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# ORTHOGONAL REVIEW RECORD

*The Division of the Vessel: The Coded Chain, the Photochrome Brake, and the Genome that Selects Itself*

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|---|---|
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## Declared conflict

The initial assessment was prepared by the same system that drafted the manuscript and wrote its blocks. A subsequent independent referee report was prepared for the Editorial Board after the first-round revisions were incorporated. There is no author-reply section.

### Scope of Review

The article's core is sound and is an advance. The counting identity and the gain that follows from it (Theorems 4.5 and 4.6) are correct, are proved from stated hypotheses, and replace a premise the corpus could not support. The barrier argument of Section 11 is the strongest

thing in the paper: its criterion is independent of the attempt rate and of the barrier height. Three findings required revision: a contradiction between Theorem 14.3 and Corollary 14.4; the uncounted counterions of the genome's own strands; and the osmotic treatment applied at a particle count of order fifty. The independent review confirms the principal advances and notes residual drafting notes, bibliography placeholders, and typographical items.

**Compiled disposition**

Accept with minor revisions. The first-round required corrections were incorporated. The independent referee confirms five major advances and recommends acceptance after removal of temporary drafting notes, completion of bibliography placeholders, and synchronization of summary passages. No further computation is required. The counting identity, the barrier criterion, and the dusk-gate mechanism stand.

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# 1 Stage summary of the first report

### R1 — Theorem 14.3 does not give condition (D3)

[**MAJOR**] The theorem concludes that no fission can occur while replication is in progress, and condition (D3) is not a separate requirement but a consequence of the switch. The first clause follows from H11 and H14. The second does not. The switch de-activates when the forcing ends, whether or not replication has finished. A vessel with $L\,t_{\mathrm{add}} > \delta T$ therefore arrives at dusk with one duplex and a partial strand. Required: delete the second clause. The clock condition survives unchanged as the upper edge of the band.

### R2 — The genome's own counterions are uncounted

[**MAJOR**] Theorem 4.5 lists the lumen particles as released chains and hydrolysed residues and nothing else. The genome is a polyelectrolyte and is itself in the lumen's electrostatic environment, and replication adds a complete complementary strand every period. At the corpus baseline the birth osmolyte is $gN_\lambda = 49.3$ particles at $L = 200$; $2L = 400$ nucleotides are added per period, and at a Manning free fraction near a quarter that is of order 96 particles, twice the entire budget. Required: decide which defence applies, state it as a clause of H8, and if the term survives, carry it in Theorem 4.6 and recompute blocks T5, T12 and T13.

### R3 — The osmotic treatment is applied at fifty particles

[**MAJOR**] At the article's own gains the lumen particle count is small. At $L = 200$, $N_\lambda = 558.6$, $gN_\lambda = 49.3$, and $N^{-1/2} = 14.2\%$. The article treats $v$ as deterministic throughout and its orbit as exact. This is not fatal — the existence condition is met with a margin far wider than 14% — but it bears on the gate. Required: a remark stating the particle counts and bounding the fluctuation, and a qualification of Corollary 13.6. A referee would accept the result as a statement about means.

| $L$ | $N_\lambda$ | $gN_\lambda$ | $N^{-1/2}$ |
|---|---|---|---|
| 200 | 558.6 | 49.3 | 14.2% |
| 432 | 1773.2 | 106.5 | 9.7% |
| 720 | 3815.3 | 177.5 | 7.5% |

### Further moderate and minor items

The fate of a genome outside the band is not computed (MODERATE). The founder cannot divide for several periods (MODERATE). Theorem 14.6 is a restatement leaned on as more (MODERATE). Article 73's guest share is altered but not reconciled (MODERATE). The photochrome's timing constants are not stated (MODERATE). $\Delta E$ and $\Delta B$ are not the same quantity (MODERATE). A shadowing defect was present in the block script (MODERATE). Three citations are unverified (MINOR). The tolerance $\theta$ is never bounded (MINOR). Strand

separation is given no energetic account (MINOR).

**Observations found sound**

Theorems 4.5 and 4.6 are correct as proved. Theorem 11.3 is the article's best result: the elimination of $k$ between the hold and fire conditions removes both $\nu$ and $B$, so the criterion $t_f/t_h \geq \ln(1/\delta)/\varepsilon$ is independent of two quantities the corpus cannot supply. Corollary 12.3 is a genuine concordance gain: under H11, dusk division follows from the switch. The release chemistry is coherent. H9 is consistent with the chain lengths.

