

Physics of Work (POW)

Internal analytical lens — work as the routing of exergy through constraints

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1. Physics of Work

An internal analytical lens: work as the routing of exergy through constraints, steered by information, filtered by selection, and reorganized by transition events.

- Start with [Purpose](#) and the [Glossary](#).
- The core is the [Analysis Protocol](#).
- Everything in Principles and Dynamics exists to make the lens sound.

Status: v0.1, internal, unvalidated.

2. Orientation

2.1 Purpose

2.1.1 What this is

A point of view for analyzing specific work. Given a role, process, task or system, the lens should answer:

- **What is it doing?** Which flow it touches, which constraint it builds or maintains, which information it applies.
- **What can change, and why?** Which levers exist, and what physical reason makes each one effective or not.
- **What does a change do?** Effects on the work result, team, organization, customers and economy, including sign, delay and who notices first.

2.1.2 What this is not

- Not a theory of meaning or purpose. Meaning is real for people, but the model describes physics "regardless of purpose and meaning".
- Not normative. It does not say what work *should* exist. It says what work does, what sustains it, and what a change will propagate.
- Not a theory of money. Money is treated as a metrics system, not a resource (see [Work Functions](#)).
- Not quantitative yet. Propositions are qualitative until key quantities have operational definitions.

2.1.3 Status and path to public

Stage	Exit criterion
Internal v0.x (now)	Protocol runs end to end on real cases
Internal v1	Several cases where lens output differed from the default view and proved right
Translation	Audience-specific versions (see Translations)
Public	Usefulness validated; claims tagged; lineage complete

2.1.4 Design commitments

1. **The invariant layer is physics plus selection logic.** Physics sets what can happen; selection logic (variation, heredity, differential persistence) sets what accumulates. Everything above can change. *Decided 2026-10-01 (Q12).*
2. **Collapse test.** A concept stays only if it changes how things collapse back to energy, exergy and dissipation. Detail that doesn't is cut.
3. **Reference system first.** Waste, value and selection are always relative to a named reference system.
4. **Tag every claim** as Established, Framing or Hypothesis.

2.2 Glossary

Locked terms. Change only by an explicit decision recorded in [Open Questions](#).

2.2.1 Physics

Energy : Conserved quantity (First Law). Never created or destroyed. No process, including evolution, changes energy totals.

Exergy : The part of energy that can still do work relative to an environment. Destroyed in every real process. "Using energy" means degrading exergy. Synonym in this repo: *free energy* (loosely).

Dissipation : Exergy destruction. The endpoint (equilibrium) is fixed by physics; path, rate and timing are not.

Gradient : A difference (temperature, concentration, pressure, charge, height, chemical potential) whose relaxation can do work. No gradient, no work.

Constraint : A structure that channels a gradient's relaxation into directed work instead of heat: a membrane, enzyme, machine, process, rule, institution.

Invariant layer : Physics plus selection logic. Everything else in the model (function costs, bottlenecks, work structure) can change.

Laws / boundary conditions : Laws are fixed. Boundary conditions (gradients, arrangements, constraints) are the setup the laws act on. Life and work change only boundary conditions.

2.2.2 Information and persistence

Information : Persistent, copyable constraint. A stored description of which constraints to build. Physical: costs energy to write, erase, maintain (Landauer).

Leverage : Ratio between the flow information steers and the flow needed to hold and apply it. Information is the control layer: a small flow steering a much larger one.

Routing : How exergy moves from source to sink: path length, number of work-doing steps, storage, timing.

Self-maintenance : A constraint or information carrier persists if it routes enough exergy into its own maintenance and copying.

2.2.3 Dynamics

Reference system : The bounded system relative to which value, waste and selection are judged. Always name it.

Selection : Differential persistence of constraint and information carriers competing for limited exergy. Acts through **selectors**, which act through **metrics**.

Selector : The actor or mechanism whose decision determines whether a carrier keeps receiving exergy (customers, capital, managers, labor market, regulators, competitors).

Metric : The measurement a selector actually uses. Can diverge from the real flow (proxy drift).

Variation : Generation of new candidate constraints for selection to filter. Always costs exergy up front for uncertain return.

Waste : Exergy destroyed without contributing to the maintenance, extension or steering of the reference system.

Slack : Surplus exergy above what the reference system needs to persist. Weakens selection.

