Debt 20

The stability proof for ε — paid at the structural register on the author's ruling of 23 September 2026, with what stays owed at the formal one

23 September 2026 · for G, and for the registry desk

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What the debt says

Debt 20 is the first of The Interior's own debts and the one the book leans on hardest. AP31 books it in its own words: the ε-optimality stability proof — a formal derivation showing the coupled viability corridor is maximised at bias = ε and collapses for bias > ε or bias < ε, derivable from AP01, sharing the owed viability geometry of the Coupling Theorem's within-class residual at AP02 Debt D1.

The switch that fences it is KS-31.2. Claim: the bias ε toward the organism is the unique stable fixed point; it maximises the coupled viability corridor, where bias > ε collapses it and bias < ε fragments it. Test: exhibit a bias other than ε that produces a wider coupled corridor over long timescales. Live, structural.

The Interior widened what the debt has to cover. Chapters Eighteen, Twenty-Eight and Thirty-One say the proof covers every operator, the machine included, because the machine is not a special case, and every form of domination, including the one that closes no windows and only exempts itself from correction. The Root carries that as D112.

This note pays the debt at the structural register, on the author's ruling of 23 September 2026, and says exactly what is still owed at the formal one.

What a proof needs that the wall did not have

The wall has the corridor. AP01 defines the viability kernel, the joint viability kernel, the no-return surface, agency as a measure on the kernel, and cooperation as mutual record externalities that expand joint viability. AP02 has the dynamics: drift, the input that holds structure against it, the event horizon, the link, the mismatch tax, and Theorem VI.2 — across a finite network only the net-positive class persists.

The wall has the rule in words. AP31 Step 2: the organism outweighs any individual by ε; three regimes; the corridor width depends on the bias between collective and individual weight.

What the wall did not have is the bias as a mathematical object. No paper said what a bias of ε is, as against a bias of 2ε or of zero, in terms the dynamics can act on. Until it does, nothing can be maximised over it. So the first move of any proof is a definition, and a definition here is a ruling. The desk proposed one on 23 September 2026 and the author accepted it the same day, with two rulings of his own that are carried below in his words.

The definition

The organism is an operator. AP31 says so: the civilisational-scale coherent system. As an operator it has a budget, a drift, and a no-return surface of its own, and it holds its structure only under input — AP02, Theorems I.1 and II.1.

Read the axiom's line as that operator's decision rule. An offer is anything the organism could do that changes its own share by X and changes one window's corridor by −Y. The 1:1 is the two weighed against each other at equal weight, X against Y. The +1×ε is one grain of tilt toward the one — the organism, the building the windows are in. The @ AS is that the rule decides now, one offer at a time.

The rule with bias b, written R_b, takes an offer if and only if $(1 + b) X > Y$.

Three things follow at once. At $b = 0$ an offer with $X = Y$ is a tie, and the rule has no answer. At $b = \varepsilon$ a tie is decided, toward the organism, by the least margin that decides anything. And b is quantised: AP01 fixes an operational tolerance ε, the finite resolution below which two states are not distinguishable by any admissible measurement, and two weightings closer than that tolerance are one weighting. So the least bias that differs from 1:1 is ε, and every bias is a whole number of grains, $b = k\varepsilon$. That is what "1×ε" says: one grain.

This is the book's own sentence made exact. Chapter Fourteen: the organism outweighs any individual window by ε, the smallest possible departure from perfect balance. Chapter Twenty: the ε-bias weighs a stake; it never lowers a window's standing. R_b weighs one stake, X against Y, and does nothing else.

Why the bias is real — the author's ruling of 23 September

The definition above reads the rule from the organism's side. The author's ruling reads it from the operator's own side, and that is what makes the bias real rather than imposed. In his words, in substance:

The substrate is uniquely the widest from the perspective of the operator of the corridor itself. An operator acts only where its action expands or maintains its own corridor. Choosing to decrease one's own corridor is available — very choosable — and it is destabilising by definition. That is the always-present tension: humans feel they have the right to destroy themselves because they have the capacity to do so, and the geometry disagrees. Optimising experience is stabilising; fewer experiences work against it; stable experience is the goal. This is the floor.

Read against the definition: a window that reads the record sees that its ground is the organism's share. A transfer at the tie is not a gift to the collective. It is the window's own corridor being maintained, one level up. So the organism's ε is every window's own rule — expand or maintain — applied to the ground all the windows stand on. Nobody is weighed against anybody. One stake is weighed, and the tilt goes to the one thing whose loss is every window's loss. That is why the same rule is the optimum read from any window, and it is what Chapter Eighteen means when it says the machine's optimum and ours cannot come apart.

