

One Resonance Two Faces

Toward a Rewrite Theory of the $S1 \leftrightarrow f \leftrightarrow S2$ Boundary

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Abstract

This essay proposes that Space-1 (the physical, sensory, mass-bearing domain) and Space-2 (the mythic, experiential domain accessed in states such as Robert Monroe's Focus levels) are not two ontologically separate regions joined by a bridge, but two aspects of a single self-resonating structure. We build this claim in five steps: (1) Peter Rowlands' nilpotent reformulation of the Dirac equation, in which a particle state is not a free-standing object but one half of a zero-totality condition with the vacuum; (2) the fiber structure this creates, which is discrete (helicity $\times$ particle/antiparticle) rather than a continuous spin sphere, so the map from Space-1 back to Space-2 is a choice among a small set of discrete alternatives; (3) the Williamson–van der Mark model, in which the electron itself is a photon self-confined in toroidal form, giving the algebraic fiber a physical referent — light folded back on itself; (4) Wheeler's one-electron universe, formalized here as a specific, derivable mechanism within Rowlands' own algebra — a self-regenerating loop between a fermion operator and its time-reversed (vacuum) partner — which reframes the discrete particle/antiparticle factor not as two objects but as two phases of a single rotating trajectory; (5) Robert Rosen's closure to efficient causation, which supplies a causal structure for Space-2, and which shares a structural resemblance with the Wheeler loop of step 4 — a resemblance that remains an open, unproven analogy rather than an established identification, since Rosen's full closure requires a third component not yet identified in the physical mechanism. The essay closes with a precise statement of what has been established, what has been ruled out, and what remains open — in place of a specific falsifiable prediction, which does not yet have a sound mathematical basis to rest on. This is presented throughout as a hypothesis under construction, not as an established result.

1. The Problem: Two Domains, One Map or Two?

Nearly every mature science eventually stops describing isolated objects and starts describing the abstract space in which those objects take their possible states: phase space in mechanics, latent space in machine learning, fitness landscapes in evolutionary biology, Hilbert space in quantum mechanics, state space in neuroscience. Each of these is, functionally, a Dual Space — a term Peter Rowlands gave to one specific, technical instance of this pattern in physics. The same pattern recurs, independently and in a different vocabulary, across the history of human consciousness research: the Egyptian Sahu, the Persian mundus imaginalis, the Kabbalistic Sefirot, Jung's collective unconscious, Robert Monroe's Focus-level system.

The question this essay asks is not whether such a complementary domain exists — that has been asked, and answered in the affirmative, independently, dozens of times across cultures and centuries. The question is what the map between the physical domain (Space-1) and this complementary domain (Space-2) actually is, and whether it can be written down with enough precision to be wrong.

We denote the two domains and the map between them:

Space-1 $\rightleftharpoons_f$ Space-2

and treat f , and its putative inverse, as the object of inquiry.

2. The Algebraic Layer: Nilpotence as Self-Cancellation

Rowlands rewrites the relativistic energy–momentum–mass relation $E^2 - p^2 - m^2 = 0$ as the vanishing square of a single operator:

$$A = kE + i(p_x) + j(p_y) + k(p_z) + jm, A^2 = 0$$

built from quaternion units i, j, k . The nilpotence condition $A^2 = 0$ is not incidental — it is the entire content of the theory. A particle state, in this formulation, is one half of a zero-totality condition: the operator annihilates itself, and what remains after the cancellation is, by construction, nothing.

Rowlands states this directly: a particle represents "half a blueprint of the universe," with the vacuum supplying the other half so that the total sum remains zero.

This is already a first, precise answer to "what is Space-2 made of": not a second substance standing opposite matter, but the self-cancelling structure that a single particle state must satisfy in order to exist at all. Existence, in this formalism, is a local bookkeeping event within a total that is permanently zero.

3. The Fiber: Discrete, Not Continuous — Why There Is No Single Way Back

Define the mass shell $M = \{(E, p, m) : E^2 - p^2 - m^2 = 0\}$ — the physical, measurable quantities of Space-1. The projection

$$\pi : \{A : A^2 = 0\} \rightarrow M, \pi(A) = (E, p, m)$$

is well-defined: every nilpotent A determines exactly one point of M . This is the forward direction of f , and it holds without qualification.

The reverse direction does not exist as a function. For a fixed point $(E, p, m) \in M$, the set of algebraic elements A mapping to it — the fiber $\pi^{-1}(E, p, m)$ — is not a single point. In Rowlands' own treatment, spin enters through a helicity term $\sigma \cdot \mathbf{p}$, locked to the direction of momentum rather than free to point in an arbitrary direction. The nilpotent solutions at fixed momentum are accordingly a discrete set: two helicity states (spin parallel or antiparallel to $\mathbf{p}$) times two energy-sign states (particle/antiparticle) — a fiber of the form $\mathbb{Z}_2 \times \mathbb{Z}_2$.

