STANDALONE CLAIMS DOCUMENT

Claims and Derivations

The method, the twelve derivations,
the definitions, and one runnable test

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Purpose. This document exists to be timestamped and read on its own. It contains the framework's method and its derivations, separated from the evidence they land on, so that a reader can re-run each chain *before* seeing what it lands on.

Companion to *The First Filter* (Volume I) and *Photons as a Microbial Readout* (Volume II), which contain the supporting material, the evidence register and the sources.

Confidence marks. ✓ verified against a source ° from memory, verify ≈ own estimate ⋆ no literature known ▷ prior work

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Contents

§1

The method

1.1 Night science

The framework was not built by hypothesis-and-test. It was built by looking at the existing body of evidence for pattern, and then constructing a theory that orders it — the mode Jacob called *night science*, and the mode in which *Origin of Species* was written.▷

That distinction matters for how the claims below should be read. They are not hypotheses awaiting first contact with data. **They are re-interpretations of evidence that already exists**, and the test of a re-interpretation is whether it orders more of the existing record than the account it replaces.

1.2 The inversion

The operation. Do not ask what the ancestor was. Ask what regime produces the observed output as its attractor.

Three knowns, one unknown:
— the outcome (extant biology)
— the genetics at $t \approx 4\,\mathrm{Ga}$ (reconstructed ancestral gene sets)
— the geological and environmental record
⇒ **solve for the selection pressure.**▷

This is facies analysis applied to a biochemical object. Geology's characteristic operation is reading a depositional environment off a preserved product — nobody observed the tidal flat; the desiccation cracks are read backwards to it. Every conserved trait in LUCA is treated the same way: as a preserved feature whose function is to constrain the environment that made it.

Wood–Ljungdahl is a desiccation crack. Universal chemiosmosis is an evaporite lamina.

1.3 The rule for presenting a derivation

A derivation cannot be dredged

Pre-registration exists because a *dataset* can be dredged. **A derivation cannot be.** If the chain is stated, references nothing in the target dataset, and a reader can re-run it and arrive at the same coordinate, then whether the author thought of it before or after looking is evidentially irrelevant.
Nobody pre-registers that general relativity predicts perihelion precession. You show the derivation; the reader re-runs it.

Therefore: derivation first, coordinate second, data third. Never the reverse. Reproducible beats witnessed.

§2

The twelve derivations

Each is a chain. **None references the observation it lands on.** Read the chain, decide where it should land, then read the landing.

D1 — The gradient pre-existed the cell.
chemiosmosis is universal ⇒ ancestral ⇒ an ancestral mechanism was not invented by its descendants ⇒ **the proton gradient was environmental before it was biological.**
Lands on: alkaline vent geochemistry as the only setting supplying one.▷

D2 — Ignition requires redundancy.
you cannot select for a thing that does not yet exist ⇒ novelty must be built from components selected for something else ⇒ a *repurposable* component is required ⇒ **redundancy is the precondition**, supplied by merger (outside), duplication (inside), or conversion (the arrow between).
Lands on: the C-value paradox; whole-genome duplication preceding radiations; Ohno.★

D3 — FUCA must be a poly-extremophile.
Pandæmonium drives every axis at once ⇒ the filter is defined by whatever tolerated all axes ⇒ **the survivor is necessarily poly-extremophilic**, by construction rather than by accident.
Lands on: LUCA's reconstructed thermophily as a *relaxation* from something harder. Tested in §4.▷

D4 — The carrier must become less reactive over time.
high throughflow ⇒ synthesis outruns loss ⇒ the scarce thing is chemistry happening ⇒ a reactive carrier wins.
falling throughflow ⇒ loss bites ⇒ the scarce thing is information retained ⇒ an inert carrier wins.
⇒ **carrier reactivity falls monotonically as planetary chao falls.**
Lands on: sugar → RNA → RNA-protein → DNA; and DNA as RNA with the 2′-OH removed — deactivation for fidelity.★

D5 — Two sweeps, from the homology pattern alone.
an endogenous sweep ⇒ all descendants inherit *one* solution ⇒ universal and homologous.
an exogenous pressure ⇒ each lineage solves separately ⇒ convergent and non-homologous.
translation is universal and homologous; DNA replication is neither ⇒ **two events, at two depths.**
Lands on: the replicase non-homology the field calls an enigma.★