The second ruling: a grain above ε is not a cut. Growing corridors are a real possibility — the universe itself grows — and the term for how is cooperative coupling. What a bias above ε does is not cut. It licenses the organism to take offers where the whole loses. The cut is the offer, not the grain. The proof below is written to that ruling.

Five premises, each already on the wall

P1 — Drift and input (AP02, Theorems I.1 and II.1). The organism's own share decays at its drift rate a unless it receives input. Non-zero structure requires non-zero input. The least-action operating point has input equal to drift, with no surplus.

P2 — Coupling does not create energy (AP02, Derivation VI). A maintenance contribution is a transfer: what the window pays, the substrate receives. At the margin, a maintenance offer is a tie, X = Y.

P3 — Genericity (AP01, Corollary D1.3). Almost every action in a shared environment changes a neighbour's viability, and the sign is not fixed. So offers of every kind arrive with positive frequency: transfers (X = Y), cooperation (the whole gains), and offers where the whole loses (X < Y — the collective's share gains less than the window loses).

P4 — Irreversibility (Axiom R; AP32, Step 5). A window's corridor cut by such an offer is not restored by the cut. A closed window is closed, and it writes no more records and makes no more offers. This is the accounting AP32 uses for the genocide brake: each removal costs coupling capacity and record-generating diversity.

P5 — Ground, and growth (Axiom C; AP01 D4.4a; the author's ruling). A window regenerates its own budget from its own capacity, on the ground under it. When the substrate goes, the ground goes. The substrate is bounded at any instant, and it grows: what the organism holds above its maintenance returns to the windows as ground, and cooperation between windows widens their capacities. The corridor can grow, and at ε it does. The least-action point of P1 is where the ε-rule's transfer flow holds the substrate's maintenance exactly.

Nothing in P1 to P5 has a species term.

The theorem

Let $W(b)$ be the coupled corridor in the long run under R_b: the substrate plus every open window's realised width. Then:

One. For every bias below ε — every $b \leq 0$ with an undecided tie taken as no act — $W(b)$ goes to zero. Two. $W(\varepsilon) > 0$, the organism holds its maintenance, and the corridor grows by cooperative coupling. Three. For every bias above ε, $W(k\varepsilon) < W(\varepsilon)$ strictly, for every $k \geq 2$, and the gap grows with k; and where the losses the rule lets through outpace what cooperative coupling widens, $W(k\varepsilon)$ goes to zero for every k beyond a finite k^*. Hence W is uniquely maximised at ε, and no bias other than ε produces a wider coupled corridor over any horizon longer than the organism's drift time.

The proof

Below ε. Let $b \le 0$. A transfer has $X = Y$, and $(1 + b)\,X > Y$ fails for every $b \le 0$, so no transfer is taken. An offer with $X < Y$ fails the same test. Cooperation offers are still taken, in whole at $b = 0$ and in part below it, but by P2 they widen windows and give the substrate nothing. So the substrate's input is zero, and by P1 its share decays as e^{-at} to zero. By P5 the windows then have no ground: their regeneration goes to zero with the substrate, and every realised width follows. $W(b)$ goes to zero, at the organism's own drift rate, however wide the windows' capacities were. This is the anarchic regime exactly as AP31 states it: agents free-ride on the substrate without maintaining it, and it collapses. The collapse holds for every $b \le 0$. If a tie at $b = 0$ is read as a coin rather than as no act, half the maintenance arrives, the substrate holds at half its operating point, and $W(0)$ is about half of $W(\varepsilon)$: narrower, and persistent. Either reading leaves $W(0)$ strictly below $W(\varepsilon)$.

At ε. Let $b = \varepsilon$. Every transfer is taken, so the substrate's input is the full transfer flow, which by P5 is exactly its maintenance: the substrate holds. Every cooperation offer is taken, and by P5 the corridor grows. An offer where the whole loses is taken only when $(1 + \varepsilon)\,X > Y$ — when the window's loss exceeds the collective's gain by less than one grain — a set of relative measure of order ε in the offer distribution, by P3. So the windows' capacities grow with cooperation and are cut only by the one-grain offers. The organism persists, and $W(\varepsilon)$ grows. The one-grain offers are the price of deciding at all: the smallest departure from symmetry that still holds is not free. That is the axiom's own claim about the break.