## 2 Stage summary of the independent report

**Five major advances confirmed**

The independent referee confirms: (i) esterified chain extension, stop-specific release, and retirement of the first-order condensation law; (ii) dusk confinement, impossibility of a static barrier, and the exogenous photochrome brake; (iii) the polypeptide extent gate and the self-selecting genome band; (iv) mutual exclusion of replication and fission, and the exact duplex bending identity $E_{\mathrm{rod}} = E^{*}$; (v) the length- and time-invariant lumen half-thickness and the two-sided gain window. Recommendation: Accept with Minor Revisions.

**Residual items M1–M4 and minor corrections**

Remove Appendix G (open drafting notes) and complete the EDITOR bibliography placeholders (update titles and pages for Articles 65 and 70–74; supply the Schuber–Pinck citation). Synchronize the Abstract and summary registers with Revision 4.2 ("ample" / $\Delta E$ vs. $\Delta B$) and Scholium 17.14 (hydration floor). Clarify the syntax of Lemma 5.1(b)–(c). Distinguish total period particles $P$ from per-acceptance particles $\bar{P}$ in Section 17.1. Clear the minor structural and typographical items (ordering, garbled formulas, unrendered Greek symbols, blank status labels).

## 3 Full original author-side report (verbatim)

The following is the complete text of the initial author-side referee report (draft of 6 October 2026), including its tables.

> **Recommendation: major revision.** The article's core is sound and is an advance. The counting identity and the gain that follows from it (Theorems 4.5 and 4.6 of the article) are correct, are proved from stated hypotheses, and replace a premise the corpus could not support. The barrier argument of Section 11 is the strongest thing in the paper: its criterion is independent of the attempt rate and of the barrier height, which is rare and valuable. The identity $E_{\mathrm{rod}} = E^{*}$ is exact and worth having, though it is a restatement of Article 62's stipulation rather than a new fact.
>
> Three findings require revision before the article can stand.
>
> **R1** is a contradiction between Theorem 14.3 and Corollary 14.4: the exclusion of replication and fission does not make condition (D3) a consequence, because the switch de-activates at dusk whether or not replication has finished. The clock condition survives and Theorem 14.3 must be weakened.
>
> **R2** is an omission with the capacity to overturn the article's central numbers: the counterions of the genome's own strands are not counted anywhere, and the lumen is now so small that the strands added each period carry roughly twice as many counterions as the whole osmolyte budget. Whether Hypothesis H8 excludes them is not said.
>
> **R3** is that the lumen holds of order fifty particles at the corpus baseline, so the osmotic treatment is applied at a particle count where its own fluctuations are 14%. Nothing in the article addresses whether the orbit survives that.
>
> Five further items are moderate and four minor. The article should not be published with Theorem 14.3 as stated, and the editor is asked to note the independence problem recorded at Section 6.
>
> ### Mathematical stage
>
> - [**MAJOR**] **Theorem 14.3 does not give condition (D3).** The theorem concludes that "no fission can occur while replication is in progress, and condition (D3) is not a separate requirement but a consequence of the switch." The first clause follows from H11 and H14. The second does not. The switch de-activates when the forcing ends, whether or not replication has finished. A vessel with $L\,t_{\mathrm{add}} > \delta T$ therefore arrives at dusk with one duplex and a partial strand, the brake falls on schedule, and fission proceeds with an incomplete genome. The exclusion prevents fission *during* separation; it does not procure completion. The article knows this elsewhere. Corollary 14.4 describes exactly that vessel and says the second daughter is lost, and Theorem 13.4 retains $L \le L_{\max}$ as the band's upper edge and (F3) as a way to fail. Theorem 14.3's second clause contradicts both. Required: delete the second clause. The honest statement is that the switch orders replication and fission but does not bound the replication interval, so the clock condition survives unchanged as the upper edge of the band.
> - [**MAJOR**] **The genome's own counterions are uncounted.** Theorem 4.5 lists the lumen particles as released chains and hydrolysed residues "and nothing else,"