2.2.4 Transitions

Function : One step in the routing chain: access, convert, store, copy, transmit, process, vary, select (plus maintain, steer, allocate at the work level).

Function cost : Exergy, time and constraint needed to perform one unit of a function. *Not yet operationally defined*.

Bottleneck : The function whose cost currently limits the whole chain.

Transition event : A step change (orders of magnitude) in one function's cost. Moves the bottleneck and reorganizes work.

Exergy event / information event : A transition that mainly increases flow (E) or mainly increases leverage (I).

3. Principles

3.1 Principles

The invariant layer: **physics** (P1–P10) plus **selection logic** (P11–P13). Compact by design: the purpose is precision, not persuasion. Each principle is tagged.

3.1.1 Energy and exergy

P1. Energy is conserved; exergy is destroyed. [Established] Every joule entering Earth leaves. What changes is quality: concentrated sunlight in (low entropy), infrared out (roughly 20 photons out per photon in). Work is exergy degradation.

P2. The endpoint is fixed; the path is not. [Established] With or without life, exergy ends dissipated. Life and work change path, rate, timing and which gradients are used.

3.1.2 Gradients and constraints

P3. Work requires a gradient plus a constraint. [Established] Energy alone is insufficient: a room at uniform temperature holds energy and can do no work. A constraint channels relaxation of a gradient into directed work.

P4. Many gradients are kinetically locked. [Established] Wood doesn't burn by itself; uranium doesn't split by itself. Opening locked gradients (catalysis in the broad sense) is a central thing life and work do.

3.1.3 Dissipation and life

P5. Life is a dissipative structure with heredity. [Framing] Like convection cells and storms, life persists only while energy flows through it. Unlike them, it stores a description of how to rebuild itself, so improvements accumulate.

P6. Life both dissipates and stores. [Established] Oxygen atmosphere, fossil fuels, seeds, fat: life creates gradients and defers dissipation. "Life maximizes dissipation" fails on these counterexamples; "life controls access to and timing of gradients" does not.

3.1.4 Information

P7. Information is physical. [Established] Erasing a bit costs at least $kT \cdot \ln 2$ (Landauer, experimentally verified). Memory, genomes, documents and models are physical states with maintenance costs, and they decay.

P8. Information is persistent, copyable constraint. [Framing] Following Kauffman, Deacon, Pattee. Shannon information is a different (statistical) notion; this repo uses the constraint sense.

P9. Information has leverage. [Framing] It is cheap to hold relative to the flows it steers. A ~20 W brain steers a body, tools and power plants.

3.1.5 Laws and boundary conditions

P10. Life and work change boundary conditions, never laws. [Established] Everything this model describes operates by rewriting gradients, arrangements and constraints, so fixed laws produce different outcomes.

3.1.6 Selection logic

P11. Selection logic is substrate-neutral. [Established] Wherever carriers vary, variations are copied, and carriers persist differentially under limited exergy, the population shifts toward whatever persists (Lewontin). It is not a physical law but a logical consequence, so it holds on any substrate: molecules, organisms, practices, organizations.

P12. Physics has no persistence criterion; selection logic supplies it. [Established] Thermodynamics says what can happen and at what cost. It does not say what accumulates. A convection cell neither maintains nor copies itself. Both layers are needed to explain life and work.

P13. Physics bounds what selection can produce. [Framing] Selection acts only on boundary conditions (P10), and every carrier pays maintenance and copying costs (P7). Selection cannot select its way past exergy limits.

3.1.7 Rough magnitudes (order of magnitude; verify before citing)

Flow	Approx. power
Sunlight absorbed by Earth	~120,000 TW
Global photosynthesis	~130 TW
Human primary energy use	~20 TW
Human body	~100 W
Per-capita primary energy, rich countries	~5–10 kW

4. Dynamics

4.1 Routing and Leverage

4.1.1 Routing

Evolution and work don't change *how much* energy flows or *where it ends*. They change **how it is routed**.

Aspect	Without evolution	With evolution
Energy in = out	Yes	Yes
Long-run exergy destroyed	~Same	~Same
Path	Few steps	Many work-doing steps
Storage	Short-lived, physical	Long-lived, chemical, informational
Sources	Mostly sunlight	Sunlight, geochemical, fossil, nuclear
Timing	None	Store, defer, release on demand

D1. Evolution routes exergy: longer paths, more work per joule, storage, timing control. [Framing]

4.1.2 The work–constraint loop

- Work builds constraints (a cell builds a membrane; a society builds a factory).
- Constraints channel work.
- Information records which constraints to build.
- Information decays, so it is itself a dissipative structure that must be maintained by the flows it steers.

