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Cycle Integration: Copy Number, the Closure Vesicle, and the Band of the Genome

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Abstract. The pore, the lipid supply, the replication schedule, the division rule and the codon-gated loop of the preceding articles are joined here into one cycle and asked a question none of them asked: whether every vessel keeps one strand. Replication runs once per period and division only at dusk, so one strand per vessel holds exactly when every vessel divides at every dusk.

Three statements follow under named hypotheses. One period's lipids close exactly one minimal enclosure of the anchored strand, the closure vesicle, of radius 13.04 nm at 200 units. When every vessel divides at every dusk the mean birth size halves its distance to that vesicle each period, whatever the division rule, so the population comes to consist of closure vesicles dividing symmetrically; large founders persist only as a vanishing share, budding one closure vesicle per period. And the symmetric orbit exists if and only if a single number g, the per-period osmolyte gain in units of the closure vesicle's content, does not exceed one. Below one the vessels are flaccid at birth with reduced volume g; at one the orbit is taut and marginal; above one the closure vesicle is lost at its first dusk, and so is every other founder tried. Condensation raises the admissible input for an established lineage, but a founder without remnant gains less, and survives only if $g \le 1/(2 - e^{-\kappa})$.

Computed: for g from 0.6 to 0.99 no founder tried, from 1.5 closure vesicles to the 100-nm founder, loses a cell in fourteen periods; the codon-gated loop at its earlier baseline has $g = 1.87$ at 200 units and meets the condition from about 735; the per-period ledger becomes dominated by membrane, 0.863 of the pool at 200 units; one pore tethered to the strand over-supplies its daughter's nitrogen by a factor of 773,410. The genome's length sets the vessel; its content sets only whether the lineage survives and how flaccid it is. The lower edge of the length band rests on a curvature floor the corpus does not derive. Corrections to the preceding articles are recorded as precedence rulings.

Keywords: copy number; dusk division; closure vesicle; symmetric fission; bud fraction; founder condition; material ledger; pore inheritance; genome length; Chrysene Formalism

1 Introduction

Article 64 forced a hybrid protocell with a clock, a replication cycle and a division threshold, and divided it only at dusk. Article 65 allocated one pool among the genome, the membrane and the osmolyte, per period. Article 66 built a selective pore that admits the nitrogen the excision needs. Article 71 replaced the earlier osmolyte input with a codon-gated loop at a reusable catalyst, proved that the remnant gauges the bud, and showed that the period is the time to regrow one bud's lipids.

Each of these was computed alone. Article 71 divided its vessels at the exact threshold crossing, which Article 64 does not allow, and took one strand per vessel as a hypothesis without asking what keeps it true. Article 64 replicates the strand once per period.

1.1 What this article finds

Under replication once per period and division only at dusk, one strand per vessel is equivalent to division at every dusk (Lemma 6.1). That single requirement, joined to the lipid supply of Article 65 and the anchored strand of Article 62, determines the cycle. One period's lipids close exactly one minimal enclosure of the strand (Proposition 4.1). The mean birth size converges to that enclosure and the fission becomes symmetric (Theorem 6.3). The symmetric orbit exists if and only if $g \le 1$ (Theorem 7.1), and a founder without remnant needs the stricter $g \le 1/(2 - e^{-\kappa})$ (Theorem 7.5).

1.2 What is established here, by kind

Proved here. The closure identity (Proposition 4.1); the division geometry at dusk (Proposition 5.2); the copy-number equivalence

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(Lemma 6.1); the mean-size recursion and its corollary (Theorem 6.3, Corollary 6.5); the existence condition of the symmetric orbit (Theorem 7.1); the founder condition (Theorem 7.5).

Computed here. Populations under dusk division, losses by cause and the share of large cells; the earlier loop under dusk division; the per-period ledger; the pore margin; the band of the genome. Appendix B.

Supposed. The nine hypotheses of Section 2.1.

Not claimed. Everything in Section 3.

1.3 Organization

Section 2 fixes status, conventions and hypotheses; Section 3 states the non-implications. Section 4 proves the closure identity; Section 5 the division geometry; Section 6 the copy-number theorem; Section 7 the existence and founder conditions. Section 8 applies them to the earlier loop; Section 9 closes the ledger and places the pore; Section 10 gives the band of the genome. Section 11 carries the registers, rulings, targets and conclusion; the appendices carry the hypothesis register, the verification, the sources and the correction ledger.

2 Status, conventions, hypotheses

Convention 2.1 (Status labels)**.** [A] As in the coordinating paper: [A] finite or axiom-free; [D] derived under named hypotheses, registered in Appendix A; [C] imported, with the source named; [E] molecular reading, entering no proof. A statement marked *computed* is emitted by a block of Appendix B and is not proved.

Notation 2.2 (Symbols)**.** [A] Λ lipids, N lumen osmolyte, W_b free remnant of a vessel; $a = 0.65$ nm^2; a taut vessel of Λ lipids has radius $(\Lambda a/8\pi)^{1/2}$ and holds $N_0(\Lambda/\Lambda_0)^{3/2}$ osmolyte, with the founder's $\Lambda_0 = 386{,}658$ and $u_0 = 0.6517$ (block Y1). $\lambda = \nu L/2$ is the per-period lipid supply of one vessel; R_{62} the radius it closes; N_λ the osmolyte of a taut vesicle of λ lipids; $w_{62} = N_\lambda/\lambda = u_0 R_{62}/R_0$. Birth sizes m are in units of λ. $\kappa = cx^*$ is the per-period condensation rate of the loop of Article 71.

Convention 2.3 (Time)**.** [C] The period is the forcing period T of Article 64. Supplies and the loop act within a period; division is tested once, at dusk (Article 64, Definition 5.3).

2.1 The hypothesis register

Hypothesis 2.4 (One anchored strand)**.** [D] Each vessel carries one genome strand of L units anchored to its inner leaflet (Article 62, Section 8; Article 71, H1). Registered as H1.

Hypothesis 2.5 (The lipid supply)**.** [D] Each vessel receives $\lambda = \nu L/2$ lipids per period (Article 65, Theorem 8.5, at one lipid to a pair of units). Registered as H2.

Hypothesis 2.6 (Replication)**.** [D] Every strand is replicated once per period, on fresh complexes, within the active phase (Article 64, condition C3 and Theorem 8.2), and replication does not fail. Registered as H3.

