

Reading the Net

The Highlights and the Reasoning of Beyond Energy

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Summary

Beyond Energy (Edition 3) maps what the Vacuum.Net theory makes possible. It does not start from human needs. It starts from the quantities of the net itself. Ten quantities and five operations give fifty possibilities. Each is worked out, tested where it can be, and linked to literature and to earlier human experience.

This essay explains how that map was made, what it found, and why the reasoning holds. It covers six highlights:

1. The net has a ceiling, and the one measured tap sits five trillionths below it.
2. Three steps at one depth equal exactly one step at the next depth.
3. Two rings lock into one identical state only when their length is a power of three.
4. On the net's register, endless circulation is the rule and rest the exception.
5. The ladder of depths lands on hydrogen's violet line, on the warmth of a room, and within 0.5 % of the Earth's cavity mode.
6. Many of the fifty possibilities have no name yet. Some have already been met, in laboratories, in music and in contemplative traditions.

Each claim carries its status. The essay separates what is assumed, what is proved, what is computed, what is measured and what is open.

1. The question behind the work

The usual question about a theory of the vacuum is how much energy it can give. That question comes from the age of fire. Its words are energy, fuel, work and efficiency. They describe conversion along a chain, with loss as heat at every link.

A question asked in those words can only find an answer in those words. It finds taps. It cannot find what is not an amount of energy.

Beyond Energy turns the question around. It asks what the net itself can do, in its own terms. The answer is larger than energy. It includes reading the state of a place, holding two distant structures in one state, selecting matter by address, and keeping a configuration in permanent circulation.

Three reasons are given why no such list can be final. Concepts belong to their time and language. The net does not offer a list; it filters, and only what closes remains. And each new configuration that closes opens others that could not be named before. The map grows as it is walked.

2. The picture

The theory describes the vacuum as a fishnet stretched in water. Its strands run everywhere: through air, water, stone and body. They are always under tension.

Where strands wind around one another, knots appear. That is matter. Between strands lie meshes: openings with a shape and a size.

Five axioms carry it.

- **One strand.** Its only local act is crossing itself. A crossing has three states: over, under, none. These are written +1, −1 and 0.
- **Closure.** Only what returns in phase onto itself persists. Nothing selects from outside.
- **Memory.** What has closed constrains what comes next.
- **Context.** What physics calls constants are functions of the local tension χ .
- **Scale.** The same winding repeats at every depth. One step deeper multiplies the states by three.

Two units fix the scale, both from hydrogen. The unit of length is $S_0 = 1/(2R_H) = 45.6$ nm. The unit of time is $T_0 = S_0/c = 1.52 \times 10^{-16}$ s. A layer at depth n has length $3^n \cdot S_0$ and time $3^n \cdot T_0$.

The rules can be run on a register. A window is three neighbouring crossings. It closes when the sum of its trits is 0 modulo 3. Of the 27 possible windows, 9 close. A ring of trits is rewritten by one rule:

$$R(t)_i = -(t_{i-1} + t_{i+1}) \bmod 3.$$

A ring stays fixed under R exactly when every window in it closes. This is the net's closure rule, written as arithmetic.

3. The method

Beyond Energy uses a grid. The net has ten quantities that can be acted on:

Quantity	What it is
Tension χ	the local state
Density deviation δ	the soft dial
Phase θ	where a winding stands in its turn
Coupling K	how strongly windings pull into step
Address	the trit string of a closed winding
Depth	the rung on the ladder 3^n
Rest	what never closes
Memory	the orientation laid down first
Handedness	left or right
Trit law	the shares of +1, 0 and −1

Each can be met by five operations: read, set, select, couple, and leave open. Ten times five gives fifty cells.

Fire-age technology fills perhaps four of them. It reads and sets current. It reads and sets heat. The other cells are empty because they have no name, not because they are impossible.

The cells were not filled from the desk alone. The work followed four rules.

1. **Predict first.** Each expected outcome was written down before the run.
2. **Run.** The register was computed exhaustively for small rings and by sampling for larger ones.
3. **Keep the failures.** A refuted prediction marks a boundary.
4. **Name afterwards.** A configuration gets a name only after it has been seen to close.

Nine predictions were tested. Six held. Three failed. Each failure narrowed the map.

4. Highlight one: the ceiling and the gap

The first result sets the scale of what is possible.

One winding at depth 0 carries $E_0 = 4.357 \times 10^{-18}$ J. Assume one full closure per mesh per layer time. Then one mesh can pass at most $E_0/T_0 = 0.0287$ W. A square metre holds $1/S_0^2 = 4.81 \times 10^{14}$ meshes. The ceiling per layer is therefore 1.38×10^{13} W/m².