and H8 gives released chains $z_c$ counterions and free residues $z_m$. The genome is a polyelectrolyte and is itself in the lumen's electrostatic environment, and replication adds a complete complementary strand to each duplex every period. Nothing in the article counts those counterions. The omission was tolerable in Article 72, where the lumen was large. It is not tolerable here, because the new gain has made the lumen small. At the corpus baseline the birth osmolyte is $gN_\lambda = 49.3$ particles at $L = 200$; $2L = 400$ nucleotides are added per period, and at a Manning free fraction near a quarter that is of order 96 particles, twice the entire budget. The same ratio, close to 1.9, holds at $L = 432$ and $L = 720$. Two defences are available and the article makes neither. The counterion may be the pore's ammonium, in which case it is equilibrated with the environment and H8 excludes it, the strand's charge being balanced by a Donnan potential rather than by excess particles. Or the counterion may be impermeant, in which case the term is real and dominant and the gain of Theorem 4.6 is wrong by a factor of about three. Required: decide which, state it as a clause of H8, and if the term survives, carry it in Theorem 4.6 and recompute blocks T5, T12 and T13.

- **[MAJOR] The osmotic treatment is applied at fifty particles.** The gain is a statement about a reduced volume, which is a continuum quantity computed from an osmolyte count. At the article's own gains that count is small:

| $L$ | $N_\lambda$ | $gN_\lambda$ | $N^{-1/2}$ |
|---|---|---|---|
| 200 | 558.6 | 49.3 | 14.2% |
| 432 | 1773.2 | 106.5 | 9.7% |
| 720 | 3815.3 | 177.5 | 7.5% |

  At the baseline the vessel's shape is set by about fifty particles, whose Poisson fluctuation is 14%, and symmetric division partitions them with the same spread. The article treats $v$ as deterministic throughout and its orbit as exact. This is not fatal — the existence condition is met with a margin far wider than 14% — but it bears on the gate. Proposition 13.3's threshold comparison and Corollary 13.6's claim that "a genome that divides once divides always" both suppose the compared quantities are sharp. At these counts they are not. Required: a remark stating the particle counts and bounding the fluctuation, and a qualification of Corollary 13.6. A referee would accept the result as a statement about means.

- **[MODERATE] The fate of a genome outside the band is not computed.** Corollary 13.6 says a genome outside the band "grows and does not divide," with "no vessel lost and no daughter miscarried." That is not a steady state. A vessel that never divides accumulates lipid without reset, and the article's own $v(t) = g/\sqrt{1+t}$, continued across $n$ periods, gives $v = g/\sqrt{1+n}$: $0.707g$ after one period, $0.5g$ after three, $0.258g$ after fourteen. A vessel already at $v \approx 0.09$ reaches 0.02 within fourteen periods. Whether such a vessel persists, bursts, fragments or stalls is not determined by anything in the corpus, and the sentence as written implies benign quiescence. Required: replace the clause with the computation above and a target.

- **[MODERATE] The founder cannot divide for several periods.** Block T10(a) shows the per-lipid extent approaching its fixed point as $1 - 2^{-n}$ from an empty start: 0.500, 0.750, 0.875, 0.969 and 0.996 at $n = 1, 2, 3, 5, 8$. A founder with no polypeptide therefore sits below any threshold $C_{\text{fire}}$ set near $C$ for its first periods, cannot pass

the gate, and by Item 2.4 deflates while it waits. Article 72 had a founder theorem for just this reason, and the present article withdraws it (Corollary 4.7) on the ground that nothing is carried across periods. That is true of the osmolyte and false of the extent, which is the quantity the gate reads. Required: a founder proposition for the extent, and a statement of how close to $C$ the threshold may sit.

### Observations found sound

Theorems 4.5 and 4.6 are correct as proved. The fixed point $N_b = P$ follows from halving at division under H9, and the division by $N_\lambda$ is right. Proposition 6.1's closed form was re-derived independently and agrees, including the point that consecutive stops release nothing, so that $\varrho = s_0$ and not $s_0/(1 - s_0)$ at $a = q = 1$. The simulations in blocks T4 and T6 are seeded and the agreement is within sampling error.

Theorem 11.3 is the article's best result. The elimination of $k$ between the hold and fire conditions removes both $\nu$ and $B$, so the criterion $t_f/t_h \geq \ln(1/\delta)/\varepsilon$ is independent of two quantities the corpus cannot supply. The arithmetic was checked. The conclusion that no static barrier serves is robust, and the required drop in Corollary 11.4 inherits the same independence.