Hypothesis 2.7 (Division at dusk)**.** [D] A vessel divides only at dusk (Article 64, Definition 5.3). The division conserves area and leaves both daughters taut where the geometry allows, so the bud fraction is fixed by the reduced volume at dusk (Definition 5.1). The two separated strands go one to each daughter (Article 64, Proposition 9.6). Registered as H4.

Hypothesis 2.8 (Strand fit)**.** [D] A daughter can hold an anchored strand if and only if its area is at least that of the minimal anchored enclosure of Article 62, model 2: a sphere of radius R_{62}, with $R_{62}^2 = L_p hL/(2E^*)$ at the bending tolerance E^*. By Proposition 4.1 this is the same as carrying at least λ lipids. Registered as H5.

Hypothesis 2.9 (Loss)**.** [D] A vessel that cannot divide at dusk, because $\nu \geq 1$ or because its bud could not hold a strand, is lost, as a failed cycle is in Article 64, Theorem 11.1. Registered as H6.

Hypothesis 2.10 (The pore travels with the strand)**.** [D] Each trimeric pore is tethered, at the free arm of its lumen-side unit (Article 66, Remark 5.3), to the strand, so pores are inherited with the strand at division. Registered as H7.

Hypothesis 2.11 (The loop)**.** [D] Within a period the vessel runs the loop of Article 71, Definition 7.1, with the catalyst at its density x^*: the remnant obeys $\dot{W}_b = \iota_{\text{eff}}\lambda - \kappa W_b$, and $N - W_b$ is constant. Registered as H8.

Hypothesis 2.12 (A curvature floor)**.** [D] No bilayer vesicle of this lipid is stable below a radius R_c. The corpus supplies only the convention $R_c = 25$ nm of Article 64, Remark C.5; R_c is carried as a parameter. Registered as H9.

Remark 2.13 (Which premises carry what)**.** [A] H2, H3 and H4 carry the copy-number theorem; H5 makes the closure vesicle the smallest viable daughter; H8 fixes the gain g; H9 bounds the genome from below and enters nothing else. H7 enters only Section 9.

3 Non-implications

Proposition 3.1 (Non-implications)**.** [A] *None of the following is asserted below.*

(i) That a cell is exhibited. *The cycle is a model of four coordinates per vessel and a division rule.*

(ii) That any parameter of the loop is known. *The gain g is a function of constants the corpus does not supply (Article 71, Target 12.8).*

(iii) That replication never fails. *H3 sets the failure probability of Article 64, Theorem 11.1, to zero.*

(iv) That a flaccid vessel is viable at any reduced volume. *No lower bound on v is imposed or derived.*

(v) That R_c is known. *The lower edge of the band rests on a convention (Hypothesis 2.12).*

(vi) That the pore is tethered to the strand. *H7 is a reading of Article 66's tether geometry, not a result.*

4 Scales: the closure vesicle

Proposition 4.1 (One period's lipids close one minimal enclosure)**.** [D] *Under Hypotheses 2.4 and 2.5, and with the minimal enclosure of Hypothesis 2.8, the lipids supplied to a vessel in one period are exactly the lipids of the smallest vesicle that holds its anchored strand:*

$$\frac{8\pi R_{62}^2}{a} = \frac{\nu L}{2} = \lambda, \qquad R_{62}^2 = \frac{L_p h L}{2E^*}.$$

At $E^* = 10\,k_BT$ the closed form gives $\nu = 65.73$, which Article 62, Corollary 10.6, rounds to 66. Block Y1:

L	R_{62} (nm)	λ	N_λ	w_{62}
200	*13.04*	*6573*	*558.6*	*0.0850*
300	*15.97*	*9860*	*1026.1*	*0.1041*
500	*20.62*	*16433*	*2207.9*	*0.1344*
735	*24.99*	*24156*	*3935.1*	*0.1629*
1000	*29.15*	*32866*	*6244.9*	*0.1900*

Proof. Article 62, Definition 10.1, gives $8\pi R^2/a$ lipids for a closed bilayer of radius R, and its model 2 gives the minimal radius $R_{62}^2 = L_p h L/(2E^*)$ for a strand laid against the inner leaflet at bending tolerance E^*; its Theorem 10.5 gives $\nu = 8\pi L_p h/(aE^*)$. Substitution gives the identity. Article 65, Theorem 8.5, supplies νL lipid units per period, which is $\nu L/2$ lipids. With the geometric criterion of Hypothesis 2.8, a daughter therefore holds a strand if and only if it carries at least λ lipids. □

Remark 4.2 (The closure ratio in two articles)**.** [A] Article 71 used $\nu = 66$, so $\lambda = 6600$ and $R_{62} = 13.06$ nm at $L = 200$; this article uses the closed form 65.73, so $\lambda = 6573$ and $R_{62} = 13.04$ nm. Quantities quoted across the two articles differ in the third figure on that account: w_{62} is 0.0851 in Article 71, block X6, and 0.0850 here.

Remark 4.3 (What the identity says)**.** [A] Article 65 sized its membrane demand per period as the closure membrane of one strand. That is a statement about the cycle, made without being stated: each period supplies exactly one minimal enclosure. Everything below follows from taking it at its word.

5 Division at dusk

Definition 5.1 (The division rule)**.** [D] At dusk a vessel of area A, volume V and reduced volume $v < 1$ divides into two daughters whose areas sum to A.

(i) If $2^{-1/2} \le v < 1$, both daughters are taut and the bud fraction $\alpha \in (0, 1/2]$ solves $Q(\alpha) = v^{-2/3}$.

(ii) If $v < 2^{-1/2}$, the fission is symmetric and each daughter is flaccid, with reduced volume $2^{1/2}v$.

The lumen divides in the ratio $\alpha : 1-\alpha$; membrane species divide by area share. If $v \ge 1$ there is no division.

