

The Net

How to read this document

This document has three parts:

Sections 1–8 present the model.

The Appendix presents the evidence: statistical signatures, quantitative predictions, derived relations, and explicit falsification criteria.

The visual Map at the e.nd.

The Vacuum from the Smallest Strand to the Greatest Knot

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This is the foundation document of the series. Every essay that reads a layer of reality — weather, stars, dark matter, war, medicine, the economy — refers back to this text and needs nothing else.

1. One primitive

The vacuum is not empty. It is a medium, and the medium has exactly one primitive: the **strand**.

A strand is not a thing. It is a **self-resonating stream**: a flow that sustains itself by feeding back on itself. The strand does not *have* a vibration; the strand *is* its vibration. Take the resonance away and nothing remains — there is no rope underneath.

The strand knows two states:

- **Open.** The resonance runs free. No form, no place, no resistance. Maximal connection, maximal possibility. This is the ground state of the vacuum.
- **Closed.** The resonance folds onto itself and holds itself: a standing wave in a loop. This is the first **knot** — the smallest structure that can exist.

Note the direction of this definition. The ground state is not emptiness or disorder. It is fullness without form. Structure is the exception: a closed, tense, held state carved out of an open one. Freedom is primary; form is the constraint.

Everything that exists is windings of windings of this one strand. That sentence is the entire model. The rest of this document unfolds it and shows, rung by rung, who has already seen or formalized each part.

2. The machine

Because the strand is resonance, the model comes with a built-in dynamic. Nothing needs to be added.

Tension. A wound or stretched strand stores resonance. It holds what it cannot release. Tension is stored resonance.

Loading. Tension accumulates slowly, along the strands, throughout a region of the net.

Discharge. When tension exceeds what the winding can hold, it releases — not gradually, and not everywhere at once, but fast and through the weakest knots. After the discharge, the net relaxes toward its ground state, and loading begins again.

Slow loading, sudden release, through the weakest points, then relaxation. This asymmetric cycle is the **machine**, and it is the same machine at every scale. Whoever recognizes it in a thunderstorm has seen all of it.

Resonance is choosy. Only windings that come back in phase with themselves persist; all others unwind. This is why the net is not a smooth continuum but a **ladder with discrete rungs** — like the overtones of a string, which exist only at whole-number fits. Which windings-of-windings fit onto each other is the recursion question of the model. My working candidate is the Bronze Mean sequence (1, 1, 4, 13, 43, 142): each term counts the windings of the next level. It is a candidate, flagged as such, not a result.

The net is fractal. A knot at one rung is a whole net at the rung below. Therefore the machine — load, discharge, relax — repeats at every rung, with one difference only: the winding number, and with it the tempo. Small windings load and discharge in fractions of a second. The largest load for ages and discharge once.

Laws are local habits. The behaviour of any knot depends on the tension of the net around it. There is no law standing outside the medium. What we call a "constant of nature" is a property of the medium's current state — an elastic modulus, not a decree. Change the state, and the constant shifts. This is the context principle: measure inside one tension state and you learn that state, not the universe.

3. The first appearance: light

The open resonance, travelling along the strand, is what we call a **photon**.

The ordering matters. Light is not the bottom of the model. Light is the first *appearance* of the bottom: vacuum-resonance in transit. That is why a photon has no rest mass — mass is winding, and the photon is the unwound state in motion. It is tension moving through the net without becoming a knot anywhere, which is exactly what a messenger has to be.

The consequence is fundamental and worth stating once, clearly: **the bottom layer is invisible in principle**. All seeing is done with photons, and the photon is already layer two. The strand itself can only be known through what runs along it and what knots in it. We swim in it as fish swim in water — and a fish does not see water.

The primacy of light over matter is old knowledge and modern physics at once. Plato put fire before the shadows; the Kabbalah puts Or Ein Sof, limitless light, before all form. Quantum field theory agrees in its own dialect: the field is fundamental, the particle is its excitation, and every measurement chain in every laboratory ends in photons striking a detector.

4. The first knot: matter as closed light

Close the travelling resonance into a loop, and it stays. That is matter.