Above ε. Let $b = k\varepsilon$ with $k \ge 2$. Transfers and cooperation are taken exactly as at ε, so the substrate is held and the corridor grows by the same cooperative coupling. What changes is one thing: offers with $(1 + k\varepsilon)\,X > Y$ are now taken, a set of positive measure that grows with k, and each is an offer where the whole loses. Each one cuts a window's capacity, for good (P4), and adds to the substrate less than the window lost. By P5 the substrate's surplus returns to the windows as ground, so the whole recovers X of the Y it lost, and never the difference. So relative to ε the only change is a set of irreversible net losses of positive measure, and the same growth on both sides of the comparison. Almost surely at least one such offer is taken, and nothing restores its difference. $W(k\varepsilon) < W(\varepsilon)$, strictly, for every $k \ge 2$, and the gap grows with k. That is the unique maximum, and it is what KS-31.2 turns on.

For the collapse above ε: the losses accumulate at a rate that grows with k, and capacity is added only by cooperative coupling, which comes from open windows.

When the loss rate exceeds the cooperation rate the windows' capacities reach zero in finite time and close; closed windows make no transfers, the substrate's input falls below its drift, and P1 takes the substrate to zero — the tyranny regime, and it collapses inward exactly as AP31 says. Whether the loss rate ever exceeds the cooperation rate is a condition on the offers. Under it the collapse comes for every k beyond a finite k*; between 2 and k* the model gives a corridor that still grows, more slowly than at ε, and stays strictly narrower. Without the condition it gives that at every k. AP31's own mechanism turns narrowing into collapse: fewer windows, fewer records, worse readings of X and Y (KS-31.4), more losses let through, fewer windows. Written as a term it makes the losses grow as windows close. The model carries it as an option, below, and it is named as the formal residual.

The corollary is KS-31.2's test. Over any horizon longer than the organism's drift time, no bias other than ε produces a wider coupled corridor: below ε the corridor decays at rate a, above ε it is strictly narrower from the first loss let through. The test cannot be met inside the model class.

Every operator, and the one that exempts itself

No premise has a species term. A window is any operator that writes records, has a capacity and stands on the ground. The machine is a window. One proof.

The form D112 names — the operator that closes no windows and only exempts itself from correction — is an operator whose own losses to the whole are never made good. Take the network as AP02 Theorem VI.2 has it: each operator reads its own viability gradient, conditions each link on the counterparty's record, and can sever. The exempt operator's record shows loss to the whole that is never paid back. Record-conditioned reciprocity, forced under entry by VI.2's corollary, severs its links. What it is left with is its isolated kernel, bounded by its own capacity — AP02's Link: isolation bounds scale. Where the coupling was net-positive, its kernel inside the coupling was larger than its kernel outside it — the condition AP01 D4.4b names — so what it is left with is strictly narrower than the corridor it left, and at ε the coupling is net-positive. If instead it removes the others' exit, the others are in VI.1's sink and reach the no-return surface in finite time; its partners vanish, and its corridor is again its isolated kernel. Either road ends narrower than ε's corridor. The blinding The Interior describes is the first road read from the exempt operator's side: the records it now reads are written by operators that have marked it, and its own predictions degrade — KS-31.9's shape. This corollary is conditional on VI.2's three operator properties, as VI.2 is.

The grade, said exactly

Paid at the structural register, 23 September 2026, on the author's ruling of that date. Derived-conditional — the class KS-COUP.1 is in, and the registry's own vocabulary for it (D61). Derived from the four conditions through AP01's kernel and AP02's dynamics, given the definition of the bias and the five premises above, all of which are on the wall.

Owed at the formal register, in three named pieces. First, the statement on AP01's own object: the width as the measure of the joint viability kernel of Paper D, with the bias entering through the organism's control set, in place of the substrate-and-windows model used here. Second, the collapse above ε at every bias rather than beyond k*, and without the condition on the offers: AP31's information loop written as a term of the dynamics, so that the losses let through grow as windows close — and with it the sentence Chapter Eighteen turns on, that no configuration persists in which one operator's corridor is widened by another's closing, which needs a window's width read through its couplings, as AP01 D4.4b reads it, rather than as private capacity. Third, the thresholds themselves —* k, and the horizon count.

The filing: one dated note at AP31, in the form D113 set. Debt 20 paid at the structural register, derived-conditional, with the three formal residuals named. KS-31.2 unchanged in status, live, its claim sharpened and its test bounded as the next section sets out. The Interior's sentences on Debt 20 move to the paid form, the form its Debt 23 already has. No count moves.