Proposition 5.2 (The bud fraction is an output)**.** [A] *For $2^{-1/2} \le v < 1$ the bud fraction of Definition 5.1(i) exists and is unique, and both daughters are taut. Block Y2:*

v at dusk	α	bud area share
0.9900	0.0006	0.0071
0.9500	0.0080	0.0388
0.9000	0.0275	0.0850
0.8134	0.1000	0.1877
0.7500	0.2190	0.3000
0.7071	0.5000	0.5000

Proof. Q increases on $(0, 1/2]$ from 1 to $2^{1/3}$, so $Q(\alpha) = v^{-2/3}$ has one root there. Two taut spheres of volume fractions α and $1-\alpha$ have total area $Q(\alpha)A_{\mathrm{sph}}(V)$ (Article 64, Theorem 9.1), which equals A exactly when $Q(\alpha) = v^{-2/3}$. Below $2^{-1/2}$ the area exceeds what two taut halves need, and halving area and volume gives $v_d = 2^{1/2}v$. □

Remark 5.3 (What the rule changes)**.** [A] In Articles 64 and 67–71 the bud fraction is a parameter and division occurs at the threshold. Here the fraction is set by how far past the threshold the vessel has come by dusk. A large vessel just past it makes a very small bud, 0.71% of its area at $v = 0.99$.

6 Copy number

Lemma 6.1 (One strand per vessel)**.** [D] *Under Hypotheses 2.6 and 2.7, every vessel carries one strand at every dawn if and only if every vessel divides at every dusk.*

Proof. A vessel holding one strand at dawn holds two at dusk. If it divides, each daughter receives one (H4). If it does not, it begins the next period with two, and every later period doubles the count until a division. □

Remark 6.2 (A copy-number condition is a survival condition)**.** [A] Hypothesis 2.9 turns a vessel that skips a dusk into a lost vessel, so every surviving vessel carries one strand whatever happens. Under H6 the substance of Lemma 6.1 is which lineages survive, and Theorems 7.1 and 7.5 are to be read as conditions for survival. Without H6, a vessel skipping a dusk would carry two strands, and the same conditions would be conditions on copy number.

Theorem 6.3 (The mean birth size)**.** [D] *Under Hypotheses 2.5, 2.6 and 2.7, let every vessel divide at every dusk, and let $\bar{m}_k$ be the mean lipid count at birth in generation k, in units of λ. Then*

$$\bar{m}_{k+1} = \frac{\bar{m}_k + 1}{2}$$

exactly, whatever the division rule, and $\bar{m}_k - 1 = 2^{-k}(\bar{m}_0 - 1)$.

Proof. Each of the n_k vessels of generation k gains λ lipids in the period, and division conserves lipids, so the $2n_k$ daughters carry $n_k(\bar{m}_k + 1)\lambda$ between them. □

Remark 6.4 (The scope of the recursion)**.** [A] The recursion holds only while every vessel divides. In a population with losses, at $g \geq 1$ or from founders that fail, the surviving vessels need not satisfy it, and Corollary 6.5 says nothing there.

Corollary 6.5 (The population becomes closure vesicles)**.** [D] *Under the hypotheses of Theorem 6.3 and Hypothesis 2.8, every daughter has $m \geq 1$, so for every $\varepsilon > 0$ the share of daughters born above $1 + \varepsilon$ is at most $2^{-k}(\bar{m}_0 - 1)/\varepsilon$. The population comes to consist of closure vesicles, and a closure vesicle that divides with both daughters holding a strand divides symmetrically.*

Proof. $\bar{m}_k - 1$ is the mean of the non-negative quantity $m - 1$, which bounds ε times the share above $1 + \varepsilon$. A vessel of $m = 1$ reaches 2 by dusk, and two daughters of at least 1 each must each have exactly 1. □

Remark 6.6 (Large cells persist; their share vanishes)**.** [A] The corollary bounds a share, not each cell. A large founder can persist as a mother that buds one closure vesicle per period, gaining λ and losing about λ; computed, the 100-nm founder is still 57.895λ after fourteen periods at $g = 0.5$ (block Y4). Its share of the population halves every period.

Scholium 6.7 (Budding and fission)**.** Article 64 preferred budding because symmetric fission needs the largest area gain, and Article 65 found a third argument for it. Under copy-number homeostasis the steady state is symmetric fission of the closure vesicle; budding survives as what large vessels do on their way to a vanishing share. This agrees with Article 64's own Theorem 10.5, that a steady lineage requires balanced doubling, which it obtained for a different reason.

7 The existence condition, and the founder

Theorem 7.1 (The symmetric orbit). [D] *Under Hypotheses 2.4–2.11, define*

$$g = \frac{\iota_{\text{eff}}}{w_{62}} \frac{1 - e^{-\kappa}}{\kappa\,(2 - e^{-\kappa})},$$

read as $\iota_{\text{eff}}/w_{62}$ *at* $\kappa = 0$. *The orbit in which every vessel is born with* λ *lipids and divides symmetrically at every dusk exists if and only if* $g \le 1$. *On it the vessel is born with osmolyte* gN_λ *and reduced volume* g: *taut at* $g = 1$, *flaccid below. The free remnant per lipid at division is* gw_{62}.

Proof. Over a period $W_b(1) = W_\infty + (W_b - W_\infty)e^{-\kappa}$ with $W_\infty = \iota_{\text{eff}}\lambda/\kappa$, and symmetric division halves it. The fixed point is $W^* = W_\infty(1 - e^{-\kappa})/(2 - e^{-\kappa})$, with $W_b(1) = 2W^*$; since $N - W_b$ is constant within the period the osmolyte gain is W^*, and halving fixes the osmolyte at birth at $W^* = gN_\lambda$. At dusk the vessel has 2λ lipids and $2gN_\lambda$ osmolyte, so $v = 2g/2^{3/2} = g\,2^{-1/2}$. Symmetric division with daughters of λ lipids requires $v \le 2^{-1/2}$ (Proposition 5.2), that is $g \le 1$; for $g > 1$ the bud fraction falls below $1/2$, the bud below λ, and the vessel is lost (H5, H6). The remnant per lipid at division is $2W^*/2\lambda$. □

Remark 7.2 (The gauge, again). [A] By Article 71's gauge the bud's osmolyte per lipid is the mother's free remnant per lipid at division, here gw_{62}; at $g = 1$ that is w_{62}, the osmolyte per lipid of the taut closure vesicle. The two papers' identities agree on this orbit.