One arrangement has been measured. A cavity of 33 nm, on one side of a metal-insulator-metal diode, gave 1.4 pW from $0.02 \mu\text{m}^2$ with no applied voltage. That area holds 9.6 meshes of depth 0. Each passes 1.46×10^{-13} W.

The ratio to the ceiling is $\eta = 1.46 \times 10^{-13} / 0.0287 = 5.1 \times 10^{-12}$.

This number reframes the field. The known tap does not show that the net is weak. It shows how far the present design sits from what the net carries. Every other possibility in the map can be read as a route to raise η .

The same arithmetic gives a density of 70 W/m², if it holds over area. A household drawing 291 W would need 4.2 m². That scaling is a prediction, not a measurement.

The ceiling also gives a free cross-check. It falls by a factor 81 per depth. At depth 5, where the layer length is $11.1 \mu\text{m}$, the ceiling is 3,954 W/m². A room at 20 °C radiates 418 W/m², most strongly near $9.9 \mu\text{m}$. The arithmetic lands within a factor 9.5 of a quantity it knew nothing about.

5. Highlight two: three steps below are one step above

The second result is proved by algebra. It concerns the scale axiom.

The axiom says the same winding repeats at every depth. On the register, that claim can be tested exactly. Group a ring into blocks of three. Take each block's sum as one trit of a parent ring. Then ask whether the rule R acts the same way on the parent as on the child.

It does, with one condition. Three steps of R on the child equal one step of R on the parent:

$$\text{coarse}(R^3(t)) = R(\text{coarse}(t)).$$

The reasoning is short. Write a ring as a polynomial over the field of three elements. Shifting by one place is multiplication by x . The rule R is then multiplication by $-(x + x^{-1})$.

Over three elements, cubing is additive: $(a + b)^3 = a^3 + b^3$. This is the Frobenius identity. It gives:

$$R^3 = -(x + x^{-1})^3 = -(x^3 + x^{-3}).$$

So three steps of R are the same rule with neighbours three places apart. Summing blocks of three turns that into R on the parent ring.

The identity was checked on every ring of length 9 and on samples of length 12, 27, 30, 81 and 243. Among the powers 1 to 9, only 3, 6 and 9 have the property.

Why it matters. The theory's unit of time says a layer at depth n lasts $3^n \cdot T_0$. One step at depth $n + 1$ lasts three steps at depth n . R5 says the rule itself agrees: three steps below are one step above. The axiom of scale and the unit of time meet from two separate directions.

In physics, this is what renormalisation looks for: a rule that keeps its form when

fine structure is replaced by coarse. Kadanoff's block spins are the classic case. On the register, the result is exact.

6. Highlight three: lock lives on the ladder

The third result is also proved by algebra. It concerns coupling.

Take two rings, a and b. Each is rewritten by R. In addition, each reads the other at the same site, with weight k:

$$a' = -(a_{i-1} + a_{i+1}) - k \cdot b_i, \text{ and the same for } b.$$

With $k = 0$ or $k = 1$, the rings agree on about a third of their sites. That is chance. With $k = 2$, which is -1 modulo 3, something sharp happens. On some lengths the rings become identical. On all others they never do.

Length	9	27	81	243	10	18	28	30	54
Runs that lock (of 200)	200	200	200	200	0	0	0	0	0
Most steps needed	5	14	41	122	—	—	—	—	—

The reasoning again uses the field of three elements. Let $d = a - b$. With $k = 2$, the difference evolves as $d' = -(x^{-1} + 1 + x) \cdot d$. Over three elements, $1 + x + x^2 = (x - 1)^2$. So the difference is multiplied by $-x^{-1}(x - 1)^2$ at every step.

On a ring of length 3^k , $(x - 1)^{3^k} = x^{3^k} - 1 = 0$. The operator is nilpotent. The difference reaches zero in at most $\lceil 3^k/2 \rceil$ steps: 5, 14, 41, 122, as measured. On any other length, $x^n - 1$ has factors other than $x - 1$, and part of the difference never vanishes.

Why it matters. Three points.

First, lock is nilpotence. The foundational paper already identifies closure with nilpotence, following Rowlands, for whom a physical state is one whose operator squares to zero. Here the same identity appears as a working rule: two meshes become one state exactly when their difference is nilpotent.

Second, the ladder decides. Lock occurs only at lengths 3^k . The depth ladder is not a convenience of notation. It is where coupling closes.

Third, the coupling that locks is counter-coupling. In 1665 Christiaan Huygens noticed two pendulum clocks hung from one beam. They settled into exact opposition. The register's lock has the same sign.

The converse is as useful. Off the ladder, coupled systems keep their difference. That is a way to build things that must not all fail together.

7. Highlight four: what the register allows and forbids

Four further runs show what the net does on its own.

Charge is kept, direction is not. Under R, the total charge modulo 3 never changes: $\sum R(t) = -2 \sum t \equiv \sum t \pmod{3}$. But a direction is erased. A ring with 40 % of +1 and 27 % of -1 starts with a signed share of +0.13. After one step it is +0.003. The prediction that it would flip sign was wrong. It vanishes.