Williamson and van der Mark (1997) built this rung concretely: the electron as a photon confined to a closed, double-looped toroidal path. Charge, spin $\frac{1}{2}$ and rest mass fall out of the winding geometry. Mass is trapped light — a number for how much resonance is held in the loop. **Robinson** extends the construction to nucleons: protons and neutrons as rotating photon structures whose fields alter the electric properties of the space around them — the knot tensing its neighbourhood, which is gravity's seed.

The idea has deeper roots than most physicists remember. **Kelvin (1867)** proposed atoms as knotted vortices in a medium; knot theory itself was born when Tait tabulated the possibilities. The program died with the ether — wrongly, on this reading; the medium was real, the model of the medium was too crude. The mathematics survived and returned: **Skyrme (1962)** modelled nucleons as topological solitons, and **Faddeev and Niemi (Nature, 1997)** proved that stable *knotted* solitons exist in field theory. Stability by topology: a knot cannot vanish, it can only be unwound, and unwinding costs what the winding stored.

And in real media, the windings are simply *observed*: quantized vortices in superfluid helium — Onsager's and Feynman's — are literal, countable knots in an actual medium, photographed in the laboratory.

So the rung stands on three legs. A concrete construction (Williamson–van der Mark, Robinson). A rigorous mathematics (Skyrme, Faddeev–Niemi). A laboratory analogue (superfluid vortices). Matter is frozen resonance: windings that cannot unwind cheaply.

5. Why the medium makes laws

If matter is winding in a medium, the medium's properties must appear to its inhabitants as "laws of nature". Two authors carry this rung.

Sakharov (1967) derived gravity as the elasticity of the vacuum: curvature is the strain of the medium around its knots. Gravity is not a force between things; it is the tension field of the net.

Volovik (2003) showed with superfluid helium that a medium generates, for its inhabitants, its own effective laws, effective particles, and even an effective speed of light. Creatures made of the medium's excitations measure the medium's state and mistake it for the universe. The laboratory case for the context principle of Section 2.

Together they close the loop of the model's logic: strands make knots, knots tense the net, the tensed net is what its knots experience as physics.

6. The ladder

From here, nothing new happens. The same machine repeats; only the winding number changes. Each rung has its own essay in the series; here each gets one line and its pointer.

- **Atoms and molecules** — knots of knots, locked where phases fit; the discrete spectra of chemistry are the choosiness of resonance in its own dialect.
- **Life** — knots that re-tie themselves. A cell holds gradients (tension) across its membrane and discharges them in timed pulses; heartbeat and nerve-firing are load-discharge cycles. Life did not invent a new machine, it learned to *time* this one. Synchronization between living knots is resonance socialized: knots on shared strands pull toward one another's phase

(Kuramoto, Strogatz). → the coherence-medicine series; "What the Instruments Already See".

- **The human** — a tower of these windings; felt tension and release is data at body scale. → "The Canary Generation".
- **Human groups** — households, firms, states as knots; contracts and debts as tensed strands; crashes and wars as discharges. → "Where Crashes Come From"; "Where War Comes From".
- **The planet** — crust strain discharging as earthquakes; atmospheric pressure discharging as storms. Weather is the best-instrumented middle rung of the whole ladder. → "The Vacuum as Weather".
- **Stars** — loading for millions of years, discharging as supernovae; neutron stars and black holes as the medium's two limiting tension states. → "Two Ends of One Medium".
- **Galaxies and their halos** — the medium's collective response, misread as invisible particles. → "The Missing Weight and the Medium".

7. The top: the greatest knot

At the largest observed scales, mainstream cosmology speaks the language of the net literally, without drawing the conclusion.

Galaxies lie on filaments; the filaments meet in knots; the standard name is the **cosmic web**. The founding paper — **Bond, Kofman and Pogosyan, Nature 1996** — is titled "How filaments of galaxies are woven into the cosmic web", and galaxy clusters sit *at the knots*. The knot we ourselves inhabit has been mapped: **Laniakea (Tully et al., Nature 2014)**, a basin of a hundred thousand galaxies defined precisely as the net would define a knot — the region whose internal flows converge on one attractor. And our motion within the largest frame is measured directly: the **CMB dipole**, the solar system riding at ~370 km/s through the background light. The highest winding in which we demonstrably turn.