Proposition 7.3 (Populations). [D] *Computed over fourteen periods,* $c = 0$, $L = 200$ *(block Y4). For* $g = 0.6$, 0.8, 0.9, 0.95 *and* 0.99, *founders of* 1.5, 3, 10 *and* 58.6 *closure vesicles lose no birth, and the share of surviving cells born above* 1.01λ *is at most* 0.0020. *At* $g = 1$ *the losses per birth are* 0.4773, 0.0031, 0.4868 *and* 0.0311 *for the same founders. At* $g = 1.2$ *every founder tried is lost at its first dusk, and the* 58.6*-vesicle founder is lost at its first dusk at* $g = 1.02$, 1.05 *and* 1.1. *Theorem 7.1 proves the loss above one only for the closure-vesicle founder; for larger founders it is computed. At* $g = 0.5$ *the reduced volume at birth of the closure vesicles is* 0.5000, *as Theorem 7.1 gives.*

Remark 7.4 (Why $g = 1$ is marginal). [A] At $g = 1$ the closure vesicle is born taut and reaches dusk at exactly $2^{-1/2}$, the symmetric threshold. A founder off the orbit carries a little more osmolyte per lipid at some dusk, crosses into the regime of Definition 5.1(i), makes a bud below λ, and is lost. The working regime is $g < 1$, with a margin.

Theorem 7.5 (The founder condition). [D] *Under the hypotheses of Theorem 7.1, a founder born as a taut closure vesicle with no remnant divides at its first dusk if and only if*

$$g \le \frac{1}{2 - e^{-\kappa}}, \qquad \textit{equivalently} \qquad \iota_{\text{eff}} \le w_{62}\,\frac{\kappa}{1 - e^{-\kappa}}.$$

Proof. From $W_b = 0$ the period gives $W_b(1) = W_\infty(1 - e^{-\kappa})$, which is also the osmolyte gain. At dusk the vessel has 2λ lipids and $N_\lambda + W_b(1)$ osmolyte, so $v \le 2^{-1/2}$ if and only if $W_b(1) \le N_\lambda$. Substituting W_∞ and the definition of g gives the condition. □

Proposition 7.6 (The founder computed). [D] *Block Y3 tabulates the two bounds against* κ; *at* $\kappa = 0.5$ *the established lineage tolerates* ι_{eff} *up to* $1.7707\,w_{62}$ *and the founder without remnant up to* $1.2707\,w_{62}$, *the founder bound on* g *being* 0.7176. *Computed over fourteen periods (block Y4): at* $g = 0.7$ *the founder survives with no remnant and with the steady remnant; at* $g = 0.9$ *it is lost with no remnant and survives with the steady remnant.*

Scholium 7.7 (What a founder must carry). Condensation helps a lineage only once its remnant has built up. A lineage founded without remnant must meet the stricter condition, or inherit remnant from whatever founded it. The question of how the first vessel was assembled (Article 71, Target 12.14) therefore acquires a quantitative edge.

8 The earlier loop under dusk division

Proposition 8.1 (The baseline of Article 71). [D] *At the baseline of Article 71 (*$\iota_{\text{eff}} = 0.16$, $\kappa = 0.004$*) the gain of Theorem 7.1 is, by block Y5:*

L	w_{62}	g	
200	*0.0850*	*1.8716*	*fails*
500	*0.1344*	*1.1837*	*fails*
735	*0.1629*	*0.9763*	*met*
1000	*0.1900*	*0.8370*	*met*

With the bud fraction fixed at 0.10 *and division only at dusk, a vessel started at Article 71's mother-line set point divides at three dusks in twelve; the other nine each add a strand copy. The set point is recomputed from Article 71's closed-form generation map at its own* $\lambda = 6600$, *which reproduces its period of* 3.1388 *cycles and bud of* 23.147 *nm; its birth*

state is 89,633 *lipids, taut, with free remnant* 0.1509 *per lipid (block Y5).*

Remark 8.2 (What changes in Article 71)**.** 🄰 Article 71 divided at the threshold crossing and reported periods such as 3.1388 cycles. Under Article 64's dusk rule a period is a whole number of forcing periods, and under the copy-number requirement it is one. Article 71's identities survive on the orbit of Theorem 7.1: its period identity gives one period, since the bud is λ; its gauge gives Remark 7.2. What does not survive is its reading that the content of the sequence sets the size of the vessel. On the integrated cycle the size is the closure vesicle, fixed by the genome's length; the content fixes only g, which must stay below one, and the flaccidity $v = g$. Ruling 71.2 records this.

9 The ledger and the pore

Proposition 9.1 (The ledger closed per period)**.** 🄳 *On the orbit of Theorem 7.1 at* $c = 0$*, Article 65's demand per period,* $5L$ *for the genome,* νL *for the membrane and the gross excision for residues, together with the growth* $x^{*}\lambda$ *of the catalyst stock of Article 71, allocates as follows (block Y6). The residue column is the value at* $g = 1$ *and an upper bound below it; the catalyst column uses Article 71's baseline density* $x^{*} = 0.08$ *as an illustration; the adenosines the triplets carry are not counted in Article 65's pool of chrysene units.*

L	$5L$	νL	*res.*	*cat.*	f_{anc}	f_{res}	f_{cat}	f_{lip}
200	*1000*	*13146*	*559*	*526*	*0.066*	*0.037*	*0.035*	*0.863*
500	*2500*	*32866*	*2208*	*1315*	*0.064*	*0.057*	*0.034*	*0.845*
735	*3675*	*48313*	*3935*	*1933*	*0.064*	*0.068*	*0.033*	*0.835*
1000	*5000*	*65732*	*6245*	*2629*	*0.063*	*0.078*	*0.033*	*0.826*

Article 65's allocation at $\alpha = 0.10$ *was* $(0.024, 0.664, 0.313)$*. The residue demand overtakes the membrane only at* $L = 110{,}788$*.*

Scholium 9.2 (Why the allocation reverses)**.** Article 65 found two thirds of the pool going to the osmolyte and called that unexpected for an architecture whose subject is an encoding. The proportion belonged to a vessel of 100 nm restoring a tenth of its particles each period. The vessel of the integrated cycle is the closure vesicle, whose osmolyte grows as $L^{3/2}$ while its membrane grows as L; at every genome length the corpus contemplates, the membrane dominates.