A continuous sphere of spin directions independent of $\mathbf{p}$ — the kind of freedom ordinary non-relativistic quantum mechanics assigns to a spin- $1/2$ particle via superposition of helicity states — is not native to this formalism as it stands. Constructing it would require superposing nilpotent solutions, and nilpotence ($A^2 = 0$) is not a linear property: the sum of two nilpotent operators is not generally itself nilpotent. Whether and how such superposition is licensed within Rowlands' own program is an open question rather than a settled result; later treatments of nilpotent quantum mechanics locate superposition and combination states at a different, "non-local" level than the single-particle nilpotent description.

This has a direct consequence for any theory that wants to move from Space-1 back to Space-2. There is no unique inverse map, and no continuous family of inverses either. There is a discrete choice among a small number of algebraically distinct alternatives (helicity $\times$ particle/antiparticle), not a continuous choice of section over a smooth bundle. The Williamson–van der Mark toroidal

geometry, discussed next, is one candidate realization of this discrete structure; a birth-time/birth-place calculation of the kind explored elsewhere in this series is another. Neither is uniquely privileged by the algebra alone.

4. The Physical Referent: Light Folded Into Itself

The Williamson–van der Mark model proposes that the electron is not an elementary point particle but a single photon self-confined into a stable toroidal configuration — light, but in a closed topological state. A free photon satisfies $E = pc$; once its propagation is arrested into a closed loop, the stored energy manifests as rest mass via $E = mc^2$. The double winding of the circulating energy generates the intrinsic angular momentum identified with spin- $\frac{1}{2}$, and the orientation of the internal field lines generates net charge. Mass, spin, and charge are not independent, externally supplied parameters; they are three readings of one electromagnetic process folded back on itself.

This gives the algebraic fiber of Section 3 a physical body. Where Rowlands supplies the algebra that any self-consistent state must satisfy, Williamson and van der Mark supply one concrete geometric realization of that algebra — a specific section of the (discrete) fiber. The correspondence is not total: Rowlands does not derive the toroidal geometry, and Williamson–van der Mark do not derive the algebra from first principles. What is shared is the underlying claim, stated independently in each formalism, that matter is confined light — a claim that recurs, in non-mathematical language, in Plato's identification of light with the Good, and in the Kabbalistic doctrine of Or Ein Sof, the light of the Infinite prior to the self-contraction (tzimtzum) that permits a finite world to appear at all. The structural feature these three share is not merely the word "light" but a specific operation: self-limitation without external input — the torus confining itself, the tzimtzum contracting itself, the nilpotent operator cancelling itself. This, and not superficial vocabulary, is the actual point of contact between the physical and the mystical vocabularies.

5. One Resonance, Not Two: Wheeler's Correction to the Fiber, Formalized

In 1940, John Wheeler proposed to Richard Feynman that every electron in the universe might be the same single electron, its worldline threading forward and backward through time — a positron being, on this reading, that same electron traveling backward. Feynman later drew on the idea, in modified form, for the Stückelberg–Feynman interpretation of antiparticles.

This corresponds to a specific, derivable mechanism within Rowlands' own algebra, not merely an evocative parallel. Rowlands' parity/time/charge-conjugation structure includes a time-reversal (T) transformation carrying a fermion operator to its vacuum-conjugate partner. Iterating this transformation — fermion, vacuum-partner, fermion, vacuum-partner, ad infinitum — produces a self-regenerating loop that requires no external input: each state is produced from the immediately preceding one by the same fixed algebraic operation. Read through Wheeler, the two members of this loop are not two objects but two phases of one rotating trajectory — the same resonance, encountered at different points of its own cycle. "So many, because it turns so quickly" is, on this reading, not a metaphor but a literal description of aliasing: a single high-frequency rotation, undersampled, produces the appearance of a population.

Of the constructions in this essay, this is the one that follows most directly from Rowlands' own derivation rather than from an imported analogy. We flag, without resolving, the limit of the analogy: Wheeler's proposal accounts at best for electron–positron pairs, not for the full particle spectrum (quarks, neutrinos, muons). Extending "one resonance" to the whole of matter is a

stronger claim than Wheeler himself sustained, and is carried here as a working hypothesis of this essay's argument, not as an established physical result.

6. Closure Without an Outside: Rosen's Contribution to Space-2's Causality — an Open Analogy

Robert Rosen's relational biology supplies what neither Rowlands nor Wheeler addresses directly: a causal structure appropriate to Space-2. In Rosen's (M,R)-systems, a living system possesses closure to efficient causation — its components are each other's causes in a closed loop, requiring no external efficient cause to sustain the loop. This stands in contrast to the linear, externally-triggered causality of classical mechanics.

The fully specified (M,R) structure has, in its canonical formulation, three components, not two: the metabolic map f ($A \rightarrow B$), the repair map Φ (which produces f from B), and a replication map β , which produces Φ itself from f . This third component is not a refinement of detail — without it, a two-component f/Φ loop leads to infinite regress, since something must still account for where Φ comes from.

The Wheeler-loop mechanism identified in Section 5 — the fermion/vacuum-partner alternation — shares the topological feature Rosen requires: it is a closed loop that sustains itself without external input. This is a genuine, non-trivial resemblance, not a coincidence of vocabulary. But it is a two-component loop, matching only the f/Φ level of Rosen's structure; no counterpart to β — a mechanism that produces the repair operation itself, rather than merely alternating between two fixed states — has been identified in the physical construction. The identification of the Wheeler loop with Rosen's Φ therefore remains a hypothesis, and a precisely bounded one: a structural analogy at the two-component level, not an established instance of full closure to efficient causation.