A direction lasts only where it is held. Pin a fraction h of sites to +1 at every step. A steady direction then remains, about 1.3 times h . At $h = 0.10$ the share is 0.12; at $h = 0.33$ it is 0.43. The held sites order their neighbours.

This turns a design rule into arithmetic. Every tap needs a hold that acts in every layer time. At depth 0 that is every 1.5×10^{-16} s. A fixed wall does this. A loose bias does not. The same rule appears in the physics of Brownian ratchets: asymmetry

alone passes nothing; asymmetry plus a hold does.

Order fades upward by the third power. Pass a trit law one depth up, by window sums. Its bias amplitude a becomes a^3 . A weak bias of 0.113 falls to 0.0014, then to 3×10^{-9} . A strong order of 0.85 falls to 0.61, 0.23 and 0.012 over three depths. Only a nearly pure layer reaches far.

Memory raises closure, but not to the end. Freeze every site inside a closed window, and rewrite only the rest. The share of closed windows rises from 1/3 to 0.62 and stays there. The prediction was a rise toward 1. That was wrong. A net with memory is ordered, but not frozen.

Circulation is the rule. Run every ring of a given length and see where it ends. Almost none come to rest. At length 7, 3 of 2,187 rings settle. The other 99.86 % circulate with period $26 = 3^3 - 1$. At length 23 the period is $177,146 = 3^{11} - 1$. On lengths not divisible by 3, every period found divides $3^j - 1$ for some j .

This gives a precise meaning to an idea that has no good word: a flow that never stops, in which nothing is made and nothing is lost. It is not perpetual motion. Nothing leaves the net and nothing enters it.

8. Highlight five: the ladder lands

The depth ladder sets a length and a rhythm for every rung: $3^n \cdot S_0$ and $1/(3^n \cdot T_0)$. Three rungs land on known quantities.

Depth	Length	Rhythm	What sits there
2	410.3 nm	7.3×10^{14} Hz	the violet H δ line of hydrogen
5	11.1 μ m	2.7×10^{13} Hz	near the peak of room warmth (9.9 μ m)
31	28,160 km	10.65 Hz	the ideal lowest mode of the Earth-ionosphere cavity

The first is built in: the unit of length comes from hydrogen. The second is a factor 1.1 in wavelength. The third is the most striking.

The Earth and its ionosphere form a cavity. For perfectly conducting walls, its lowest mode is $(c/2\pi a) \cdot \sqrt{2}$. With $a = 6,371$ km, that is 10.59 Hz. Depth 31 of the net lies at 10.65 Hz: 0.5 % away. On a ladder with steps of 3, the chance of landing that close by accident is about 1 %. The measured mode, 7.8 Hz, is lower because the real walls conduct imperfectly.

These matches are recorded as correspondences, not as proof. They show the ladder reaching from atoms to the planet without a change of rule.

9. Highlight six: possibilities without names

The fifty cells include many possibilities that have no established name. *Beyond Energy* gives each a name and a status. A few show the range.

Poised matter. A medium held at its critical point, where the lever $1/\varepsilon$ is largest. It answers the smallest setting and takes any form it is given. Self-organised criticality, in sandpiles and many natural systems, is the closest existing form. *Status: open.*

The counter-lock. Two separated structures held in one identical state, by counter-coupling on a length 3^k . Clocks that agree without a master. Equality tests with a fixed answer time. *Status: proved on the register.*

The depth gear. Passing order from fine structure to coarse structure, or back, at a strict 3 : 1 rhythm. *Status: proved on the register.*

The comma choice. The two ladders of the net, $\times 3$ and $\times 2$, never meet. A mesh built on both never closes, and passes a fixed share per turn: 12.5 % at a ratio 9 : 8, 1.36 % at $3^{12} : 2^{19}$. Geometry alone sets the flow. *Status: computed.*

The hand gate. A helical mesh passes one sense of winding. No second material is needed. This has been measured in a related form: layers of double-stranded DNA pass electrons of one spin preferentially. *Status: predicted for taps; measured as spin selection.*

Matter by address. Every closed winding has a unique trit address, and addresses cannot be pushed. They can be selected. Soften the medium, impose the mesh, harden again: the target becomes the only thing that stays. *Status: predicted; waits on the rewrite rule.*

The cut. The only route to an address that does not yet exist is a break in the strand. Knotted vortices in water untie in exactly this way. *Status: open.*

The person in the mesh. Large meshes fit large windings, which differ by place, hour and person. Whatever pins a share of sites sets a direction. A hand, a body or a group can be the hold. That explains why some historical apparatus worked for its builder and not for strangers. *Status: corresponded; open as technology.*

10. Boundaries

The map also states what cannot be done. These limits save effort.