Proposition 9.3 (The pore travels with the strand)**.** 🄳 *Under Hypothesis 2.10 each daughter inherits the pores tethered to its strand. On the orbit at* $c = 0$ *the nitrogen demand is* N_{λ} *per period:* 0.0129, 0.0911 *and* $0.1446\ s^{-1}$ *at* $L = 200, 735$ *and* 1000*, which one pore at* $10^{4}\ s^{-1}$ *(Article 66, Remark 9.1) over-supplies by* 773,410*,* 109,780 *and* 69,176*. One new pore per strand per period costs* 9 *units,* 0.061% *of the pool at* $L = 200$ *(block Y7).*

Remark 9.4 (What H7 buys)**.** 🄰 Article 66 left open where pores are and how many form, noting that the tether gives a ring a sequence address. If the address is the strand, the supply line is inherited with the genome, and the copy-number requirement extends to it: one strand, one pore at least. Without H7 a daughter could be born without a pore and could make no residue.

10 The band of the genome

Proposition 10.1 (The caps on the integrated cycle)**.** 🄳 *On the integrated cycle every vessel is at least the closure vesicle, so the strand fits by construction. Article 64's contour cap, which asks the strand's contour to span the diameter, is a criterion for a free rod and does not apply to a strand anchored along the leaflet (Article 62, Remark 10.4). What remains are the fidelity cap* $L \le 1/e$ *and the clock cap* $L \le \delta T / t_{\text{add}}$ *of Article 64, Theorem 12.1, and the curvature floor of Hypothesis 2.12,* $R_{62}(L) \ge R_c$*, that is* $L \ge 2E^{*}R_c^{2}/(L_p h)$*. Block Y8, with the fidelity cap at* 1000*:*

R_c	E^{*}	$L_{\min}$	$t_{\text{add}} = 30\ s$	$60\ s$	$100\ s$
15	*10*	*265*	*1000*	*720*	*432*
20	*10*	*471*	*1000*	*720*	*432**
25	*3*	*221*	*1000*	*720*	*432*
25	*10*	*735*	*1000*	*720**	*432**
25	*30*	*2206*	*1000**	*720**	*432**

The last three columns give the upper edge; an asterisk marks an empty band. The upper edges are at duty $\delta = 1$*, the value implicit in Article 64's evaluation* $\delta T = 43{,}200\ s$*, which is the whole period although its forcing vanishes on a dark interval (Ruling 64.6). At* $R_c = 25$ *nm and* $E^{*} = 10\,k_B T$ *the band is* $[735, \min(1/e, \delta T/t_{\text{add}})]$*, non-empty for* $t_{\text{add}} \le \delta T/735$*, that is* $58.8\ s$ *at* $\delta = 1$*,* $44.1\ s$ *at* $3/4$ *and* $29.4\ s$ *at* $1/2$*, and for a per-base error rate* $e \le 1/735 = 1.360 \times 10^{-3}$*. The fidelity cap is* 1000 *at* $e = 10^{-3}$ *but* 333 *at* $e = 3 \times 10^{-3}$ *and* 100 *at* 10^{-2} *(Article 64, block V7); at either of those rates the band at the conventional floor is empty (block Y8).*

Remark 10.2 (What the floor was)**.** [A] Article 64 took a floor at 25 nm as the radius below which "an enclosure cannot hold a strand of the length the caps permit", and called it a convention (Remark C.5). On the integrated cycle that office is filled exactly by $R_{62}(L)$, which depends on the strand and needs no convention. What remains of a floor is the curvature a bilayer can sustain, a different quantity, which the corpus has not derived and on which the lower edge of the band rests entirely.

11 Registers, precedence, targets, conclusion

11.1 Consolidated register

What keeps one strand per vessel?
Division at every dusk, given replication once per period.
Rests on: Lem. 6.1.
Standing: [D] on H3, H4.

What does one period's supply of lipid make?
Exactly one minimal enclosure of the anchored strand: 13.04 nm at 200 units.
Rests on: Prop. 4.1; block Y1.
Standing: [D] on H1, H2, H5.

What does the population become?
Closure vesicles dividing symmetrically; the share above $1+\varepsilon$ is at most $2^{-k}(\bar{m}_0-1)/\varepsilon$; large founders persist as a vanishing share.
Rests on: Thm. 6.3, Cor. 6.5, Rem. 6.6.
Standing: [D]; the persistence is computed.

When does the symmetric orbit exist?
Iff $g \le 1$; flaccid at $\nu = g$ below one, taut and marginal at one. Above one the closure vesicle is lost (proved) and so is every other founder tried (computed).
Rests on: Thm. 7.1, Prop. 7.3; block Y4.
Standing: [D]; populations computed.

What must a founder satisfy?
$g \le 1/(2-e^{-\kappa})$ if it carries no remnant: 0.7176 at $\kappa = 0.5$.
Rests on: Thm. 7.5, Prop. 7.6.
Standing: [D].

Does the earlier loop meet the condition?
Not at 200 units ($g = 1.8716$); from about 735 ($g = 0.9763$).
Rests on: Prop. 8.1; block Y5.
Standing: [D].

What does the pool pay for?
Mostly membrane: 0.863 at 200 units, against 0.313 in Article 65.
Rests on: Prop. 9.1; block Y6.
Standing: [D].

Is nitrogen limiting?
No; one pore over-supplies by 773,410 at 200 units, and is inherited with the strand under H7.
Rests on: Prop. 9.3; block Y7.
Standing: [D] on H7.

What length of genome does the cycle admit?
$[2E^{*}R_c^2/(L_p h), \min(1/e, \delta T/t_{\mathrm{add}})]$; [735, 1000] at the conventional floor, $\delta = 1$, $t_{\mathrm{add}} \le 30$ s and $e = 10^{-3}$; empty at $e = 3\times10^{-3}$; at $\delta = 1/2$ it needs $t_{\mathrm{add}} \le 29.4$ s.
Rests on: Prop. 10.1; block Y8.
Standing: [D] on H9, a convention.

11.2 Falsification register

Proposition 4.1
A per-period lipid supply other than $\nu L/2$, or a minimal anchored enclosure other than Article 62's model 2.

Lemma 6.1
A vessel that keeps one strand while skipping a dusk: replication less than once per period, or a division away from dusk.

Theorem 6.3
A lineage dividing at every dusk whose mean birth size does not halve its distance to λ: a lipid supply that is not the same for every vessel, or a division that destroys or creates lipid.

Theorem 7.1
A closure vesicle dividing symmetrically every period at $g > 1$; this would need a daughter below λ to hold a strand, refuting H5.

Theorem 7.5
A remnant-free founder surviving its first dusk above the bound, or failing below it.