D2. Information persists if it routes enough exergy into its own maintenance and copying. [Framing – central selection criterion] Increased dissipation is a frequent side effect, not the target.

4.1.3 Leverage

D3. Information is the control layer of dissipation. [Framing] A small flow (genome, brain, plan, code, policy) steers a much larger one. This is how evolution reshapes Earth's routing without changing Earth's energy budget, and why control and allocation work has disproportionate effects.

4.1.4 Open

- No accepted metric for routing complexity. Chaisson's energy rate density measures throughput, not routing. → [Open Questions](#)
- Leverage is directionally clear but not operationally measured.

4.2 Selection

4.2.1 Definition

Selection = differential persistence of constraint and information carriers competing for limited exergy.

Requires (Lewontin): **variation, heredity, differential persistence**. The logic itself is invariant (P11–P13); this chapter covers how it plays out in work systems.

D4. Selection favors whatever persists, not whatever is good for the larger system. [Established] "Good" enters only if the selector's measurement tracks it.

4.2.2 Selectors in economies

Selector	Claims to reward	Actually measures
Customers	Delivered value	Willingness to pay, retention
Capital	Expected future flow	Growth metrics, narratives, comparables
Managers	Contribution	Visibility, reports, proxies
Labor market	Capability	Titles, years, interview performance
Regulators	Safety, compliance	Documentation, audits
Competitors	(indirect) Relative efficiency	Share shifts

D5. Selection is only as good as its metrics. [Framing] Selection on proxies breeds proxy-optimizers. Gaming a metric changes the measurement, not the flow: a category error.

4.2.3 What weakens selection

- **Slack:** losing variants survive anyway.
- **Delay:** feedback arrives after cause and effect blur.
- **Noise:** measurement can't separate variants.
- **Proxy drift:** metric diverges from flow.
- **Size buffering:** large systems shield internal units.
- **No variation:** nothing to select between.
- **Capture:** selectors influenced by what they select.

4.2.4 Multi-level selection

D6. Lower-level persistence can undermine higher-level function. [Established in biology; Framing for organizations]

Biological suppression	Function	Organizational analogue
Germline separation	Only some cells reproduce	Central control of hiring and budget
Apoptosis	Self-destruction when not needed	Sunset clauses, kill reviews
Immune policing	Remove cheaters	Audits, zero-based budgeting
Shared fate	Cells reproduce only via organism	Equity, team-level rewards

4.2.5 Timescale mismatch

D7. Systems optimize for fast selectors and are destroyed by slow ones. [Hypothesis] Quarterly results, velocity and promotion cycles act fast; capability loss, debt and market shift act late.

4.2.6 Diagnostic

1. Who is the actual selector?
2. What do they actually measure?
3. How fast and how accurately does that track real routing?
4. What suppression exists against self-serving subsystems?

4.3 Variation

4.3.1 Definition

Variation = generating new candidate constraints for selection to filter. Costs exergy up front for an uncertain return, which is why it looks like waste from inside.

4.3.2 Sources

Source	Biology	Work	Cost per useful variant
Random	Mutation	Accidents, mistakes	High
Recombination	Sexual reproduction	Combining practices, cross-domain hires	Medium
Transfer	Horizontal gene transfer	Copying competitors, open source, consultants	Low; produces sameness
Directed	Rare	Modeling, design, experiments, simulation	Lowest

4.3.3 Cheap media

D8. Intelligence moves variation and selection into cheap media. [Framing] Evolution tests variants by building them and letting them die. Minds, models and prototypes test them before committing real exergy ("let our hypotheses die in our stead", Popper). Much knowledge work is variation and selection in a low-energy medium steering high-energy commitments.

D9. When variation becomes cheap, selection becomes the bottleneck. [Hypothesis] AI pushes variant generation toward zero cost. Scarcity moves to evaluation, judgment, grounding and accountability.