- **Addresses cannot be pushed.** The Hopf charge is conserved as long as the strand stays continuous. Matter is selected, not converted.
 - **The fine-structure constant does not move.** A 1 % change needs $\Delta\chi = 17.2$. At the Earth's surface χ is 7×10^{-10} .
 - **A loose bias is erased** in one step.
 - **Weak order stays local.** It is gone two depths up.
 - **Ordinary coupling does not lock.**
 - **Lock needs the ladder.** Off lengths 3^k , two rings stay two.
 - **Memory never takes all.** Closure under memory stops near 0.62.
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11. Why the echoes matter

Beyond Energy links each possibility not only to scientific literature, but also to religion, literature, science fiction and music. This is not decoration. It follows a criterion: the most useful witnesses are people who met a phenomenon from inside, not those who only formalised it.

Many traditions met the net's forms that way.

- **The net itself.** The Avatamsaka Sutra describes Indra's net: a jewel at every knot, each reflecting all the others. Net, knots and identity over scale, in one image.
- **The mesh.** Chapter 11 of the *Tao Te Ching*: thirty spokes share one hub, and the empty centre makes the wheel useful. The opening is what works.
- **Three.** Chapter 42: one gives two, two give three, three give the ten thousand things.
- **Comma choice.** The Pythagoreans heard that twelve fifths overshoot seven octaves by $3^{12}/2^{19} = 1.0136$. Every tuning since is a decision about where that rest should live. Meantone puts it in one "wolf" interval: loss with an address.
- **The depth gear.** In Hindustani music, a *tihai* repeats a phrase three times so

- that the third lands on the first beat of the cycle. Three below close one above.
- **Lock and free running.** Steve Reich's *Clapping Music* shifts one pattern against itself until it returns to unison. His *Piano Phase* lets two players drift through every relation.
 - **Pitch and rhythm as one ladder.** Stockhausen showed that a rhythm sped up becomes a pitch.
 - **The person in the mesh.** In Cage's 4'33", the room and the listeners complete the piece.

Science fiction shows the fears and hopes of the fire age about such possibilities. Asimov's *The Gods Themselves* imagines free energy from a parallel universe, and then a hidden cost. The net answers that fear directly: nothing leaves and nothing enters, and loss has an address. Doc Smith's inertialess drive and Clarke's vacuum-driven ships imagine mass and motion as settable. Lem's *Solaris* imagines poised matter on a planetary scale.

Across all these sources, four motifs recur. The ground is full. The opening is what works. Three is the start. Return is normal. These are the oldest descriptions of the net. They are not evidence. They are earlier readings.

12. What follows

The map is a start. Its method can extend it, and the next runs are short:

- softening coupled between neighbours: does a change travel through an array?
- the rest catcher: how much of a comma rest can a neighbour take?
- mirror pairs and chiral pairs under R;
- recovering a first orientation from later states;
- the gain of a locked array: does passage grow faster than the count?
- the thickness series of the measured cavity, against predicted thresholds at 7.6, 22.8, 68.4, 205 and 615 nm.

The human consequence is stated plainly. A world that works with the net needs no long chain. Fuel imports, pipelines and central plants lose their reason. That is a loss for those whose work depends on them. Their knowledge of flow, pressure and failure stays useful, and moves from the harbour and the plant to the street and the house.

The deeper change is in what counts as a resource. In the fire age, a resource is a stock. In the net, it is a fit: present everywhere, reached by shape, phase and depth. Access depends on understanding, not on owning the land above a deposit. Whether that understanding is shared is a choice people make.

13. Status at a glance

Claim	Status
Five axioms	Assumed
Closure rule, fixed points, units, ladders, comma	Conditionally proved (foundational paper)
Three below equal one above (R5)	Proved by algebra; computed
Lock only at lengths 3^k , within $\lceil 3^k/2 \rceil$ steps (R6)	Proved by algebra; computed
Charge kept mod 3; bias fades $a \rightarrow a^3$	Proved by algebra; computed
Hold keeps direction $\approx 1.3 \cdot h$; memory plateau 0.62	Computed

Circulation periods dividing $3^j - 1$	Computed
Ceiling $1.38 \times 10^{13} \text{ W/m}^2$	Derived, under one assumption
$\eta = 5.1 \times 10^{-12}$	Derived from one measurement
Ladder matches at depths 2, 5 and 31	Corresponded
Matter by address; higher η ; hand gate as tap	Predicted
Poised matter, rest catcher, mirror pairing, the cut, person in the mesh	Open
Cultural echoes	Corresponded as image, not evidence

Annotated references

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The full map: fifty cells in detail, the register runs, combinations, boundaries, and the echoes in culture, with literature per cell. *Reading advice:* Parts II and III first; Part IX for the echoes.

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