Laws as Bygone Glory

Toward a Context-Sensitive Physics

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A synthesis essay and personal framework — a way of reading a century of physics, mathematics, and philosophy as pointing toward one conclusion: that what we call "laws of nature" are not eternal truths but context-bound regularities, and that the deepest context of all is a vacuum that is fractal to its core.

I. The Conformists at the Fork: Lorentz and Heaviside

Every story of modern physics as a search for eternal law has a beginning, and the beginning was a choice — one made not by the boldest minds available, but by those willing to bend their own reasoning back into line with the crowd.

In 1887, Michelson and Morley tried to detect the Earth's motion through the "luminiferous ether." They found nothing. Hendrik Lorentz had, in hand, the beginning of a genuinely context-sensitive account: objects moving through a medium contract along their direction of motion, so what you measure depends on your local relationship to that medium. This was a live, mechanistic idea — space as something with structure, measurement as something conditioned on where and how you move through it.

Lorentz did not carry that idea to its conclusion. He reached instead for the vaguest possible placeholder — an "ether" with no specified density, no composition, no independently measurable property beyond the one effect it was invoked to explain — and left it there, undeveloped, easy to discard. When Einstein discarded it in 1905 and replaced it with a bare postulate (the speed of light is constant, full stop, no mechanism required), Lorentz did not resist. He adopted the new orthodoxy. A man who had glimpsed a context-dependent universe folded back into the safety of consensus rather than push the medium-based picture toward something specific enough to defend.

Oliver Heaviside compounds the pattern from another direction. Maxwell's original equations, elaborated with the aid of quaternions, retained a structure — scalar and vector bound together — that carried more relational information than the field equations that replaced it. Heaviside, finding quaternions "antiphysical and unnatural," stripped that structure out and rebuilt Maxwell's twenty equations as four vector equations — clean, teachable, and stripped of exactly the kind of internal structure a context-sensitive account of matter and field would later need. He won the argument in the pages of Nature against Tait's defense of the older, richer formalism, and the simplified form became the only one anyone was taught. What was lost in that simplification

was not noticed for a century — until physicists like Peter Rowlands began deliberately working their way back to the algebra Heaviside discarded, in search of exactly the structure his simplification had erased.

Neither man set out to block innovation. Both had, in their hands, the beginning of something that could have stayed open — a medium, a richer algebra — and both let it collapse into whichever version was easiest to defend to their peers. That is the pattern this essay is built to reverse: not to prove a rival theory correct, but to refuse the reflex that trades a genuinely open, context-sensitive idea for whichever version survives contact with consensus.

II. What the Vacuum Already Told Us: Sakharov and Volovik

Andrei Sakharov's 1967 theory of induced gravity reopened a door the Lorentz-to-Einstein handoff had closed. Sakharov proposed that gravity is not a fundamental force at all, but a macroscopic byproduct of quantum field fluctuations in the vacuum. Newton's constant G falls out of the calculation not as an input but as an output, determined by which quantum fields happen to populate the vacuum and how they respond to curvature. Change the field content, and G changes with it. Gravity is not imposed on spacetime from outside; it is a local property of the medium.

Grigory Volovik extended this into a full research program: Superfluid Vacuum Theory. The vacuum behaves as a quantum liquid — modeled on the superfluid phase of Helium-3. Lorentz invariance itself turns out, in Volovik's framework, to be an emergent, low-energy property of this underlying fluid. Push toward higher energy, closer to the fluid's own microscopic scale, and Lorentz invariance stops holding. What looked like an eternal law is a local habit of a medium in a particular regime — precisely the kind of specific, mechanistic account Lorentz's own ether never became.

III. Matter as Structure: Williamson, van der Mark, and Rowlands

If gravity dissolves into a medium property, the particles inside that medium cannot be exempt. In 1997, Williamson and van der Mark proposed that the electron is not a point particle but a photon confined into a toroidal structure by two rotations per wavelength — reproducing spin, relativistic mass corrections, and the electron's characteristic internal oscillation. What looks like an elementary, structureless particle turns out to be a self-organizing pattern of light — a knot, not a point.