Then the last step, which the model forces. The ladder began with one strand resonating with itself. Followed to the top, it ends in the same statement at full scale: **the universe is one self-resonance** — a single stream, wound so richly upon itself that it appears as many separate things. Multiplicity is winding depth, nothing more. Wheeler's one-electron universe was an early word for this, phrased in particles because particles were still assumed in his day; the resonance version needs no such crutch.

So the ladder closes on itself. The smallest layer and the greatest knot are the same thing, seen at two winding depths. This closure is what "fractal" means when it is taken seriously, and it is the deepest claim of the model: there is one strand, and we are among its windings.

8. Open work

Three tasks are open, and they are tasks, not doubts.

1. **The recursion.** Derive which windings-of-windings fit — the calculation that should deliver the rung structure (and test the Bronze Mean candidate) from the choosiness of resonance itself.
2. **The coupling constant of the net.** The collective nonlinearity of the knot-network (γ , of order 2π as a phase winding) is measured in the sky but not yet derived from the network dynamics. One coarse-graining calculation should yield it, the sign of the medium's self-attraction, and the dimensionality of our rung in one stroke.

3. **The first distinction.** The model begins where an open resonance closes. What draws the first closure — where the observer enters the net — is deliberately left open. It is the oldest question, and the model is honest enough not to answer it in passing.

Annotated references

The series (constable.blog):

1. **"Het Heelal Lijkt op een Visnet" (30-7-2026).** The net in Dutch, for the general reader; this document is its foundation in full.
2. **"The Strand That Knots Itself" / "De Grote Ontknoping" (juli 2026).** The strand as single primitive; the General Strand Principle.
3. **"The Universe as Oscillation" (17-7-2026).** The self-resonance reading and the one-resonance closure of §7.
4. **The winding essays:** "The Vacuum as Weather"; "Two Ends of One Medium"; "The Missing Weight and the Medium"; "Where War Comes From"; "Where Crashes Come From"; "The Canary Generation"; "What the Instruments Already See". Each reads one rung and refers only to this document.

External underpinning, bottom of the ladder:

5. **J.G. Williamson & M.B. van der Mark, "Is the electron a photon with toroidal topology?" (Annales de la Fondation Louis de Broglie, 1997).** Matter as closed light, constructed.
6. **V. Robinson, sub-quantum gravity papers (Qeios/QuiCycle).** Nucleons as rotating photon structures; the knot tensing its neighbourhood.
7. **W. Thomson (Lord Kelvin), "On Vortex Atoms" (1867).** The precedent: atoms as knots in a medium; knot theory born from it via Tait.
8. **T.H.R. Skyrme (1962); L. Faddeev & A. Niemi, "Stable knots in a topological field theory" (Nature 387, 1997).** Particles as topological solitons; knotted solitons proven stable.
9. **Quantized vortices in superfluids (Onsager 1949; Feynman 1955).** Real, countable windings in a real medium — the laboratory analogue.
10. **A. Sakharov, "Vacuum quantum fluctuations in curved space and the theory of gravitation" (Doklady, 1967).** Gravity as vacuum elasticity.
11. **G. Volovik, *The Universe in a Helium Droplet* (Oxford, 2003).** A medium generating its own effective laws for its inhabitants — context-dependence in the laboratory.

External underpinning, top of the ladder:

12. **J.R. Bond, L. Kofman & D. Pogosyan, "How filaments of galaxies are woven into the cosmic web" (Nature 380, 1996).** Filaments and knots, observed and named.
13. **R.B. Tully, H. Courtois, Y. Hoffman & D. Pomarède, "The Laniakea supercluster of galaxies" (Nature 513, 2014).** The knot we live in, defined by converging flows.
14. **The CMB dipole (COBE/Planck measurements).** Our measured motion, ~370 km/s, through the largest observable frame.