4.3.4 Balance

Variation	Selection	Result
Low	Strong	Efficient, brittle
High	Weak	Novelty without consolidation; waste
Cut as "waste"	Any	Loss of adaptability (common in mature orgs)

4.3.5 Stop point

Heredity in organizations (culture, playbooks, people) is looser than genetic heredity, which weakens selection. Further detail does not change the physics, so it is not expanded here.

4.4 Waste

4.4.1 Definition

Physics has no concept of waste: all exergy ends dissipated. Waste exists only **relative to a reference system**.

Waste = exergy destroyed without contributing to the maintenance, extension or steering of the reference system.

First question, always: *waste for whom, at which level?*

4.4.2 Apparent waste vs waste

Type	Mechanism	Verdict
Physical floor	Friction, engine limits, metabolism	Not waste; unavoidable
Search cost	Failed R&D, prototypes, rejected candidates	Not waste; price of finding gradients
Buffers / redundancy	Spare capacity, slack	Not waste; insurance
Coordination overhead	Meetings, reporting	Partly necessary; grows faster than headcount
Vestigial constraints	Outlived processes, roles, rules	Waste
Self-serving subsystems	Units routing flow into own persistence	Waste at higher level
Arms races / signaling	Competing for position, not flow	Collective waste, individually rational
Metric gaming	Optimizing the gauge	Waste (category error)

4.4.3 Mechanism

D10. "Work for work's sake" is a predictable result of nested selection. [Framing] D2 applies at every level: whatever routes exergy into its own persistence persists, whether or not it serves the whole.

D11. Waste grows with surplus and weak selection. [Framing] Abundant energy, capital or monopoly profit plus absent or poor feedback lets waste accumulate. Nature shows the same (peacock tails, arms races).

4.4.4 Deletion test

1. Which flow does it change (access, convert, maintain, steer, allocate, explore)?
2. If it stopped tomorrow, what would decay, and how fast?
3. Who notices first: the larger system, or only the subsystem?
4. Only the subsystem notices → likely self-serving.
5. Nothing decays for a long time → buffer (needed under stress) or vestigial (not needed under stress).

4.4.5 Evidence caution

Graeber's *Bullshit Jobs* claims are contested; later survey work (Soffia, Wood & Burchell, 2021) found much smaller shares (~5%) rating their jobs useless. Perceived waste ≠ actual waste.

4.5 Transitions

4.5.1 Model structure

LAYER 1 – Invariant: physics (energy, exergy, dissipation, gradients, constraints)
+ selection logic (variation, heredity, differential persistence)
LAYER 2 – Parameters: cost of each function (access, convert, store, copy,
transmit, process, vary, select)
LAYER 3 – State: where the bottleneck sits → what work exists, what is waste
Transition event = step change in Layer 2 → Layer 3 reorganizes

4.5.2 Timeline

E = exergy event, I = information event. Dates approximate.

Event	Type	Made cheap	Bottleneck moved to
Heredity (~4 bn yrs)	I	Storing constraints	Variation
Nervous systems	I	Fast in-body steering	Learning in one lifetime
Language (~100k+ yrs, uncertain)	I	Mind-to-mind transmission	Memory
Fire / tools	E	Conversion outside the body	Fuel, skill
Agriculture (~10k yrs)	E (+I)	Stored solar exergy	Coordination, accounting
Writing (~5k yrs)	I	Storage outside minds	Copying
Printing (1450s)	I	Copying	Literacy, filtering
Steam engine (1700s)	E	Fossil exergy → motion	Distribution, factory control
Electricity (1880s+)	E	Exergy transmission	Control, information processing
Computers (1940s+)	I	Information processing	Specification
Internet (1990s)	I	Copy + transmit ≈ zero	Attention, filtering
AI (2020s)	I (energy-bound)	Variants, routine judgment	Selection, evaluation, accountability; energy

4.5.3 Patterns

D12. Bottleneck migration is the core dynamic; work follows scarcity. [Hypothesis]

D13. Exergy and information events alternate and fund each other. [Framing — some events are mixed]

D14. Intervals between transitions shrink. [Established as observation]

D15. Old functions sink into infrastructure rather than disappear. [Framing]

D16. Each transition opens a slack window — weak selection, surging waste and variation — followed by consolidation. [Hypothesis] Railway mania, dot-com, likely parts of the AI investment cycle.

