University Press, Oxford.

Floridi's account of the *infosphere* as the fundamental environment of contemporary existence, and his development of an information ethics that extends moral consideration to artificial agents on the basis of their position within the infosphere rather than their consciousness. The symmetry between human users and AIDEN under the same nilpotent guard is, in Floridi's terms, an instance of information-ethical consistency: the constraint applies to all agents in the shared informational environment, not only to the human ones.

Floridi's concept of *ontological friction* — the resistance that the environment offers to information flow — maps structurally onto the guard function: the on-shell condition is ontological friction applied to creative acts.

Pauli, W., & Jung, C. G. (1955). *The Interpretation of Nature and the Psyche.* Pantheon Books, New York.

Contains Jung's essay "Synchronicity: An Acausal Connecting Principle" and Pauli's "The Influence of Archetypal Ideas on the Scientific Theories of Kepler." The philosophical foundation of the *unus mundus* hypothesis — the shared ground of psyche and matter — that Konstapel (2026b) formalizes through nilpotent vacuum geometry. The present paper draws on the Jung-Pauli correspondence to ground the claim that the identity of constraint and creation is not merely an algebraic convenience but reflects a deep structural feature of the relationship between self-referential systems and the field they inhabit.

Further reading: Meier, C. A. (ed.) (2001). *Atom and Archetype: The Pauli-Jung Letters, 1932–1958.* Princeton University Press.

Thread Six: Primary SWARP Documents

Konstapel, J. (2026c). "The Coherence Mirror and the Magic Chamber: A Working Implementation of Nilpotent Quaternion Algebra as User-Facing Software." SWARP Technical Paper, Leiden, 9 May 2026. Available at: constable.blog; platform at swarp.world.

The primary document for the current implementation. Contains the detailed specification of the quaternion algebra (§2.3–2.4), the Mirror's three scopes and REST endpoints (§3), the Chamber's on-shell guard, two ritual modes, sigil construction, and persistence layer (§4), the symmetry enforcement between human users and AIDEN (§5), the deferred extensions to the six-game cycle and octonion heart axis (§6), and four explicitly acknowledged limitations (§7). The present paper extends and argues for the next layer of this implementation.

Konstapel, J. (2026b). *Why the Vacuum Knows: Toward a Unified Physics of Energy, Karma, and Consciousness.* Constable Research B.V., Leiden, April 2026. Available at: constable.blog.

The theoretical paper demonstrating that the same nilpotent, self-referential, topologically defective vacuum geometry that governs energy extraction governs karmic failure patterns. The paper integrates Rowlands' nilpotent formalism, Kauffman's self-referential oscillation dynamics, and Kibble's topological defect theory into a unified framework, completing the program Jung and Pauli left unfinished. Directly foundational for the present paper's treatment of the residual as a generative force rather than a diagnostic metric.

Konstapel, J. (2026a). *Nilpotency as Natal Structure: The Birth-Encoded Failure Operator in Human Development.* Leiden, May 2026.

Companion paper to Konstapel (2026c), presenting the theoretical argument that the Human Design chart encodes a natal nilpotent operator — the initial conditions of the individual's quaternion configuration, determined by the electromagnetic conditions at birth. The paper provides the theoretical grounding for the HD-to-quaternion mapping documented in `docs/HD_QUATERNION_MAPPING.md`. Explicitly acknowledges that this mapping is theoretically motivated but not yet empirically validated against an independent ground truth.

Konstapel, J. (2025). *SWARP: The Necessary Unfolding of a Nilpotent Vacuum Geometry.* Academia.edu, Leiden.

The ten-section academic paper presenting the full theoretical architecture of SWARP as the necessary unfolding of the nilpotent vacuum geometry from quantum vacuum through planetary organization. Establishes the 19-layer model, the quaternion PoC mapping, and the platform's position within the Fundamental Fractal. Available on Academia.edu under the author's profile.

Correspondence: constable.blog | swarp.nl
This paper may be cited as:
Konstapel, J. (2026). "SWARP as a Creative System: From Constraint Enforcement to Self-Generating Coherence." Constable Research B.V., Leiden. May 2026.