### Concordance stage

- **[MODERATE] Theorem 14.6 is a restatement, and is leaned on as more.** The identity $E_{\mathrm{rod}} = L_p L h/(2R_{62}^2) = E^*$ is exact, and the block confirms it at four lengths. But $R_{62}$ is *defined* in Article 62 by that very criterion, so the theorem says that a stipulated tolerance equals itself. The article labels it [A] and calls it an identity, which is correct. Scholium 14.8 then uses it physically: the anchors "command" $2E^*$, 6–60 $k_B T$, and bias the vessel toward a necked branch. That is a physical claim resting on a stipulated number, and the stipulation's range, $E^* = 3$ to 30, is a factor of ten. Required: a sentence in Scholium 14.8 making the dependence on the stipulation explicit.
- **[MODERATE] Article 73's guest share is altered but not reconciled.** Proposition 14.5 recomputes $\phi$ with doubled anchors, from 0.1241 to 0.1433 at $L = 200$, and the existence bound with it. But Appendix C already rules that Article 73's $\phi$ must be recomputed for a different reason, the removal of the co-aggregate, and Section 9 adds membrane-retained and stranded chains as new guests. Three separate corrections to one quantity are issued in one article and none is applied together. Required: one consolidated recomputation of $\phi$, or an explicit statement that Proposition 14.5 is partial and the consolidated figure is a target.
- **[MINOR] The relation to Article 74's Target 10.7 is not stated.** Article 74 left the tether count open between one per base and the ledger's $5L$, and Proposition 14.5 computes at one per base only, having just doubled the strand count. At $t = 5$ the anchors would be $20L$ and $\phi$ substantially larger. The article should say which target its Proposition discharges and which it does not.

### Domain stage

- **[MODERATE] The photochrome's timing constants are not stated.** H11 makes the switch "activated by the forcing" and relaxing "when the forcing ends." For a substituted azobenzene the activated form is the metastable one and its return is thermal, with lifetimes ranging across many orders of magnitude with substitution. Two constraints follow and neither is stated: (i) the thermal lifetime must be short against the firing window, $\theta T$, which at $\theta = 0.10$ is about 1.2 h, or the brake does not fall at dusk; (ii) the photostationary state under the forcing must be strongly biased to the activated form, or the brake is partial throughout the day. Both are attainable for substituted azobenzenes; but they are conditions on the molecule and belong in the register.
- **[MODERATE] $\Delta E$ and $\Delta B$ are not the same quantity.** Proposition 12.4 compares the shift in whole-vessel bending energy between switch states, 10.3 to $46.8\,k_B T$, with the barrier drop Corollary 11.4 requires, 4.09 to $10.73\,k_B T$, and concludes that every entry exceeds the requirement. Remark 12.6 concedes that $\Delta E$ is not a barrier height, which is right, but the proposition's own sentence does not carry the concession. An energy difference between two equilibrium configurations constrains the barrier between them only from below in one direction. Required: move the concession into Proposition 12.4 and soften "ample" to "of the required order, with headroom."
- **[MINOR] Strand separation is given no energetic account.** H14 makes separation depend on the activated switch. Separating a duplex of $L$ base pairs is a large energetic undertaking, and the article gives neither a per-pair cost nor a mechanism by which an area-changing isomerisation accomplishes it. The hypothesis may stand as [E], but the article should say that the cost is unaccounted and register it as a target.

### Targeted verification

- **[MODERATE] A shadowing defect was present in the block script.** Block T9's loop over attempt rates bound the name `nu`, which is also the corpus constant from which $\lambda$ is computed. Every block after T9 that called $\lambda$ therefore computed with $\nu = 10^{12}$. The defect was caught because block T13's guest shares printed as zero, and has been corrected; T13 now reproduces Article 73's published $\phi = 0.124$ for the Z1 configuration, which is the right check. Recommended: assert the corpus constants at the head of each block and name loop variables distinctly, and state in Appendix B that this was done.
- **[MINOR] Three citations are unverified.** The bibliography carries EDITOR markers on Articles 65 and 70 and on the aminolysis reference, and the companion to Article 57 is cited by an inferred number. Hypothesis H4, on which Remark 6.4 and the whole fidelity section depend, rests on the last of these. It must be verified against a primary source before publication, or H4 must be stated without it.
- **[MINOR] The tolerance $\theta$ is never bounded.** $\theta$ enters Theorem 10.4, Corollary 11.4 and the firing window, and the article computes against 0.01 to 0.50 without saying what sets it. Since the daughters' lipid shortfall is $\theta/2$ and Article 72 loses

a daughter below $\lambda$, $\theta$ is not free: it is bounded by whatever margin the enclosure tolerates. The article should say so, or record that the corpus does not supply it.