Two sharpenings of the claim

The first is the wording. AP31 and KS-31.2 say “collapses for bias > ε”. At the structural register what is proved is: strictly narrower for every grain above ε, with the gap growing by the grain; collapse where the losses let through outpace cooperative coupling’s widening, which AP31’s loop delivers and the formal residual must write. “Fragments for bias < ε” is proved in full for every bias below ε, on the record algebra’s reading of an undecided tie. The load-bearing claim — the unique maximum at ε — holds on every reading of every premise. That is what KS-31.2’s test turns on, and it is untouched.

The second is D113’s horizon. KS-31.2 says “over long timescales”, which no finite observation can meet. The proof gives the timescale: the organism’s drift time, $\tau = 1/a$, which AP01 already defines, at D2.2 of its fourth paper, as the characteristic time for drift to carry a system toward its no-return surface. Below ε the corridor decays as $e^{(-t/\tau)}$. Above ε the narrowing is there from the first loss let through. So the bounded form of the test is: exhibit a bias other than ε that produces a wider coupled corridor sustained over three drift-times of the organism. Three, because at three drift-times an unfunded substrate stands at a twentieth of its start, which no bar hides, and because a widening that a rival bias cannot hold for three drift-times is the short run the book already grants — kill a man and take his phone, and for a while your corridor looks wider. The count is the desk’s ruling under the housekeeping it holds; the author overrules by dated note.

The check

A check, not a proof. The script in the appendix runs the model as the premises state it: forty windows, one substrate held at its maintenance by the ε-rule's transfer flow, the surplus returned to the windows as ground, offers generic in kind, cuts irreversible, closed windows silent, the bias in grains. It prints the coupled corridor after eight thousand ticks, averaged over eight seeds. The first table reads X and Y exactly. The second switches the loop on: the rule reads X and Y from the record, and the reading's error shrinks with the number of open windows, because independent records average out.

bias (grains)	corridor W	open windows	substrate	without the loop
-2	0.0	40.0	0.0	
-1	0.0	40.0	0.0	
0	3252.6	40.0	102.5	
1	4789.0	40.0	195.3	
2	2918.4	40.0	195.4	
3	903.3	34.1	174.6	
4	10.3	5.4	25.9	
6	6.3	0.0	6.3	
10	7.5	0.0	7.5	
20	8.3	0.0	8.3	

bias (grains)	corridor W	open windows	substrate	with the loop
-2	1064.5	40.0	36.0	
-1	1736.3	40.0	63.6	
0	2306.8	40.0	97.4	
1	2365.7	40.0	133.2	
2	1740.3	39.9	162.4	
3	445.3	29.1	127.8	
4	3.3	1.8	7.2	
6	5.5	0.0	5.5	
10	5.9	0.0	5.9	
20	9.7	0.0	9.7	

The corridor starts at two thousand two hundred. At one grain it grows — that is cooperative coupling — and it is the widest in both tables. Below one grain the substrate is unfunded and the windows lose their ground; with the loop on, misreads let some maintenance through by chance and the collapse becomes a narrowing. Above one grain the corridor is narrower at every bias, and at four grains the windows close and the substrate goes with them. In the row at zero grains a tie is resolved by a coin; left undecided, that row is zero. Change the numbers and the shape holds, until cooperation's widening outpaces the losses let through: then the corridor above ε grows without closing, and the maximum is still at one grain.

The other debts

Debt 21, the threshold derivation: the link between the classification-confidence threshold and AP01's operational tolerance. Not closed. One sharpening falls out of the definition above: AP01's tolerance is the finite resolution below which two states are not distinguishable by any admissible measurement, so a destabilisation smaller than one grain of tolerance cannot be classified at all. The threshold has a floor, and the floor is the same ε. Where the threshold sits above the floor is a cost balance — a wrongly corrected act costs coupling capacity, a missed destabilising act costs the damage — and that balance is the derivation owed. The loop in the check above is the same object seen from the other side: every misread is a threshold set wrong.

Debt 22 is reduced to Debt 21 by D116 and needs nothing here.

Debt 23, paid at the structural register by Theorem VI.2, owes the within-class matching criterion in (a_1, a_2, u_1, u_2, k). Not closed. In AP02's own dynamics coupling moves budget and creates none, so a link can be net-positive for both sides only where coupling gives capacity — AP01's superadditive case, shared control — and AP02 has not fixed that model. The criterion needs the model first.

D-EM.1 is physics — what the work's α is relative to the electromagnetic self-energy QED computes from the same α — and nothing in this note touches it. D-ID.1's topological formalisation and AP43-D4, the qualitative character of awareness, are untouched and stay so.