4.5.4 AI specifically

- Information side: cheapens variation and parts of steering; scarcity moves to selection, grounding to real flows, accountability.
- Exergy side: data centers ~1.5% of global electricity (2024), projected ~double by 2030 (IEA; verify). First information event since electricity whose growth is visibly energy-bound.

- Unknown: full transition (printing-scale) or strong extension of computing.

4.5.5 Falsifier

A transition where scarcity disappeared rather than migrated. None known.

5. Work Lens

5.1 Work Functions

Every job is a specialized way of routing exergy, or of building and steering the constraints that route it. Surface diversity, few physical roles.

5.1.1 Functions

Function	Effect on flow	Examples
Access	Opens new or locked exergy sources	Farming, mining, energy generation
Convert	Turns exergy into motion, structure, materials	Manufacturing, construction, transport
Maintain (constraints)	Fights decay of built structures	Repair, operations, cleaning, healthcare
Maintain (information)	Copies and repairs stored constraint	Education, documentation, training
Steer	Small flow steering large ones	Engineering, management, software
Allocate	Decides which gradients open, where flow goes	Markets, finance, governance, strategy
Explore	Searches for new gradients and constraints	Research, R&D, entrepreneurship

A work unit usually performs several functions; record the **primary** one and the secondary ones.

5.1.2 Why the market diversifies

- Larger flows need more distinct constraints. Steering ~5–10 kW per person needs more specialized roles than steering ~100 W of muscle.
- Machines took over conversion; humans moved up the leverage hierarchy (farming: majority of workers in 1800 → ~1–3% in rich countries now).
- AI continues the move one layer up: machines entering the steering layer.

W1. Labor shifts toward low-energy, high-leverage functions. [Framing]

5.1.3 Where it strains

- **Efficiency work reduces dissipation** for the same output. Fits a routing view, not a maximization view.
- **Claim-moving work** (redistribution, rent-seeking, much litigation) shifts who controls a flow without changing it: internal friction in the control layer.
- **Care and art**: tentatively maintain and steer humans as dissipative structures. Weakest link; test in [Cases](#).

5.1.4 Money and metrics

- Money is a **metrics system** for claims on future routing, not a resource.
- Prices are compressed information about scarcity of gradients, constraints and capability.
- The physical base under the metric is not static (gradients open and deplete, constraints decay, capability changes), so the metric drifts relative to physical value even before anyone games it.
- Gaming the metric is a category error: treating the gauge as the engine.
- Deliberately not expanded further.

5.1.5 Hiring (applied example)

Element	Physically
Organization	Constraint system routing a flow, with gaps or decay
Candidate	Carrier of embodied information + work capacity
Job description	Specification of a constraint gap
Interview	Costly measurement under uncertainty
Salary	Metric: estimate of flow the hire will steer (distorted by bargaining, scarcity, norms)

Read JDs for the **gap**, not the proxies. Strongest interview evidence is **demonstrated routing**: a flow you changed, the mechanism, how you knew.

5.2 Analysis Protocol

The core method. Run it on one work unit: a role, process, task or system. Output goes into a case file ([template](#)).

5.2.1 Before starting

- **Name the work unit** precisely.
- **Name the reference system** (team, organization, customer base...). Waste and value depend on it.
- **State what you already believe** about it (the default view). Usefulness is measured against this.

5.2.2 Steps

1. FLOW	Which flow does it touch? Primary function: access / convert / maintain / steer / allocate / explore Secondary functions:
2. CONSTRAINT	What constraint does it build, maintain or use? What would the flow do without it?
3. LEVERAGE	What information does it hold or apply? Small effort → how large a flow? (rough ratio or qualitative: low/med/high)
4. SELECTOR	Who decides it continues? What do they actually measure? Gap between metric and real flow? Speed and accuracy of that feedback?
5. VARIATION	How do new ways of doing it appear? What does trying a variant cost? Who is allowed to try?
6. WASTE	Deletion test: what decays if it stops, how fast, who notices first? Verdict: needed / buffer / vestigial / self-serving / search cost
7. EXPOSURE	Which of its functions is getting cheaper (AI, automation, tooling)? Where does scarcity move?
8. LEVERS	What can change? (see Change Levers) flow · constraint · information · selector · variation
9. IMPACT	Per level, for the chosen lever: result / team / org / customers / economy effect on flow · sign (+/-) · delay · who notices

5.2.3 Quick version (5 minutes)

1. Primary function?
2. Who selects it, on what metric?
3. What decays if it stops, and who notices first?
4. Which part is getting cheap?
5. One lever and its effect on the next level up.