### Meta-review

- **[MAJOR] The drafting and reviewing systems are not independent.** This report was produced by the same system that drafted the article. The corpus has recorded that the previous three articles each had a central claim withdrawn, in every case because a correctly computed quantity was asked to carry a conclusion it did not support, and in every case the error ran toward the cleaner result. The same configuration produced this report. Item 2.1 is precisely that failure mode occurring again: a correct exclusion theorem asked to deliver a condition it does not deliver, yielding the cleaner statement that two conditions had collapsed into one. That the report found it is some evidence that the configuration is not blind, and no evidence that it is sufficient. Required of the editor: an independent model over the article before acceptance, with Items 2.1, 2.2 and 2.3 withheld from it, so that the test is whether they are found again.

### Items by severity

| Item | Subject | Severity |
|---|---|---|
| 2.1 | Thm. 14.3 does not give (D3) | MAJOR |
| 2.2 | Genome counterions uncounted | MAJOR |
| 2.3 | Fifty particles in the lumen | MAJOR |
| 6.1 | Reviewer not independent | MAJOR |
| 2.4 | Fate outside the band | MODERATE |
| 2.5 | The founder's extent | MODERATE |
| 3.1 | $E^*$ identity leaned on | MODERATE |
| 3.2 | $\phi$ corrected three ways | MODERATE |
| 4.1 | Azobenzene timing constants | MODERATE |
| 4.2 | $\Delta E$ is not $\Delta B$ | MODERATE |
| 5.1 | Block script shadowing | MODERATE |
| 3.3 | Art. 74 Target 10.7 | MINOR |
| 4.3 | Cost of separation | MINOR |
| 5.2 | Unverified citations | MINOR |
| 5.3 | $\theta$ unbounded | MINOR |

## 4 Full independent referee report (verbatim)

The following is the complete text of the independent referee report on the revised manuscript.

**Manuscript ID:** ACF-2026-076 (Vol. 1, No. 4, pp. 1545–1566)
**Title:** *The Division of the Vessel: The Coded Chain, the Photochrome Brake, and the*

*Genome that Selects Itself*
**Author:** Charles D. Schaper, Ph.D.
**Recommendation: Accept with Minor Revisions**

## 1. Summary and Overall Assessment

This manuscript is a landmark synthesis in the protocell and cell-division arc of the *Annals of the Chrysene Formalism*, uniting the coding chemistry of Articles 57 and 70 with the closure-vesicle cycle of Articles 62, 64, 65, and 71–74. By re-examining the chemical fate of an excised residue at the tether ribose and pricing what is required to withhold division until replication completes at dusk, the paper resolves both the excessive-gain problem of Article 71 ($g = 1.8716 > 1$ at $L = 200$) and the mechanical-drive deficit of Articles 73–74.

The manuscript establishes five major advances, each supported by exact closed-form identities and verified against seeded stochastic simulations in `acf-76-blocks.py` (Blocks `T1`–`T15`):

1. **Esterified Chain Extension, Stop-Specific Release, and Retirement of the First-Order Condensation Law (Sections 4–8, 10–11).** Restoring the ribose ester chemistry recorded in Articles 57 and 70 (Hypothesis 2.5 / H2), each residue formed at the C6–C5 attack on the 6, 12-disubstituted chrysene is esterified to the $2'$- or $3'$-hydroxyl of its own adenosine tether ribose rather than released into the lumen. Under the adjacent-occupant rule (H5) and trapped-stop scission of the tether phosphate on its chrysene side (H6), unaccepted sense words or pre-joining ester hydrolyses $(1 - q)$ produce single-residue deletions via transesterification across the bare $2'/3'$-OH rather than chain stranding (Lemma 5.1, Corollary 5.2), while chain release into the lumen occurs exclusively at stop words (Proposition 5.3). Theorem 4.1 proves that the lumen particles added per period are $P = (1+z_c)f_L C+(1+z_m)H$, yielding the memoryless gain (Theorem 4.2)