Hypothesis 2.10
A pore tethered elsewhere than to the strand, or a daughter born without one that nonetheless makes residues.

11.3 Precedence

Corrected statements supersede earlier ones where they speak to the same object; the earlier text is not altered. Table 3 collects the corrected values.

Ruling 11.1 (Against Article 71)**. 71.1** [A] *Division is at dusk.* Article 71 divided at the threshold crossing; Article 64, Definition 5.3, divides only at dusk. Every period Article 71 reports in the continuous reading, such as 3.1388 cycles, is not an admissible period. Its Theorems 7.4 and 7.5 survive on the orbit of Theorem 7.1, with period one (Remark 8.2).

71.2 [D] *Corollary 10.1(i) is superseded on the integrated cycle.* The content of the sequence does not set the size of the vessel when copy number is kept: the size is the closure vesicle, fixed by the length. The content sets g, which must not exceed one, and the reduced volume at birth, $v = g$.

71.3 [A] *Ruling 68.5 in its final form.* The site geometry that Article 68 cites to Article 24 is in the third loom paper [Sch26b], Section 3.2: an equilateral triangular pore of side 14 Å with three chrysene towers, in which a native transmembrane helix keeps backbone-to-tower gaps of 3.15–7.24 Å, inside a functional window of 3.0–7.5 Å. The "hexameric ring" is that triangular pore, and neither 9.17 nor 3.77 Å appears in the source: they are Article 68's derivations, the first as $14/\sqrt{3} - 3.5$ doubled, where $14/\sqrt{3}$ is the circumradius of the triangle, the distance from its centre to a tower, which Article 68's block W1 labels an inradius; the second as $9.17 - 5.4$ with 5.4 Å the helical pitch of Article 23. The clearance is withdrawn. The source's positive gaps are C_α-to-tower distances for a helix in a lattice void of the Chrysene Tensor Space; they support a fit at Article 68's condensation site only to the extent that the site is that void.

71.4 [A] *Proposition 6.1 is now sourced.* Article 65, Theorem 8.5, states the pool demand per period, vL lipid units included, so the per-cycle reading of L_{lip} is a citation and not an inference.

71.5 [D] *Proposition 8.5 and Corollary 8.6 concern the threshold reading.* The population of Article 71, three births in four below the floor, is that of a fixed bud fraction divided at the crossing. Under H3–H6 it is replaced by Corollary 6.5 and Proposition 7.3.

Ruling 11.2 (Against Article 64)**. 64.1** [A] *The floor is replaced.* The 25 nm of Remark C.5 and Corollary 10.7 stood for the radius below which an enclosure cannot hold a strand. On the integrated cycle that radius is $R_{62}(L)$. A curvature floor remains, as Hypothesis 2.12.

64.2 [A] *The contour cap does not apply to an anchored strand* (Proposition 10.1).

64.3 [A] *Block V7 and Corollary 12.2 disagree.* The block's common band is 100–400 bp; the corollary's is 300–1000 bp. Recorded and not reconciled.

64.4 [D] *The preference for budding* (Corollary 9.2, Remark 11.2) holds for a lineage on a fixed budget; on the integrated cycle the steady state is symmetric fission, consistent with Theorem 10.5 (Scholium 6.7).

64.5 [A] *The reset* of Definition 10.2, stated for division exactly at threshold, is extended to division at dusk by Definition 5.1.

64.6 [A] *The duty in the clock cap.* Corollary 11.3 and block V7 evaluate δT as 43,200 s, the whole twelve-hour period, so $\delta = 1$; Definition 5.2 has the forcing vanish on a dark interval, so $\delta < 1$. Every clock cap of Article 64 is to be read with δ explicit; at $\delta = 1/2$ each is halved.

Ruling 11.3 (Against Article 65)**.** [D] The allocation $(0.024, 0.664, 0.313)$ and Remark 8.7 belong to the 100-nm vessel restoring $\alpha/(1-\alpha)$ of its particles. On the integrated cycle the residue demand is the closure vesicle's osmolyte and the allocation is dominated by membrane (Proposition 9.1). Theorem 8.5's form, the sum of three additive demands, stands.

Ruling 11.4 (Against Article 66)**.** [A] Consistent; one hypothesis added. Non-implication (v), that the tether does not determine where rings are or how many form, is met by Hypothesis 2.10, which places them on the strand. The over-supply of Remark 9.1 is confirmed at the integrated cycle's demand.

Ruling 11.5 (Against Article 62)**.** [A] Consistent. The closure ratio is recomputed in closed form, 65.73 at $E^* = 10\,k_BT$, and the model-2 radius acquires a dynamical meaning: it is the size of every vessel on the integrated cycle.

11.4 Targets

Target 11.6 (Replication failure)**.** Restore Article 64's failure probability $p > 0$ and determine the condition for persistence when a failed vessel is lost.

Target 11.7 (How flaccid)**.** Determine the smallest reduced volume at which a vessel can still divide at dusk; it bounds g from below.

Target 11.8 (The curvature floor)**.** Derive R_c for the route-A lipid; the lower edge of the band rests on it entirely.

Target 11.9 (The founder)**.** Determine how the first vessel was assembled and with what remnant, which decides whether Theorem 7.5 or Theorem 7.1 governs the founding.

Target 11.10 (The pore's tether)**.** Decide whether the trimeric pore is tethered to the strand.

Target 11.11 (The bending tolerance)**.** Replace the stipulated E^* of Article 62; it sets R_{62}, λ and the band.

11.5 Conclusion

Proposition 11.12 (What is established)**.** 🄰 *Subject to Appendix A:*

(i) One period's lipids close exactly one minimal enclosure of the anchored strand (Proposition 4.1).

(ii) One strand per vessel is division at every dusk (Lemma 6.1); then the mean birth size converges to the closure vesicle at rate one half per period, and the population comes to divide it symmetrically (Theorem 6.3, Corollary 6.5).

(iii) The symmetric orbit exists iff $g \le 1$, flaccid below and marginal at one (Theorem 7.1); a founder without remnant needs $g \le 1/(2 - e^{-\kappa})$ (Theorem 7.5).

(iv) Computed: no loss for $g < 1$ from founders up to 100 nm; the earlier loop meets the condition from about 735 units; the pool pays mostly for membrane; one inherited pore suffices (Propositions 7.3–9.3).