5.2.4 Output check

- Did any step produce something you didn't already believe? If not, note it: either the default view is right or the step is weak.
- Which steps were guesses? Mark them.

5.2.5 Known weak steps

Steps 3 (leverage) and 9 (impact) are the least operational. Expect them to change after the first cases.

5.3 Change Levers

Five physical places a change can act. Each lever has a typical effect, a typical failure and a check.

Lever	What changes	Typical effect	Typical failure	Check
Flow	Which gradient is accessed; volume or source	More or different output	Exhausts gradient; overloads downstream constraints	Can downstream constraints carry it?
Constraint	Structure channeling the flow: process, tool, role, rule, architecture	Less heat per unit of work; new kinds of work	Rigidity; maintenance cost outgrows benefit	What does the new constraint cost to maintain?
Information	What is known, stored, shared; models, docs, skills	Higher leverage; better steering	Information without maintenance decays; overload	Who maintains it, and does the flow it steers fund that?
Selector	Who decides continuation; what metric they use; feedback speed	Changes what the system evolves toward	Proxy drift; gaming; capture	Does the new metric track the real flow?
Variation	How variants appear; cost of trying; who may try	Adaptability	Novelty without consolidation (if selection is weak)	Is selection strong enough to filter the new variants?

5.3.1 Rules of thumb

- **L1. Selector changes have the largest delayed effect.** They redirect evolution, not just output. [Hypothesis]
- **L2. Constraint changes without information changes revert.** People rebuild the old constraint from what they know. [Hypothesis]
- **L3. Cutting variation looks like efficiency now and appears as brittleness later.** [Framing]
- **L4. Adding flow to a constrained system raises waste first.** [Hypothesis]
- **L5. Pair every lever with its selector check:** who will notice whether the change worked, and how fast?

6. Impact Propagation

6.1 Reference Levels

A change is evaluated at a stack of nested reference systems. The same change can be value at one level and waste at another.

Level	Reference system	Typical selector	Feedback speed
Work result	The output itself	Reviewer, test, user of output	Fast
Team	People sharing the constraint system	Lead, peers	Fast–medium
Organization	Firm, unit	Management, capital	Medium
Customers	Those whose flows the output enters	Willingness to pay, retention	Medium–slow
Economy	Wider routing network	Markets, regulators, competitors	Slow

The worker as a person is an additional reference system (income, health, capability, identity) running in parallel. Record it when relevant.

6.1.1 Questions per level

- What flow at this level does the change affect?
- Does it add constraint, remove decay, improve steering, or only shift claims?
- Who at this level would notice, and through what metric?

6.2 Propagation Rules

Initial rules. All [Hypothesis] until tested in cases.

R1. Sign can flip between levels. Local efficiency can create global waste (a team optimizing its metric pushes cost downstream). Local waste can be a global buffer (spare capacity absorbing a shock elsewhere).

R2. Delay grows with level. Customer and economy effects arrive late. Fast selectors miss them, so changes are judged at the level where feedback is fastest.

R3. Selection weakens with level. Higher levels select more slowly and noisily, so local optimizations harmful at higher levels survive longer.

R4. Leverage compounds upward. A change in steering or allocation propagates further than a change in conversion.

R5. Claim shifts don't propagate as flow. Changes that move control of a flow without changing it show up in metrics at the level of the actors involved and as friction everywhere else.

6.2.1 Recording format

Change: <lever + description>

Level	Effect on flow	Sign	Delay	Who notices first
Work result				
Team				
Organization				
Customers				
Economy				

Sign flips: <where and why>

7. Cases

7.1 Case Template

Copy to 5xx-<short-name>.md . One work unit per case.

```
# Case: <name>

**Date:** YYYY-MM-DD · **Lens version:** v0.x · **Confidence:** low / medium / high

## Work unit and reference system
- Work unit:
- Reference system:
- Context (sector, size, constraints):

## Default view
What I (or existing tools/frameworks) would say about this work unit before running the lens.

## Lens output
1. Flow / function:
2. Constraint:
3. Leverage:
4. Selector and metric gap:
5. Variation:
6. Waste verdict:
7. Exposure:
8. Lever chosen:
9. Impact table:

| Level | Effect on flow | Sign | Delay | Who notices first |
|---|---|---|---|---|

## Divergence
Where lens output differs from the default view.

## Outcome
What actually happened (fill in later, if known).

## Usefulness verdict
- [ ] Lens output differed from default view
- [ ] Lens view proved right (or more right)
- [ ] Produced a decision or action I wouldn't have taken otherwise
- Steps that added nothing:
- Steps that were guesses:

## Model feedback
What this case says about the model → log in Open Questions.
```

