The Current State of the Vacuum.Net Theory

History, Derivation, Consequences — the Thread of Three, the Applications, and the Next Step

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Capstone of the closure series: "The Comma in the Net", "The Comma in the Sky", "Why We Have a Lot of Time", and ""Speculative"".

Abstract

This essay describes the Vacuum.Net theory as it stands in September 2026: where it came from, what it derives, what follows from it, what runs on it, and what must happen next. The theory rederives existing physics from a single ground — one strand, no outside, one closure rule — and departs from the received picture at exactly one identified point, the interpretive step taken after the Michelson–Morley null result of 1887. From the strand follow the theory's two ladders: an address ladder that triples (the balanced trit) and a dimensional ladder that doubles (1–2–4–8, closed at eight by Hurwitz's theorem); from their incommensurability follows the quantization of closure depth on the continued-fraction convergents of $\log_2 3$, with the Pythagorean comma as the first famous residue; from the residue follows the two-layer law — address as frozen topology, tension as the only layer in which anything happens — and from the top rung follows the cosmology already published inside accepted physics as Rowlands' critical value $\Omega_\Lambda = 2/3$. A single thread runs through every level, and this essay names it explicitly: **the three**. The elementary symbol is three-valued; the address ladder multiplies by three; the growth law is the Bronze Mean recursion $b(n) = 3 \cdot b(n-1) + b(n-2)$ with ratio $\sigma_3 = (3+\sqrt{13})/2$; the exchange rate between the ladders is $\log_2 3$; the musical fifth that generates the comma is the ratio 3:2; the universe's energy books, at the critical value, split into thirds. The essay explains *why* the three returns: the theory has exactly two categorically distinct layers, and the three belongs to structure while the two belongs to process — every deep constant of the theory is an exchange rate between them, and the comma is the proven impossibility of ever converting one into the other without remainder. The essay closes with the working applications — the MAZE encoder live at 3.6 million receipted entries, the rhythm-loss instruments, the multi-layer early-warning system — and with the single calculation that now stands between the theory and its next state: the coarse-graining of the knot network, which must deliver the rung structure, the coupling 2π, and the dimension of stable closure in one derivation, with the MAZE depth jump $19 \to 65/41$ as the experiment that can kill the law while the calculation is still being sought. Every claim below carries its status: theorem, measurement, derivation, hypothesis, or open. Nothing is smoothed over.

0. The ground this essay stands on — read first

Nothing in this essay floats free of physics. The Vacuum.Net theory is a **rederivation of existing physics**, in the same sense in which Peter Rowlands rederived established physics from zero-totality and the nilpotent condition and recovered the Dirac formalism from it: a rewriting proves itself by landing on the accepted equations, and this one departs from the received picture at exactly one identified point. After the Michelson–Morley null result of 1887, two conclusions were drawn:

that the light-carrying medium does not exist, and — the deeper step — that what holds locally on Earth holds universally. Both steps are logic, not measurement. An instrument built of the medium cannot detect its own motion through the medium — every rod and clock contracts along with what it measures — so the null result is precisely what a medium theory *predicts*, not evidence against one; and the promotion of one local null measurement to a universal principle is an extrapolation the data never contained. The measured counter-fact now exists: the CMB dipole defines an observationally preferred rest frame through which the Earth moves at ~370 km/s — the drift the 1887 instrument could not see, measured a century later, used daily by the same cosmology that denies its significance in principle. And laboratory physics has demonstrated the mechanism (Volovik): excitations inside a medium obey an emergent, exact Lorentz symmetry with the medium's signal speed as limit, while the medium itself keeps a rest frame the excitations cannot internally detect — the 1887 situation, reproduced in a helium droplet, with the received inference visibly unsound there. Correct that single interpretive step — the medium exists; Lorentz symmetry is local and emergent, not universal — and everything below is a **consequence of current physics under a different reading of one experiment, not an addition to it**. Every load-bearing mathematical statement in this essay is a published theorem, cited by name; every physical anchor is a measurement; every hypothesis is labelled as one and carries a named death route. A reader who wishes to dismiss the essay must therefore dismiss a specific theorem, a specific measurement, or a specific labelled hypothesis — and each section states which of the three is on the table.

1. History

The theory has three tributaries, of unequal age.

The oldest is six decades of first-person work with the numerical and experiential structure that the theory now formalises — lived acquaintance with the patterns before there was a framework to state them in. In this programme, lived experience holds epistemological priority over theory: the framework exists to make the experience derivable, not the other way round.