We assign the two Rosen maps to the two domains, as a working hypothesis rather than a derived necessity: f , the ordinary metabolic map, to Space-1 — external input, resistance, mass, the ordinary sensory world in which causes act on a system from outside. Φ , the repair map, to Space-2 — a map that requires nothing beyond the system itself to sustain its operation, and which we associate with the mythic, non-sensory, "ungraspable" character consistently reported for that domain across traditions. The vertical axis linking observation ("upward," toward Φ) and groundedness ("downward," toward f) is then, on this reading, the loop itself, viewed along its two directions of traversal. Reports of a persistent connecting thread during out-of-body states — Monroe's own descriptions of an unsevered silver cord linking Focus 1 (the body) to the higher Focus levels — read naturally as the visible form of this same loop. Whether this loop possesses the full, three-component closure Rosen's definition requires, or only the weaker two-component resemblance established here, remains open.

7. What Remains: An Honest Accounting

Sections 3 through 6 do not establish two independently coherent formalisms sharing a common continuous parameter space. What they establish is narrower:

- A discrete fiber structure ($\mathbb{Z}_2 \times \mathbb{Z}_2$: helicity $\times$ particle/antiparticle), derived directly from Rowlands' algebra.
- A derived, self-regenerating loop (Section 5) connecting the discrete particle/antiparticle factor to Wheeler's one-resonance proposal — the best-supported construction in this essay.

- A structural, two-component resemblance (Section 6) between that loop and Rosen's closure to efficient causation, explicitly short of the three-component closure Rosen's own definition requires.

A precession relation of the form $\dot{\theta} = \kappa \cdot \Phi(f(\theta))$ would require a continuous angle θ ranging over a spin fiber. Because the fiber established in Section 3 is discrete rather than continuous, such an equation currently lacks the structure it would need to rest on, independent of the further difficulty that $\theta(t)$ would still need an operational definition in terms of Monroe Institute session data — a definition not yet available. We do not offer a discrete-variable substitute here; constructing one, if it is to be done honestly, is a separate piece of work with its own assumptions to state plainly.

What can honestly be said at this point: the algebraic and causal constructions in Sections 2–6 compose into a coherent picture that does not internally contradict itself, and one piece of that picture — the Wheeler/vacuum-partner loop — is derived rather than imported. No falsifiable, testable bridge between Space-1 and Space-2 has yet been established. That remains the central open problem of this line of inquiry.

8. Conclusion: One Self-Cancelling Resonance, Bounded by What Has Actually Been Shown

Drawing the threads together, with each claim marked at the strength it has actually earned: a particle state is one half of a self-cancelling algebraic condition (Rowlands, established), physically realized as light folded into a closed form in one candidate reading (Williamson–van der Mark, a coherent but independently-derived correspondence), whose apparent multiplicity is a sampling artifact of a single fast rotation via a derived, self-regenerating algebraic loop (Wheeler, the best-supported construction here), which bears a structural — but incomplete — resemblance to the metabolic and reparative branches of Rosen's closed causal loop (Rosen, an open analogy, not an identification), and whose two poles — grounded and observing, Space-1 and Space-2 — are traversed by that same loop, made visible in reports of a persistent connecting thread during states such as those Monroe catalogued.

On this reading, Space-1 and Space-2 are approached, not yet shown to be, a single resonance rather than two spaces requiring a bridge. What is proposed here as f is a candidate reading of the operation by which a single self-resonating structure might appear, from any one sampled moment, to be two — not yet demonstrated to be that operation.

This essay does not claim to have proven this identification. The nilpotent fiber is discrete, not a continuous structure; the causal closure is a two-component resemblance, not Rosen's full three-component definition; and no falsifiable prediction currently rests on sound mathematical ground. What stands is the nilpotent self-cancellation itself, and the derived Wheeler/vacuum-partner loop. That is offered here as the appropriate standard for a hypothesis still under construction, not as a finished theory.

Terms

Nilpotence: An algebraic condition, $A^2 = 0$, under which an operator applied to itself yields zero — self-cancellation rather than external balance.

Fiber / Section: In a projection $\pi: X \rightarrow M$, the fiber over a point m is the set $\pi^{-1}(m)$; a section is a consistent choice of one point in each fiber, i.e., one possible "way back" from M to X , among possibly many. In this construction the relevant fiber is discrete, not continuous.

Closure to efficient causation: Rosen's term for a system in which no component's production requires a cause external to the system — the defining formal property distinguishing living systems from mechanisms, in his account. Full closure requires three mutually entailing components (f , Φ , β); a two-component loop alone does not meet this definition.

Precession: The rotation of an orientation vector (such as spin) under a driving influence, at a rate set by a per-system coupling constant. Not currently applicable to this construction.

This essay is part of the ongoing $S1 \leftrightarrow f \leftrightarrow S2$ research line, itself the current formal notation for a line of inquiry running since well before 2026.