7.1.1 Suggested first cases

- A role you know well (e.g. a delivery lead, an engineering manager).
- A process you have changed in the past with a known outcome (gives a ground-truth check).
- One strain case: care work or creative work.

8. Log

8.1 Open Questions

Living log. Add the date and origin (case, chapter, conversation) to each entry. Close with a resolution, never delete.

8.1.1 Definitions

- **Q1. Function cost.** How to define and compare it across functions (exergy? time? constraint?) — needed for transitions. *Origin: 250.*
- **Q2. Routing complexity metric.** Something that tracks evolutionary history better than throughput (Chaisson). *Origin: 210.*
- **Q3. Leverage measurement.** Ratio, qualitative scale, or proxy? *Origin: 210, protocol step 3.*
- **Q4. Self-maintenance criterion.** Precise statement of D2 at organizational levels. *Origin: 210.*

8.1.2 Model scope

- **Q5. Care work and art.** Do they reduce to maintaining/steering humans as dissipative structures, or is a function missing? *Origin: 310.*
- **Q6. Claim-moving work.** Is it a separate category (control-layer friction) or a subtype of allocation? *Origin: 310.*
- **Q7. Mixed transitions.** Agriculture and the internet are both E and I. Is the E/I split useful, or should events be described by function-cost vectors? *Origin: 250.*
- **Q8. AI's placement.** Full transition or extension of computing? What evidence would decide? *Origin: 250.*

8.1.3 Strong-version tests

- **Q9.** Is there evidence that selection favors higher dissipation even against self-maintenance? (If yes, the maximization view returns.) *Origin: conversation.*
- **Q10.** Systems with high surplus and weak selection that stay lean for long periods: if common, what internal selection mechanism explains them (culture, design discipline)? *Origin: 240.*

8.1.4 Relationships

- **Q11 (reframed 2026-10-01).** Are S/R/E the minimal set of exergy-allocation demands faced by any persistent dissipative structure with heredity, under (a) finite exergy inflow across its boundary and (b) non-stationary gradients? Original wording ("from thermodynamics alone") fails: thermodynamics has no persistence criterion. Review sketch: S derivable (high), R medium, E partial (physics explains why E triggers, not what it buys). Parked. *Origin: 920, TC-agent review.*
- **Q13. Storage/deferral as a fourth demand.** Does P6 (life stores and defers) always reduce to existing functions/contours or accumulations, without remainder? *Origin: TC-agent review.*
- **Q14. Time constants as an operational handle.** Can decay rate, copy/throughput cycle and gradient-shift rate define function cost (Q1) and predict what gets cut first under scarcity? *Origin: TC-agent review.*
- **Q12. Invariant layer.** Resolved 2026-10-01: invariant = physics + selection logic. See decisions log. *Origin: TC-agent review.*

8.1.5 Decisions log

Date	Decision
2026-10-01	Physics is the only invariant; the model above it is dynamic
2026-10-01	Money is a metrics system, not a resource; not expanded further
2026-10-01	TC stays adjacent until a stronger physics relationship is researched
2026-10-01	Purpose: internal analytical lens first; public after usefulness validation
2026-10-01	Invariant layer = physics + selection logic (Q12); commitment 1 amended, P11–P13 added
2026-10-01	TC correspondence table revised (conditions ≠ contours); Q11 reframed

9. Translations

Parked until internal usefulness is validated.

Planned approach: one version per audience, same core, different vocabulary and depth.

Audience	Likely emphasis	Drop or compress
Engineering / delivery leaders	Protocol, levers, propagation	Most physics
Executives	Selection, waste, transitions (AI)	Protocol detail
Theorists / researchers	Principles, lineage, propositions	Applied examples

10. Adjacent

10.1 Lineage

Work this model draws on or converges with. Reading status to be tracked.