Peter Rowlands' nilpotent quantum mechanics goes further, deriving mass, charge, spin, and the Dirac equation from a self-referential algebraic process — explicitly recovering the richer, quaternion-adjacent structure Heaviside discarded. Both programs share the same spirit as

Sakharov and Volovik: what looks like a fixed, external law is an emergent consequence of a deeper, self-organizing process.

IV. The Ungraspable: Spencer-Brown, Kauffman, and the Tao

Every account so far still risks the same trap that caught Lorentz: reaching for a placeholder — a medium, a substrate — and treating it as if naming it were the same as understanding it. Louis Kauffman's work, following George Spencer-Brown's Laws of Form, refuses that trap from the start.

Spencer-Brown begins with nothing but a single instruction: draw a distinction. Not a particle, not a field, not a spacetime — only the primitive act of separating an inside from an outside. Kauffman shows that when such a distinction is allowed to re-enter itself — to refer back to its own act of distinguishing — it generates oscillation, and oscillation generates the recursive structures (iterants, eigenforms) from which stable form can arise. An eigenform is a solution to $X = F(X)$: a thing that is produced by its own process of being observed, rather than a fixed object waiting to be found.

This is where Kauffman reaches for the Tao Te Ching's opening image: the Tao that can be named is not the eternal Tao. What is most fundamental is not capturable as a static object or a fixed postulate — it can only be pointed at through the process that keeps generating it. This is not vagueness in the sense Lorentz's ether was vague — an empty placeholder nobody could specify. It is a different kind of precision: the recognition that the ground of things is a process, not a thing, and that trying to freeze it into a named substance (an ether, a postulate, a particle) is exactly the move that produces false eternal laws in the first place.

This gives the present framework something Lorentz's ether never had and Einstein's postulate never wanted: a foundation that is rigorous without being static — self-generating structure in place of either a vague medium or a bare axiom.

V. The Fractal Vacuum

Pulling these threads together: if particles are windings (Williamson–van der Mark), and if the ground of things is recursive, self-referential process rather than a fixed substance (Spencer-Brown/Kauffman), then there is no principled reason for the winding to stop at one level. A winding built from a self-referential process should, at smaller scale, be built from the same kind of process again — windings within windings, the identical recursive act repeating at every scale it touches.

This is the core of the present thesis: physical laws are context-dependent, and the context is the vacuum itself — a fractal medium, beginning at the smallest conceivable scale and repeating its own generative structure upward, through particles, through fields, through the effective geometry that Sakharov and Volovik showed is itself only a local, emergent habit of that same medium. What we call "the universe" is, on this reading, extremely simple in its essence: one recursive act of distinction, applied to itself without end, whose accumulated windings-within-windings are what we mistake for separate laws governing separate domains.

VI. Conclusion

Lorentz and Heaviside each stood at a fork with something genuinely new in hand — a medium, a richer algebra — and each let it go rather than defend it against consensus. Sakharov and Volovik show, a century later and independent of any of this, that a medium-based account of gravity and relativity is not only possible but rigorously workable. Williamson, van der Mark, and Rowlands show the same for matter itself. And Kauffman, reaching back through Spencer-Brown to the Tao, supplies what none of the earlier medium-based attempts had: a way to ground all of this in something that does not need to be named as a fixed substance to be real — only followed as a process that keeps producing itself, at every scale, fractally, all the way down.

Laws, on this reading, were never the eternal truth waiting to be found. They are the visible residue of one recursive, self-generating process, mistaken — through a century of choosing consensus over the harder, unfinished idea — for something fixed and final. A bygone glory, not because the process stopped, but because we stopped looking for it once we had a simpler story to agree on.

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