Appendix — The Evidence

A.0 What counts as proof here

Section 3 established that the strand itself is invisible in principle: all seeing is done with photons, and the photon is already layer two. So the model cannot be proven by pointing at a strand. It can be proven the way every medium in the history of physics was proven — atoms, fields, the quantum vacuum itself — by three kinds of evidence:

1. **Signature evidence.** If one machine runs at every rung, every rung must leave the same statistical fingerprint. Not similar stories — the same measurable numbers.
2. **Quantitative pins.** Numbers the model fixes in advance, checkable against sky and laboratory.
3. **Derived relations.** Pieces of the chain that are calculated, not postulated.

And, because proof without risk is decoration: a list of **forbidden outcomes** — observations that would kill the model. Each class follows.

A.1 Signature evidence: one fingerprint on every rung

The machine of §2 makes three statistical predictions, valid at any rung whatsoever: (i) fluctuations with heavy tails and long memory (fractal noise), because the net is fractal; (ii) the asymmetry slow-loading / fast-discharge; (iii) rising variance and autocorrelation *before* a discharge — critical slowing down — because tension accumulates before it releases.

All three are measured, rung by rung:

- **Condensed matter / the laboratory.** $1/f$ ("flicker") noise appears in practically every conducting and driven system, unexplained as a universal fact for a century. Crackling noise and Barkhausen avalanches in magnets follow power laws: many small discharges, few giant ones.
- **The solid Earth.** Earthquake sizes follow the Gutenberg–Richter power law; aftershocks decay by Omori's law. Strain loads for centuries, releases in seconds. The seismic rung is the machine in its purest measured form.
- **The atmosphere.** Turbulence and rainfall are multifractal across scales (Kolmogorov; Lovejoy & Schertzer); storms are fast discharges of slowly built pressure gradients. Climate tipping elements show critical slowing down before transition (Dakos et al., PNAS 2008).
- **The sun.** Solar flare energies follow a power law over eight decades of magnitude — the same avalanche statistics as earthquakes, on a star.
- **Stars at the extreme.** Neutron-star glitches — sudden spin-ups of the most extreme knots we observe — follow power-law size distributions, read as vortex avalanches in a superfluid interior. The laboratory analogue of §4 (superfluid vortices), observed astrophysically.
- **Life.** Healthy heart-rate variability is fractal (long-range correlations); the *loss* of that fractality predicts pathology (Goldberger et al.). Neuronal avalanches in the cortex follow power laws (Beggs & Plenz, 2003). Epileptic seizures — the brain's discharges — are preceded by measurable critical slowing in a significant fraction of patients.
- **Human groups.** Market returns show heavy tails and long memory (Mandelbrot, 1963 — sixty years of confirmation); crashes are preceded by log-periodic acceleration (Sornette, forward-tested); war sizes follow the Richardson power law from skirmishes to world wars.
- **Ecosystems.** Generic early-warning signals — rising variance, rising autocorrelation — precede regime shifts in lakes, drylands and fisheries (Scheffer et al., Nature 2009). The same paper generalizes the signature across systems; mainstream science has already discovered the machine, one rung at a time, without naming the net.

The force of this section is not any single item. It is the *identity* of the fingerprint across rungs that share no material, no mechanism in the conventional sense, and no scale — conductors, faults, storms, flares, pulsars, hearts, cortices, markets, wars, lakes. Conventional science treats each power

law as a separate puzzle with a separate local explanation. The net predicts them all at once, as one machine seen at different winding numbers. One model, one fingerprint, every rung: that is what a medium looks like from inside.

A.2 Quantitative pins

Three numbers pin the model to the sky.

The acceleration threshold. Galaxy dynamics deviate from Newtonian expectation below one specific acceleration, $a_0 \approx 1.2 \times 10^{-10} \text{ m/s}^2$ — measured across thousands of galaxies (the Radial Acceleration Relation; McGaugh, Lelli & Schombert, PRL 2016, 153 galaxies, scatter consistent with observational error). Empirically, $a_0 \approx cH_0/2\pi$. In the standard picture this is an unexplained coincidence between a galactic number and a cosmological one. In the net it is forced: the threshold marks where local winding tension gives way to the ground-state tension of the largest winding, and the 2π is a phase winding — one closed loop of the strand. A measured number, carrying the model's signature factor.