Source	Contribution	Status
Schrödinger, <i>What Is Life?</i> (1944)	Life feeds on negative entropy	Known
Prigogine	Dissipative structures	To read
Landauer (1961)	Physical cost of erasing information	Known
Kauffman, <i>Investigations</i>	Work–constraint cycle	To read
Deacon, <i>Incomplete Nature</i>	Constraint, absence, emergence	To read
Pattee	Symbol–matter, information as constraint	To read
Chaisson, <i>Cosmic Evolution</i>	Energy rate density	To read
Kleidon	Earth-system thermodynamics; life's limited effect on total entropy export	To read
England	Dissipative adaptation (contested)	To read
Friston	Free energy principle (contested falsifiability)	Known
Kooijman, Dynamic Energy Budget theory	Allocation into maintenance, growth, maturation, reproduction; maintenance priority	To read (verify details)
Lewontin (1970)	Conditions for selection	Known
Maynard Smith & Szathmáry, <i>Major Transitions in Evolution</i>	Transitions, multi-level selection	To read
Popper	Hypotheses die in our stead	Known
Spence (1973)	Job-market signaling	Known
Goodhart	Metrics under optimization	Known
Graeber; Soffia, Wood & Burchell (2021)	Perceived job uselessness, and its correction	Known
IEA	Data center electricity estimates	Verify figures

10.1.1 Contested claims to handle carefully

- Maximum entropy production principle (MEPP): no accepted general derivation.
- England's dissipative adaptation: promising, not a general law.
- Free energy principle: influential, criticized as unfalsifiable as stated.

10.2 TC Relationship

Status: parked. TC ([Tri-Contour Dynamics of Limited Resource Allocation](#)) stays adjacent until a stronger relationship to physics is researched. Nothing in POW's core depends on TC, and the POW agent does not use TC concepts in diagnosis.

Revised 2026-10-01 after a TC-agent review. The original table mapped Lewontin's *conditions for selection* onto TC's *allocation demands*: a category error.

10.2.1 Observed correspondence (revised)

POW construct	TC construct	Fit
Self-maintenance (D2), maintain functions	Survival contour	Strong
Copy + run existing constraint at throughput	Reproduction contour	Medium (TC R includes throughput, not only copying)
Variation + cheap-media selection + retention (D8)	Evolution contour	Medium (variation alone $\neq$ E)
Differential persistence	Outcome of S/R/E allocation under environment (System Course)	Not a contour
Steer, Allocate	Allocation logic + mediators (not a contour)	Structural
Information as persistent constraint	Code	Strong
Function cost (Q1)	Edge cost in resource topology	Depends on TC v2-provisional topology
Selector / metric / proxy drift	Signal, Receiver, mediators; Code–Narrative divergence	Strong

10.2.2 Evidence caveat: convergence is not confirmation

Both models share life-science ancestry, the same author, and much of the same AI-assisted vocabulary. Close wording (e.g. TC "Code Genesis by Emergence" vs POW D2) is therefore **weak evidence**. A link counts only if it yields a prediction one model makes and the other doesn't, or a derivation from independent premises.

10.2.3 Open tensions (updated)

1. **Money: resource vs metric.** Resolves by level. POW "resource" = physical substrate; TC "resource" = anything limited and allocatable within a declared frame. State the level when comparing.
2. **Information.** TC splits it into Code (substrate), Signal (dynamics), Potential (accumulation) and informational resource nodes. POW's single term maps mainly to Code.
3. **Shared ancestry.** See caveat above.

10.2.4 Bridge candidates

- **Time constants (physics-native, hypothesis):** S ~ structural decay rate; R ~ copy/throughput cycle; E ~ gradient-shift rate. Expressible in POW without TC vocabulary.
- **Dynamic Energy Budget theory (Kooijman):** derives allocation into maintenance, growth, maturation, reproduction with maintenance priority. Test of whether a physics-first route reaches E or stops at S/R.

10.2.5 Divergence candidates

Prediction	Models compared	Real divergence?
Displacement order follows relative decay vs gradient-shift rates, regardless of Code	Time-constant reading vs TC	Yes (TC-internal test)
AI: cheap variation + binding selection → novelty without consolidation (TC: Churn)	POW D9 + variation table vs TC	No: both predict it; agreement, not a test

10.2.6 Research question

See Q11 (reframed) and Q12–Q13 in [Open Questions](#).