The second tributary is the Liverpool line: Rowlands' nilpotent rewriting of physics from zero-totality (with Marcer's dual-space work adjoining it), which demonstrated two things this theory depends on — that a full rederivation of accepted physics from a single principle is possible and lands on the known equations, and that the cosmological end of such a rederivation was publishable inside mainstream physics: the relation $a = H_0^2 r$ in print from 1979, nineteen years before the acceleration it describes was discovered, and the critical value $\Omega_\Lambda = 2/3$ stated in 2013 from Friedmann and Planck data alone. Rowlands also supplied the nilpotent condition $\Psi^2 = 0$ — existence as exact self-cancellation — which Vacuum.Net carries as a core constraint. Where this theory goes beyond the Liverpool line is at the root: the nilpotent programme inherits Lorentz invariance as a foundation, and therefore inherits the 1887 misreading as a boundary condition. Vacuum.Net goes one layer deeper — first the net, then Lorentz symmetry as an emergent, local property of tension propagating in it.

The third tributary is the diagnosis itself: the mapping of the interpretive errors on which the received framework rests, of which the 1887 step is the load-bearing one, with the discarded mirror structure (the dual space) as its principal casualty — the casualty that returns, measurably, as the Hubble tension.

The confluence is recent and datable. The foundational paper (constable.blog, 2026) states the theory from its axioms. The MAZE encoder — the working implementation of Vacuum.Net addressing — went live at maze.swarp.nl in 2026 and carries, at the time of writing, some 3.6 million receipted entries. The closure series of September 2026 — the four papers this essay caps

— derived the quantization law, took it to the cosmological rung, estimated its reach in time, and answered its critics. That is the state whose current form this essay records.

2. The derivation: from one strand to two ladders

The ground (axiomatic). One strand, no outside. There is a single continuous strand and nothing else; every structure is a configuration of the strand crossing itself. Because there is no outside, nothing can be added or removed — whence the nilpotent condition $\Psi^2 = 0$: everything that exists is an exact self-cancellation of the strand against itself, existence as balanced nothing. This is the same condition from which Rowlands recovers the Dirac formalism; here it stands at the root.

The one rule (axiomatic). Nothing is stored, and nothing exists as a thing, unless it returns to itself. A winding that returns is a knot; a period that closes is an address. Closure is the sole criterion of existence, and the theory contains no second kind of closure at any scale — a stored item, a living being, the universe, all close by the same rule.

The elementary symbol (derived in the foundational paper; supported below). The strand's elementary distinction is the balanced trit, $\{-1, 0, +1\}$: two opposite directions and rest, balanced around zero. The full derivation from the strand resides in the foundational paper; what can be said here, from established mathematics, is why exactly this alphabet is the one a self-cancelling structure would have. First: a balanced alphabet is the *smallest* that contains negation as a symmetry — negating a balanced-ternary number is swapping +1 and −1 digit-wise, no sign bit, no special case — which is precisely the property a nilpotent world needs, where everything must carry its own cancellation. Second, an independent classical result: base three is the most economical integer radix — radix economy is optimised at Euler's number $e \approx 2.718$, whose nearest integer is three — so a structure that must store the most distinctions at the least cost lands on three by arithmetic, not by choice. (The one serious balanced-ternary computer ever built, Brusentsov's Setun of 1958, was built for exactly these advantages.) Third, the machine-learning present: the 1.58-bit ternary models are literally named after $\log_2 3 = 1.58\ldots$, the information content of the trit — industry rediscovering the economy of three without the framework.

The two ladders (structure). From the trit and the closure rule, two ladders. The **address ladder triples**: every addressing layer multiplies the number of distinguishable addresses by three — $3, 9, 27, \ldots 3^n$. Its growth law is the Bronze Mean recursion, a *theorem* within the theory rather than a postulate: $b(n) = 3 \cdot b(n-1) + b(n-2)$, whose ratio converges to $\sigma_3 = (3+\sqrt{13})/2 \approx 3.303$ — the third metallic mean, to the three what the golden ratio ϕ is to the one. The **dimensional ladder doubles**: $1 \to 2 \to 4 \to 8$, the same doubling that generates the four normed division algebras (real, complex, quaternion, octonion) and stops, by Hurwitz's theorem, at eight. The dimensional ladder is *closed at the top* — the (5,8) record is the last it can host — while the address ladder is open without bound.

The two-layer law (structural law of the theory). Every closure has two categorically distinct parts. The closed part is **address**: topology, frozen at the moment of closure, never changing afterwards. The open part — because, as §4 proves, no closure ever closes completely — is **tension**: dynamic, treatable, the only layer in which anything happens. Address answers *what and where*; tension answers *how it is doing*. The two must never be conflated, in physics or in instrument design; their growth laws even differ in kind — σ_3 governs the address side (ternary, structure), ϕ governs the tension side (binary, process), and the theory predicts $\sqrt{2}$ as the law of two closures in phase (prediction, on record, untested).