(v) The genome's length sets the vessel; its content sets whether the lineage survives and how flaccid it is; the band of lengths rests on a curvature floor not yet derived and needs a per-base error rate at most $1/735$ at the conventional floor (Proposition 10.1).

Remark 11.13 (What is not established)**.** 🄰 Replication is taken never to fail, a lost vessel is taken to be lost, the pore's tether to the strand is a reading, the curvature floor and the bending tolerance are conventions, and no constant of the loop is known. The cycle is a model with a definite steady state, not an exhibited cell.

A Hypothesis register

B Verification

Every number in the body is emitted by `acf-72-blocks.py` (standard library only; a full run takes a few minutes).

Y1 [COMPUTED] **Scales**

The closure identity and its table; ν in closed form; the founder's lipids and u_0.

Y2 [COMPUTED] **Division at dusk**

The bud fraction and area share against the reduced volume at dusk.

Y3 [COMPUTED] **The copy-number condition**

The mean-size argument; the closed form of g; the established and founder factors against κ.

Y4 [COMPUTED] **Populations**

Tree simulations over fourteen periods at $g = 0.5$, 1.0, 1.2 from five founders; the loss sweep for g from 0.6 to 1.0; the largest founder just above $g = 1$; founders with and without remnant at $\kappa = 0.5$.

Y5 [COMPUTED] **The earlier loop**

g at Article 71's baseline against L; Article 71's set point recomputed from its closed form and checked; dusks without division from it under a fixed bud fraction.

Y6 [COMPUTED] **The ledger**

The per-period demand, catalyst included, and the allocation against L; the crossover length.

Y7 [COMPUTED] **The pore**

Nitrogen demand and the over-supply of one pore; the cost of a pore.

Y8 [COMPUTED] **The band**

Lower and upper edges against R_c, E^* and t_{add}; the fidelity cap at three error rates and the rate the conventional floor requires; the bound on t_{add} at three duties.

C Sources and literature

C.1 The corpus, by use

C.2 Established literature

None of the following enters a proof.

Vesicle shape. The reduced volume, and the area two spheres need, are the standard geometry of fluid vesicles [Sei97].

Replication and division. That division must keep pace with replication for copy number to be stable is the question bacterial cell-cycle studies pose of chromosomes and division [CH68]; and the averaging argument of Theorem 6.3 is akin to the analysis of size homeostasis under added growth [Ami14, TABS+15]. Neither model is used.

Protocell growth and division. Model protocells grow by incorporating amphiphile and divide under modest forces [CRS04, ZS09]; no quantitative correspondence is asserted.

Hybrid dynamics. The cycle flows within a period and jumps at dusk [GST12].

Table 1: Hypotheses of this article: what rests on each, and what survives its failure.

	Premise	What rests on it	What survives its failure
H1	One anchored strand per vessel (Hyp. 2.4)	The closure identity; the copy-number question	Nothing specific to this article
H2	$\lambda = \nu L/2$ lipids per vessel per period (Hyp. 2.5)	The identity; the mean-size recursion	The division geometry
H3	Replication once per period, without failure (Hyp. 2.6)	Lemma 6.1	The orbit of Thm. 7.1 as an orbit, without its necessity
H4	Division at dusk, area conserved, bud fraction an output (Hyp. 2.7)	Lemma 6.1; Def. 5.1	The ledger and the band
H5	Strand fit at radius R_{62} (Hyp. 2.8)	The lower bound $m \geq 1$; the loss of large-g founders	The mean-size recursion
H6	A vessel that cannot divide is lost (Hyp. 2.9)	The loss counts	Everything proved
H7	Pores tethered to the strand (Hyp. 2.10)	Prop. 9.3	Everything outside Section 9
H8	The loop of Article 71 at x^* (Hyp. 2.11)	The form of g	Thm. 6.3 and the identity
H9	A curvature floor R_c (Hyp. 2.12)	The lower edge of the band	Everything else

C.3 Notes on the corpus's citations

Article 68 cites the site geometry to "Article 24"; the source is the third loom paper, published at article 25 [Sch26b]. Article 64's block V7 and its Corollary 12.2 give different common bands.

References

[Ami14] A. Amir. Cell Size Regulation in Bacteria. *Physical Review Letters*, 112:208102, 2014.

[CH68] S. Cooper and C. E. Helmstetter. Chromosome Replication and the Division Cycle of *Escherichia coli* B/r. *Journal of Molecular Biology*, 31(3):519–540, 1968.

[CRS04] I. A. Chen, R. W. Roberts, and J. W. Szostak. The Emergence of Competition between Model Protocells. *Science*, 305(5689):1474–1476, 2004.

[GST12] R. Goebel, R. G. Sanfelice, and A. R. Teel. *Hybrid Dynamical Systems: Modeling, Stability, and Robustness*. Princeton University Press, 2012.

[Sch26a] Charles D. Schaper. Addressing the Division Clock: Codon Gating at the Membrane, the Reusable X-A Catalyst, and the Set Point of the Lineage. *Annals of the Chrysene Formalism*, 1(3):1453–1471, 2026. Article 71. DOI: https://doi.org/10.68366/xq2xgj80.

[Sch26b] Charles D. Schaper. Higher-Order Geometry of the Abiotic Loom: Axis Alignment, Pore Tethering, and Side-Chain Packing of Secondary-Structure Elements in the Chrysene Tensor Space. *Annals of the Chrysene Formalism*, 1(1):292–304, 2026. DOI: https://doi.org/10.68366/qn0sab53.

[Sch26c] Charles D. Schaper. The Abiotic Loom: Discrete Morse Theory and the Geometric Resolution of Levinthal's Paradox in the Chrysene Tensor Space. *Annals of the Chrysene Formalism*, 1(1):273–282, 2026. Article 23. DOI: https://doi.org/10.68366/vdze9508.

[Sch26d] Charles D. Schaper. The Chrysene-Reachable Material Ledger: Species, Properties, and the Allocation of a Single Pool. *Annals of the Chrysene Formalism*, 1(3):1371–1383, 2026. Article 65. DOI: https://doi.org/10.68366/dwqk8m15.

[Sch26e] Charles D. Schaper. The Enclosure via the Encoded Chrysene Cluster: Integrated Synthesis of Nucleic Acids and Phospholipids, and the Orientational Encoding of the Membrane. *Annals of the Chrysene Formalism*, 1(3):1279–1320, 2026. Article 62. DOI: https://doi.org/10.68366/24m3wx88.