D6 — Homochirality is a date, not a puzzle.
before a sweep both enantiomers are present and neither is privileged ⇒ a selective sweep consumes one ⇒ **observed homochirality timestamps the sweep** rather than requiring a chemical cause.
Lands on: the mutually contradictory chiral-catalysis results, which stop contradicting.▷

D7 — The freeze postdates the first chiral residue.
glycine is achiral ⇒ a code containing only glycine has no handedness ⇒ there is nothing to freeze ⇒ **the chirality lock dates to the recruitment of the second amino acid.**
Lands on: alanine, whose acceptor-stem identity is a single wobble pair.★

D8 — Specialists die in events that liberate generalists.
canalisation deepens a channel ⇒ the lip is the threshold ⇒ **canalisation depth *is* threshold height** ⇒ the same perturbation overtops a shallow channel and not a deep one.
Lands on: selective extinction of specialists at every mass extinction in the record.▷

D9 — Punctuation tracks acceleration, not magnitude.
adaptation has a response time ⇒ a *steady* change is trackable at any speed ⇒ an *accelerating* change is not ⇒ d^2**chao**$/\mathrm{d}t^2$ **decides who passes the filter.**
Lands on: punctuated equilibrium, whose punctuation has lacked a mechanism since 1972.★

D10 — Nodes saturate, edges proliferate.
component space is finite ⇒ exploration saturates ⇒ **novelty must move from components to relations.**
Lands on: the protein-fold plateau beside rising regulatory complexity; a fixed Hox set beside diversifying body plans; segmentation then differentiation.★

D11 — Generation without retention gives unpaired disequilibrium.
closing a cycle requires something to persist long enough to close it ⇒ no retention means no closed loop ⇒ **only unpaired, non-cyclic, throughflow-driven signatures are possible.**
Lands on: Venus, and a discriminator for 2026+ missions.★

D12 — Stress machinery must be deeper than metabolic machinery.
the filter selects for surviving the *transition*, not for performing in either regime ⇒ the survivor's machinery is transition-tolerance machinery ⇒ all extant life descends from that survivor ⇒ **transition-tolerance should be more deeply conserved than regime-specific machinery.**
Lands on: chaperones and repair systems among the most conserved proteins known, while carbon fixation runs by six pathways.★

The consolidated derivation — the 1.57 Ga coordinate

Stated separately because it is the one that lands on a *date*.

1. Endosymbiosis is an ignition event and therefore requires a selective pressure (D2). "They cozied up" is not one.
2. The mitochondrion is the capture of an oxidising gradient. A gradient can only be captured once it exists ⇒ mitochondrial establishment sits at the appearance of that gradient.
3. The chloroplast is the capture of the *inverse* gradient — carbon fixation under the opposite redox direction.
4. An inverse-gradient capture cannot precede the gradient it inverts ⇒ **chloroplast establishment follows mitochondrial establishment in forced order.**
5. Establishing a new throughflow path re-cuts the network ⇒ a threshold event ⇒ a geochemical signature.
6. The gradient is inverted ⇒ **the signature is analogous and opposite in sense.**
7. ⇒ *there should be a carbon/redox excursion marking the chloroplast crossing from captured to established, in the Mesoproterozoic.*

Nothing above names a formation, a proxy, or a coordinate more precise than "Mesoproterozoic." Re-run steps 1–7 and arrive independently.

§3

Definitions

The framework's definition of life is **decomposable**, and the decomposition is what does the work. Most definitions fail because they are conjunctions of properties: an edge case either satisfies all of them or does not, and the answer is unhelpful either way.

Life — a **dissipative structure** held above threshold by sustained **throughflow**, carrying a **heritable carrier** through persistence-filtering.

Three separable terms. Substrate-neutral, because none of them names a chemistry.

Biological life — the above, realised by **self-assembly of supramolecular systems**: amphiphile compartments, template polymers, catalytic macromolecules.▷ One instantiation, not the category.

3.1 The virus case, which is the proof

Separability resolves what conjunction cannot

Standard definitions use single properties and produce contradictions: metabolism → no → not alive; evolution → yes → alive.
This definition decomposes, so it can say cleanly what a virus *is*: **a free heritable carrier that must couple to an external dissipative structure in order to participate in life.**▷

It has the carrier term. It lacks the structure term. It resolves the lack by parasitising another system's.