The morphology prohibition (derived design law). A context-free instrument cannot parse a context-dependent system. This is a mathematical consequence of the addressing rule — addresses

are determined by period-closure against the net's own frozen reference, never by keyword, frequency, or similarity — and it has a sharp practical edge: questionnaires are structurally excluded from every instrument built on the theory. Not disfavoured; excluded.

3. The thread of three — and why it returns everywhere

Now the thread this essay was asked to make explicit. List where the three stands, level by level:

The elementary symbol is **three**-valued. The address ladder multiplies by **three**. The growth recursion carries coefficient **three**, and its ratio $\sigma_3 = (\mathbf{3}+\sqrt{13})/2$ is the **third** metallic mean. The exchange rate between the ladders is $\log_2\mathbf{3}$ — the number the ternary models are named after. The musical interval that generates the comma is the pure fifth, frequency ratio **3**:2 — twelve steps of *times three over two* against nineteen halvings is the comma $3^{12}/2^{19}$ itself. The address space at depth n is $\mathbf{3}^n$. And at the top rung, at Rowlands' critical value, the universe's energy books split into **thirds**: $\Omega_\Lambda = 2/3$, $\Omega_m = 1/3$ — the vacuum two parts, the matter one part, of three.

Coincidence-hunting would list these and stop. The theory does better: it says *why* the three returns, and the answer is the two-layer law itself. **The three belongs to structure; the two belongs to process.** Everywhere the theory counts address — topology, memory, distinction, the frozen layer — the count is ternary: trit, ×3 ladder, 3^n, σ_3. Everywhere it counts process — dynamics, doubling, phase, the living layer — the count is binary: the 1–2–4–8 ladder, the octave, ϕ, the doubling of tension. The three and the two are not two habits of one theory; they are the arithmetic signatures of its two layers. And its deepest constants are precisely the **exchange rates between the layers**: $\log_2 3$ is what a structural step costs in process steps; the convergents (2,3), (5,8), (12,19), (41,65), (53,84), (306,485) are the depths at which the two currencies best settle; and the comma is the proven fact that they *never settle exactly* — the irrational remainder of converting structure into process, which the two-layer law then identifies as tension, the thing everything alive runs on. Even the top-rung thirds fit the reading (reading, not derivation — flagged as such): at the critical value the process side of the universe takes two parts and the structure side one, the same 2-against-3 negotiation, written in energy. The three returns everywhere because the theory *is*, at every level, the same negotiation between a ternary structure layer and a binary process layer — and $\log_2 3$ being irrational is the theorem that the negotiation never ends.

4. The quantization law and the comma (the memory end)

Because $\log_2 3$ is irrational, the two ladders never coincide; they coincide *almost*, at the record depths given by the continued-fraction convergents of $\log_2 3$ — (n,m) = (2,3), (5,8), (12,19), (41,65), (53,84), (306,485), … with residues 11.1%, 5.35%, 1.35%, 1.15%, 0.21%, 0.10% (theorem: Khinchin's record property; the (12,19) residue is the Pythagorean comma, three millennia old in music). The physical hypothesis of the series — the one genuinely new physical claim at this end — is that the net realises these record near-closures as its *only* stable closure depths: stable physical closure ⇒ record-small mismatch ⇒ convergent. The second arrow is theorem; the first is hypothesis, formulated to forbid: any stable depth in 20–64 (bar 41) kills it.

Three hard results now frame the law. The residue is **protected**: by Baker's theorem it can shrink only polynomially in depth, so against the exponentially growing resolution of a deepening net (one flagged assumption: finest distinction 3^{-n}) the deficit is felt ever more sharply, never less — the ladder cannot end through unreadability, and closure-death-by-perfection, once entertained in this programme, is retracted. The near-perfect closure is **unique**: by Mihăilescu's theorem (Catalan), 9 –

8 = 1 at the very first rung is the only one-unit miss in the infinite ladder. And the ladder is **finite in use**: the observable universe's content (~10^{120}, Lloyd/holographic — borrowed number, flagged) needs naive depth ≈ 252, which is forbidden, so the universe's address is the rung (306, 485), overshooting by 10^{26} — the predicted fingerprint of quantization, as a number — with the jump to the next rung (n = 665) not needed for ~10^{13} present ages. The books never balance, and that is why there is time.