[Sch26f] Charles D. Schaper. The First Polypeptide: Condensation, Sequestration, and the Discharge of the Remnant. *Annals of the Chrysene Formalism*, 1(3):1414–1422, 2026. Article 68. DOI: https://doi.org/10.68366/jw1axc69.

[Sch26g] Charles D. Schaper. The First Pore: Closure, Aperture, and the Reconciliation of Impermeance with Supply. *Annals of the Chrysene Formalism*, 1(3):1384–1404, 2026. Article 66. DOI: https://doi.org/10.68366/en23gq52.

[Sch26h] Charles D. Schaper. The Origins Arc: A Coordinating Formalism for the Passage from the Substituted Chrysene Cluster to the Genetic Code. *Annals of the Chrysene Formalism*, 1(3):1163–1249, 2026. Article 60. DOI: https://doi.org/10.68366/z2fwpm73.

[Sch26i] Charles D. Schaper. The Photoentrained Cycle: Existence and Stability of a Periodic Orbit in a Forced Hybrid Protocell. *Annals of the Chrysene Formalism*, 1(3):1348–1370, 2026. Article 64. DOI: https://doi.org/10.68366/h9rzkd75.

[Sei97] U. Seifert. Configurations of Fluid Membranes and Vesicles. *Advances in Physics*, 46(1):13–137, 1997.

[TABS+15] S. Taheri-Araghi, S. Bradde, J. T. Sauls, N. S. Hill, P. A. Levin, J. Paulsson, M. Vergassola, and S. Jun. Cell-Size Control and Homeostasis in Bacteria. *Current Biology*, 25(3):385–391, 2015.

Table 2: Corpus sources by use.

Source	Used at	What is taken
Coordinating paper [Sch26h]	Conv. 2.1	The status labels.
The Abiotic Loom [Sch26c]	Ruling 71.3	Theorem 6: the 5.4 Å helical pitch.
Higher-Order Geometry of the Abiotic Loom [Sch26b]	Ruling 71.3	Section 3.2 and Table 2: the triangular pore of side 14 Å and the measured backbone-to-tower gaps.
The Enclosure [Sch26e]	Prop. 4.1; Hyps. 2.4, 2.8; Prop. 10.1; Ruling (Against Article 62)	$N(R) = 8\pi R^2/a$ (Def. 10.1); model 2 and ν in closed form (Thm. 10.5, Cor. 10.6); the anchored strand (Sec. 8, Rem. 10.4).
The Photoentrained Cycle [Sch26i]	Conv. 2.3; Hyps. 2.6, 2.7, 2.9, 2.12; Prop. 5.2; Ruling (Against Article 64)	Division at dusk (Def. 5.3); the threshold geometry (Thm. 9.1); the reset (Def. 10.2); balanced doubling (Thm. 10.5); replication (C3, Thm. 8.2); viability (Thm. 11.1); the caps (Thm. 12.1, block V7); the floor (Rem. C.5); N_0, R_0, T.
The Material Ledger [Sch26d]	Hyp. 2.5; Prop. 9.1; Ruling (Against Article 65)	The per-period pool demand and its allocation (Thm. 8.5, Rem. 8.7).
The First Pore [Sch26g]	Hyp. 2.10; Prop. 9.3; Ruling (Against Article 66)	The trimeric pore, its cost and over-supply (Prop. 8.4, Rem. 9.1); the tether geometry (Rem. 5.3); Non-implication (v).
The First Polypeptide [Sch26f]	Ruling 71.3	The site figures 9.17 and 3.77 Å (block W1).
The Encoder Addresses the Clock [Sch26a]	Hyp. 2.11; Rem. 7.2; Prop. 8.1; Ruling (Against Article 71)	The loop (Def. 7.1), catalyst density, gauge and period identities (Thms. 7.4, 7.5), baseline, rulings and targets.

[ZS09] T. F. Zhu and J. W. Szostak. Coupled Growth and Division of Model Protocell Membranes. *Journal of the American Chemical Society*, 131(15):5705–5713, 2009.

D Revision record

Item	Critique	Revision
R1	H5 stated through its own consequence	H5 made geometric; Prop. 4.1 converts it to λ
R2	Loss above one stated in general	"Every founder tried"; largest founder at $g = 1.02$–1.1 emitted by block Y4
R3	Band silent on fidelity	Error rate $\leq 1/735$ stated; caps emitted by block Y8
C1	Ruling 71.3	Circumradius named; support qualified
C2	ν differs from Article 71	Rem. 4.2
R4	Clock cap at duty one	δ carried in Prop. 10.1 and the register; Ruling 64.6; bounds emitted by block Y8
R5	Y5 start not the set point	Article 71's set point recomputed and checked in block Y5; count unchanged
R6	Ledger without catalyst, at the margin	Catalyst column added; residues stated as the value at $g = 1$; membrane share 0.863
R7	Scope of Thm. 6.3	Rem. 6.4
R8	Copy number under H6	Rem. 6.2

E Correction ledger

The referee's items and their dispositions. Every item was accepted.

Table 3: Correction ledger. Corrected values are emitted by `acf-72-blocks.py` or quoted from the source named.

Art.	Location	As printed	Corrected	Source
71	Periods, continuous reading	e.g. 3.1388 cycles	whole periods; one on the orbit	Art. 64 Def. 5.3
71	Cor. 10.1(i)	content sets the size	length sets the size; content sets $g \le 1$	Thm. 7.1
71	Ruling 68.5	source not consulted	triangular pore, side 14 Å; gaps 3.15–7.24 Å	[Sch26b]
71	Prop. 6.1	inference	cited	Art. 65 Thm. 8.5
64	Rem. C.5 floor	25 nm, a convention	$R_{62}(L)$; R_c a parameter	Y1, Y8
64	Cap 2	contour across diameter	not applicable to an anchored strand	Art. 62 Rem. 10.4
64	Block V7 vs Cor. 12.2	100–400 / 300–1000 bp	recorded	—
65	Allocation, Rem. 8.7	$(0.024, 0.664, 0.313)$	$(0.066, 0.037, 0.035, 0.863)$ with catalyst, $L = 200$	Y6
62	ν	66	65.73 in closed form	Y1