The virus is not a borderline case the definition struggles with. It is a case the definition resolves — and it explains why the thing that confuses everyone else is confusing.

And because the terms are separable, coupling becomes a *gradient* rather than a binary:

Free virion — carrier, no structure. Coupling absent.

Lytic infection — carrier visiting a structure. Coupling brief, parasitic.

Lysogenic prophage — carrier integrated into the host's own heritable carrier, riding the host's throughflow every division. *More* alive than the free virion, because the coupling is continuous.

Endogenous retrovirus — coupling permanent. Syncytin, from a retrovirus, builds the placenta. **At what point did the viral carrier stop being a passenger and become part of the structure?** The definition answers: when the coupling became permanent.▷

And this is the same object as D2's conversion category. Lysogeny is how an exogenous source becomes an endogenous one. The definition's coupling gradient and the redundancy routes are one structure described twice — which is a consistency check the framework passes without having been built to.⋆

§4

One runnable test: D3 against extant poly-extremophiles

4.1 A correction first

LUCA is not gammaproteobacterial

Current reconstructions place LUCA as an **anaerobic, thermophilic, H_2-dependent, CO_2-fixing autotroph** running the Wood–Ljungdahl pathway, with Fe–S and Ni–Fe cofactors, chemiosmotic, and closest in physiology to **clostridia and methanogens**.° [Weiss et al. 2016 Nat Microbiol; Moody et al. 2024 Nat Ecol Evol]

Gammaproteobacteria are late-branching and largely aerobic, and include *E. coli*. The likely source of the confusion is either *E. coli*'s status as the model organism, or the *alpha*proteobacterial ancestry of the mitochondrion — which is a different lineage answering a different question.

This matters for the test below, because it changes the comparison set entirely.

4.2 The test

D3 says the survivor of an all-axes filter is *necessarily* poly-extremophilic. That has a consequence in extant genomes.

Prediction (P17). Extant poly-extremophiles should retain a larger fraction of the reconstructed LUCA gene complement than mesophiles do.*

Comparison set — poly-extremophiles with deep placement:
Methanopyrus kandleri (hyperthermophilic methanogen) · *Pyrococcus* / *Thermococcus* · *Thermotoga maritima* · *Aquifex aeolicus* · *Moorella thermoacetica* (thermophilic acetogen — Wood–Ljungdahl, the closest metabolic match) · *Picrophilus torridus* (acidophile) · *Deinococcus radiodurans* (radiation) · *Halobacterium* (halophile)

Controls: mesophiles matched for genome size and, critically, for phylogenetic depth.

The confound that will otherwise sink it

Deep-branching and extremophilic are correlated. *Thermotoga* and *Aquifex* are both deep *and* thermophilic, so a naive test cannot separate "retains LUCA genes because it branches deeply" from "retains LUCA genes because it is an extremophile." Run naively, the result is circular and a referee will say so.

The fix: sister-pair comparison. Compare *closely related pairs* in which one member is extremophilic and the other is not — same branch depth, different lifestyle. Within-pair difference in LUCA-gene retention is then attributable to lifestyle rather than to depth.

That is the version worth running. It is also the version a referee cannot dismiss.*

Secondary prediction, and the sharper one. D12 says transition-tolerance machinery should be deeper than regime-specific machinery. So within the LUCA gene set itself, **chaperone and repair families should show higher retention across *all* lineages than metabolic families do** — and poly-extremophiles should differ from mesophiles *most* in the metabolic fraction, least in the stress fraction.
Two predictions from one dataset, and they discriminate: a purely phylogenetic-depth explanation predicts no difference between the two functional classes.⋆

§5

Status

What this document claims. That the twelve chains above are derivable from stated premises, that they land on observations the field has published and not explained, and that the method which generated them is stated plainly enough to be audited.

What it does not claim. It does not claim pre-registration. It does not report executed results. The 1.57 Ga chain is offered as a **consistency result** — weaker than a confirmed prediction, stronger than a post-hoc match, because the chain is checkable and does not mention its target.

What would falsify the programme rather than a part of it. If the derivations systematically land on observations that turn out to have accepted mechanistic explanations already — that is, if the "unexplained" status of the landings is an artefact of the author's reading rather than of the literature — then the method is not doing work, and the framework reduces to a vocabulary.
That is checkable by anyone, and it is the honest global falsifier.