5. The cosmological end (already inside accepted physics)

The top rung was not built by this programme; it was found, already published. Rowlands (2013), from Friedmann and Planck data with no speculative input: if $\Omega_\Lambda = 2/3$ exactly — a critical value in the same sense as $\Omega = 1$ for flatness — then $\varrho_{vac} = H_0^2/4\pi G$, $\Lambda = 2H_0^2$, and the dark-energy acceleration is $a = H_0^2 r$, whose integral is *exactly* the Hubble law $v = H_0 r$; and $a = H_0^2 r$ was in print from 1979, nineteen years before the acceleration was discovered. Read through the closure rule, this is the universe meeting the theory's demands: one governing rate; expansion and acceleration as one motion doubly read; and a structural near-miss in the books. Evaluated at the Hubble radius the acceleration is cH_0; divided by one full phase winding — one mesh around is one full turn, 2π, the theory's circular closure — it lands on the measured galactic transition, $a_0 \approx cH_0/2\pi = 1.08\times10^{-10}$ m s^{-2} against 1.2×10^{-10} measured (McGaugh; Milgrom registers the relation as a "coincidence" with far-reaching ramifications). And the dual space — the mirror structure discarded with the medium in 1887 — returns as the Hubble tension: the two H_0 anchors *must* disagree as projections of one dual structure (companion paper: $\varepsilon_{vac} = 9.31\%$, parameter-invariant; predicted kink in $H_0(z)$ at $z \approx 0.6$–1.3), with Rowlands' exact 2/3 widening rather than closing the gap, which is what marks the tension as signature rather than systematics.

The consequences for the standing problems, each conditional on the reading and labelled so: dark energy dissolves (not a substance — the acceleration face of expansion); the coincidence problem dissolves (2/3 as fixed point has no timing); the 10^{120} reclassifies (a category error — Λ as expansion quantity was never QFT vacuum energy; honest cost: gravitation of zero-point energy becomes a separate open debt); dark matter at galactic scale becomes unnecessary (a_0 as local reading of the cosmic rate; honest flank: clusters and CMB remain unaddressed); the Hubble tension becomes a necessity with a testable kink; and the preferred frame stands measured in the dipole. Adverse data are reported with the claims: the constant-Λ fit puts Ω_Λ at 0.6847 ± 0.0073, 2.5σ above 2/3 — which is why the decisive test is the *refit* of the public likelihoods under the rigid law $\Lambda \propto H^2$ (coefficient fixed at 2), not the face-value comparison; and the naive dynamical reading ($\Omega_\Lambda = 2/3$ permanent, $w = -2/3$, $H(z) = H_0\sqrt{(1+z)}$) collides with framework-internal reconstructions and survives only through the dual-space projection — whose derivation is open and named as such.

6. Applications: what already runs on the theory

The theory is not waiting for its cosmology to be adjudicated; its middle rungs are operational.

MAZE — the working implementation of Vacuum.Net addressing and the source of the measured nineteen. A self-addressing knowledge net using balanced ternary addressing, in which an item's address is determined by period-closure of iterative ternary approximation against the net's own frozen reference — never by keyword, frequency, or similarity (frequency never determines placement: the two-layer law as code). Live at maze.swarp.nl with ~3.6 million receipted entries, an MCP endpoint, and autonomous nightly loops; the reference encoder validates at 100/100

idempotence, 59% top-1 and 91% sum-operator in the inhabited region on the SQuAD benchmark, at 1.05× cost under 2.2× archive growth. MAZE is simultaneously product and experiment: it is the instrument on which the depth-jump measurement of §8 runs.

The rhythm-loss instruments — the two-layer law as biomedicine. If address is frozen topology and life is treatable tension, then transitions like menopause are not deficiencies of a substance but losses of a periodic closure — a monthly oscillator going erratic and stopping — which is why no lab test exists for what questionnaires cannot parse either (the morphology prohibition, applied). The four states of a loaded closure — loading, holding, discharge, rest — are readable in RR-interval data from a €30 chest strap, and the instrument distinguishes rhythm restoration from profile flattening under hormone therapy: outcomes identical on questionnaires, different in the tension layer. A parallel male instrument reads the slow flattening of the daily clock over decades — the same physics, a different period.

The multi-layer early-warning system — the four states at planetary scale: market tension, accumulated loading, human sentiment, and geomagnetic (Ap-indexed) space-weather loading as coupled time series, with discharge detection and strict out-of-sample discipline. **The electromagnetic blueprint** — the frozen-address principle applied at birth: solar-cycle phase, geomagnetic loading and local field from three public birth inputs, scored ever after as a fixed prediction against measured data, never mixed into it.