The RAR as a crossover curve. The same relation traces a smooth, universal crossover between two regimes — exactly the constitutive behaviour $g(\chi)$ that a medium must show between its tensed and relaxed states. The curve is measured; the model reads it as the medium's equation of state, seen edge-on.

The α -prediction. If "constants" are state functions of the medium (§2, §5), the fine-structure constant must shift measurably with local vacuum tension: $\Delta\alpha/\alpha = \beta \cdot \Delta\chi$. Benchmark: $\beta = \alpha/4\pi$ gives $\Delta\alpha/\alpha \approx 3.4 \times 10^{-8}$ at the surface of white dwarf G191-B2B — within reach of next-generation spectroscopy. This is the model's cleanest forward bet: a number, a place, an instrument.

A.3 Derived relations

Not everything is postulated. The chain currently derived, in order:

1. **Knots exist and are stable.** Faddeev & Niemi (Nature, 1997) proved stable knotted solitons exist in field theory. Stability by topology is a theorem, not a hope.
2. **A self-interacting medium has a constitutive law.** From one assumption — the medium's energy is not purely quadratic in density ($g_3 \neq 0$) — the effective stiffness $g_{\text{eff}} = \bar{g}(1+\gamma\delta)$ follows by the standard acoustoelastic route (Murnaghan; Thurston & Brugger). Materials science does this calculation for steel; here it is done for the vacuum.
3. **The medium's response functions follow.** Bogoliubov machinery then yields the healing length, sound speed and effective mass as functions of tension: $\xi(\chi)$, $c_s(\chi)$, $m_{\text{eff}}(\chi)$. This is textbook condensed-matter method applied to the vacuum condensate — engineering, not speculation.
4. **One knob.** Consistency forces the factorisation $g = g(\alpha(\chi))$: context sets α , α sets interaction. One internal degree of freedom, so galactic dynamics (A.2) and laboratory spectroscopy (A.2) must co-vary. Two independent instruments, one predicted correlation — the strongest kind of test a framework can set itself.

A.4 Forbidden outcomes

The model is killed by any of the following:

1. **Direct detection of a dark-matter particle.** The missing weight is the medium's collective mode; there is no particle to find. Fifty years of null results to date are, on this reading, not a crisis but a datum.
2. **Detection of a quantized spin-2 graviton.** Gravity is medium elasticity (Sakharov), not a particle exchange.
3. **A discharge without loading.** A major crash, seizure, or regime shift arriving with flat variance, flat autocorrelation and no acceleration signature in the preceding record. One clean counterexample on any well-instrumented rung breaks the machine.
4. **Gaussian, memoryless noise on any rung.** If any layer's fluctuations turn out clean and memoryless at all scales, that layer is not a winding of this net.
5. **A dead coincidence.** If a_0 is shown to *not* track the cosmological state (e.g. no evolution with H over cosmic time where evolution is predicted), the phase-winding reading of 2π fails.
6. **Uncorrelated knobs.** If α -spectroscopy and dynamical anomalies are ever shown to vary independently where the model says they must co-vary (A.3.4), the single-knob structure is false.

A.5 Status ledger

Honesty about the state of each piece, in one table of words. **Proven:** knot stability (theorem); the cross-rung fingerprint (measured, A.1); the a_0 coincidence and the RAR (measured, A.2). **Derived:** the constitutive chain A.3.2–4, from one flagged assumption ($g_3 \neq 0$, with the bridge $\delta \propto \chi$). **Argued but not yet derived:** $\gamma = 2\pi$ as phase winding — the number is measured, the derivation from network dynamics is open task 2 of §8. **Candidate:** the Bronze Mean recursion (open task 1). **Deliberately open:** the first distinction (open task 3).

That is the shape of an honest research program: a theorem at the bottom, a fingerprint across every rung, three pins in the sky, a derived chain in the middle, and its remaining tasks named — with six stated ways to kill it. Nothing in it hides.

One strand. Two states. One machine. Every essay in the series is one winding of it.