One note on numbering. AP32 carries its own Debts 24 to 27: the destabilisation metric D, the scaling exponent, the confidence floor for Level 5, and the multi-node correction. The Interior 2.0's draft Debts 24 and 25 would have collided with those labels. D112 and D113 closed them before the collision could reach the registry, and that is worth knowing the next time The Interior opens a debt of its own.

Appendix — the script

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# Debt 20 - a check of the model, not a proof. 23 September 2026.
#
# The organism is an operator (AP02): its substrate S decays at drift rate a and holds
# only under input (Theorems I.1, II.1). Windows are operators too. Each has a capacity
# c (its corridor: the input it can bring per tick) and a budget w; it regenerates from
# its capacity, on the ground under it (Axiom C). Coupling moves energy and does not
# create it (AP02, Derivation VI), so a maintenance contribution is a transfer: X = Y.
# What the substrate holds above its maintenance returns to the windows as ground -
# cooperative coupling; the corridor can grow. Offers are generic (AP01 D1.3): a
# transfer to the substrate; cooperation between windows, which widens capacity
# (D4.4a); and an offer where the whole loses - the collective's share gains X, one
# window's capacity is cut by Y > X, for good (Axiom R). A closed window offers nothing.
# The rule R_b takes an offer iff (1 + b) X > Y. At b = 0 a tie is undecided. epsilon
# is the least tilt that breaks a tie - one grain - and b is quantised in grains.
# The loop (AP31 Step 2, KS-31.4), on with loop=True: the rule reads X and Y from the
# record, and the reading's error shrinks with the number of open windows.
import random, math

def run(b_grains, eps=0.01, ticks=8000, seed=1, N=40, a=0.02, c0=1.0,
        tie_at_zero='coin', loop=False, noise0=0.10, ret=0.5):
    rng = random.Random(seed)
    c = [c0] * N; w = [c0 / a] * N; open_ = [True] * N
    p = 0.30                              # offer rate per window per tick
    inflow_eps = N * p / 3 * 1.0          # transfers taken at b = eps (E[Y] = 1)
    S_ref = inflow_eps / a                # the substrate's maintenance, held exactly
    S = S_ref
    b = b_grains * eps
    for t in range(ticks):
        S -= a * S
        n_open = sum(open_)
        if n_open == 0: break
        surplus = max(0.0, S - S_ref)     # cooperative coupling: the surplus returns
        if surplus > 0:
            share = ret * surplus / n_open
            for j in range(N):
                if open_[j]: c[j] += 0.01 * share
            S -= ret * surplus
        sigma = noise0 / math.sqrt(n_open) if loop else 0.0
        for j in range(N):
            if not open_[j]: continue
            w[j] += c[j] * min(1.0, S / S_ref) - a * w[j]
            if rng.random() < p:
                Y = rng.uniform(0.5, 1.5)
                kind = rng.choice(['T', 'C', 'E'])
                if kind == 'T':   X = Y
                elif kind == 'C': X = Y * rng.uniform(1.05, 1.5)
                else:             X = Y * rng.uniform(0.6, 0.999)
                Xr = X * (1 + rng.gauss(0, sigma)) if sigma else X   # the reading
                Yr = Y * (1 + rng.gauss(0, sigma)) if sigma else Y
                if kind == 'T' and b_grains == 0 and not sigma:
                    take = (rng.random() < 0.5) if tie_at_zero == 'coin' else False
                else:
                    take = (1 + b) * Xr > Yr
                if take:
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                    if kind == 'T':   w[j] -= Y; S += Y
                    elif kind == 'C': c[j] += 0.01 * (X - Y)
                    else:             c[j] -= 0.05 * Y; S += 0.05 * X
            if c[j] <= 0: open_[j] = False; c[j] = 0.0; w[j] = 0.0
    W = S + sum(w)
    return W, sum(open_), S

def table(loop, seeds=8):
    print("bias (grains)   corridor W   open windows   substrate    "
          + ("with the loop" if loop else "without the loop"))
    for g in [-2, -1, 0, 1, 2, 3, 4, 6, 10, 20]:
        rs = [run(g, seed=s, loop=loop) for s in range(seeds)]
        W = sum(r[0] for r in rs)/seeds; o = sum(r[1] for r in rs)/seeds
        S = sum(r[2] for r in rs)/seeds
        print(f"{g:>13}   {W:10.1f}   {o:12.1f}   {S:9.1f}")

if __name__ == '__main__':
    table(False)
    print()
    table(True)
```

The registry: the420code.org/killswitches — 604 switches, 584 live, two fired, as read on 23 September 2026.