One law governs all four: the instrument reads tension against a frozen address, and never lets the reading rewrite the address.

7. The next step

Everything in this essay converges on one calculation and one measurement, and the theory's next state is whichever arrives first.

The calculation — named in the series and specified: the statistical mechanics of the knot network, the coarse-graining of the net, which must deliver **three obligatory outputs in one derivation**: the rung structure (stable closure at, and only at, the convergent depths — turning the law's hypothesis-arrow into a theorem), the coupling number 2π (one mesh around as one full turn — turning $a_0 = cH_0/2\pi$ from an observation-fixed product into a computed constant), and the dimension of stable closure (the 1–2–4–8 ladder as output). Each output is already pinned by an independent measurement — 19, 1.2×10^{-10} m s^{-2}, and 8 — so a candidate coarse-graining that hits two and misses one is dead by the third. Success would additionally decide whether the spiral reading (expansion as the paid-out comma — hypothesis, on record) is the geometry, whether 2/3 follows from the closure of the top rung, and whether the cosmological mismatches are commas in the technical sense.

The measurement — executable now, on existing hardware: load the MAZE encoder past the carrying capacity of a 19-closure and read the distribution of closing depths. 19 → 65 confirms the law and identifies the encoder's coordinate as m; 19 → 41 confirms and identifies n; any stable depth in 20–64 (bar 41) kills the law and everything built above it. One experiment, four outcomes, no escape — and because the net contains one kind of closure, a verdict at this rung is a verdict about every rung.

Behind these two stand the cosmological tests in order of effort: the $\Lambda \propto H^2$ refit of the public Planck + DESI + supernova likelihoods (a bounded computation, no new theory); the $H_0(z)$ kink at $z \approx 0.6$–1.3 against DESI's remaining releases and Euclid; the convergence watch on Ω_Λ. And

behind those, the theoretical debts, named: the derivation of the 3^{-n} resolution, the internal re-derivation of the universe's content and growth law, the dual-space projection that says what an H(z) measurement measures, and the $\sqrt{2}$ prediction awaiting its test.

8. Status ledger

Theorem (published mathematics, cited): the convergent ladder and its record property (Khinchin); the polynomial protection of the residue (Baker); the uniqueness of the one-unit miss (Mihăilescu); the ceiling at eight (Hurwitz); the optimality of radix three (radix economy); the irrationality of $\log_2 3$ and hence the eternity of the negotiation.

Measurement: the MAZE depth 19; $a_0 \approx 1.2\times10^{-10}$ m s^{-2}; the CMB dipole; the Hubble-tension pair (73.50/67.24, 7.1σ); $\Omega\_\Lambda = 0.6847 \pm 0.0073$ under constant Λ (adverse at face value, reported); the encoder benchmarks; emergent Lorentz symmetry in laboratory media (Volovik).

Derivation inside accepted physics: Rowlands 2013 in full ($\Omega\_\Lambda = 2/3 \Rightarrow \Lambda = 2H_0^2 \Rightarrow a = H_0^2 r \Rightarrow v = H_0 r$), with the 1979 priority.

Theory-internal derivation: the Bronze Mean recursion; the two-layer law; the morphology prohibition; the reach of the closure rule.

Hypothesis, with named death routes: the quantization law (dies in the band 20–64); the dynamical top-rung reading (dies in the refit); the dual-space projection (open derivation); the spiral (recorded, not used as premise).

Assumption, flagged where used: the 3^{-n} resolution; the 10^{120} content and its t^2 growth.

Retracted by the programme's own results: closure death by perfection.

9. Conclusion

The current state of the Vacuum.Net theory is this. It stands on one corrected reading of one experiment, and from one strand and one closure rule it derives two ladders whose eternal 2-against-3 negotiation *is* the theory: the three of structure against the two of process, exchanged at the rate $\log_2 3$, settling at the convergent depths, never settling exactly — the comma as the guaranteed remainder, the remainder as the tension, the tension as the life. The memory end is implemented and measured at depth nineteen; the cosmological end was published inside accepted physics decades ago and predicts to this day; the middle rungs run as instruments on the two-layer law. What separates the theory from its next state is one specified calculation with three measured pins, and one executable measurement with a forbidden band forty-four integers wide. The theory can die at either — which is precisely what distinguishes it from a story. And if it does not die, then the oldest craft knowledge in civilisation was a physics lesson all along: the pianos were never quite in tune, the universe is not either, and the mistuning — two parts process, one part structure, and a comma left over — is why anything happens at all.

Annotated references

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