$$g = G\big[(1 + z_c)f_L\rho + (1 + z_m)(1 - q)\big], \qquad G = \frac{\iota_{\text{eff}}}{w_{62}},$$

where $\rho = \frac{s_0 q}{s_0+(1-s_0)aq}$ under independent words (Proposition 6.1). Consequently, Article 71's first-order bilayer condensation law is retired (Section 10, Ruling D.1), the founder condition coincides with the established-lineage condition $g \le 1$ (Corollary 4.3, Ruling D.2), and across the observed stop sets $(2/64, 3/64, 4/64)$ the gain lies in 0.0588–0.5389 (with dusk reduced volume $v \in [0.0416, 0.3811]$) (Theorem 6.3).

2. **Dusk Confinement, Impossibility of a Static Barrier, and the Exogenous Photochrome Brake (Sections 9, 12–14).** Because $g < 2^{-1/2}$, the vessel sits below the two-sphere limit shape from birth ($v(t) = g/\sqrt{1+t}$, Propositions 9.1, 9.2, 12.2), so geometry permits fission throughout the period and gates nothing (Corollary 12.4, Ruling D.3). Yet the requirement that each daughter close a minimal anchored enclosure of at least $\lambda$ lipids (D2) confines symmetric fission to dusk ($t = 1$, Theorem 12.3), and no internal shape or monotone bulk concentration can mark dusk without prior tuning to $g$ (Proposition 12.5). Modeling neck fission as Poisson escape over a barrier $B$ at rate $k = \nu e^{-B/k_B T}$ (H10), Theorem 13.2 proves that holding for $t_h = (1-\theta)T$ (expected events $\le \epsilon$) and firing within $t_f = \theta T$ (probability

$\geq 1-\delta$) requires $t_f/t_h \geq \ln(1/\delta)/\epsilon \geq 23.0$ (at $\epsilon = \delta = 0.10$), which no static barrier can satisfy regardless of $\nu$ or $B$. The barrier must instead drop at dusk by $\Delta B \geq k_B T \ln\left[\frac{\ln(1/\delta)}{\epsilon}\frac{1-\theta}{\theta}\right] \in [4.09, 10.73]\ k_B T$ (Corollary 13.3). Under Hypothesis 14.1 (H11), the bilayer-resident substituted *trans*-azobenzene photochrome holds fission while light-activated and releases upon dark relaxation at dusk, making dusk division an exogenous consequence (Theorem 14.2, Corollary 14.3) and commanding a whole-vessel bending energy shift $\Delta E \in [10.3, 52.4]\ k_B T$ across $L \in [200, 1000]$ (Proposition 14.4, Scholium 14.5).

3. **The Polypeptide Extent Gate and the Self-Selecting Genome Band (Section 15).** Under Hypothesis 15.1 (H12), the gate's second input is the per-lipid extent of membrane-retained polypeptide $p(t)$, which Proposition 15.2 proves is constant across the period at the fixed point $C = (1-f_L)\rho\iota_{\text{eff}}$ set by the genome's stop density. Combined with the packing floor $L \geq L_{\min}$ and replication clock cap $L \leq \delta T/t_{\text{add}}$, Theorems 15.5–15.6 and Corollary 15.7 establish a non-empty heritable band in $(L, s_0)$ outside which vessels grow without dividing.

4. **Mutual Exclusion of Replication and Fission, and the Exact Duplex Bending Identity $E_{\text{rod}} = E^*$ (Section 16).** With both strands of the duplex tethered into the bilayer (H13) and strand separation requiring the activated photochrome (H14), Theorem 16.3 proves that replication and fission are mutually exclusive, while Corollary 16.5 makes two complete duplexes the gate's third material input. Theorem 16.8 proves the exact length-independent identity $E_{\text{rod}} = \frac{L_p L h}{2R_{62}^2} = E^*$, showing that two demixed polar duplexes command up to $2E^* \in [6, 60]\ k_B T$ to flatten the poles and localize curvature at the equatorial neck (Proposition 16.9, Scholium 16.10).

5. **The Length- and Time-Invariant Lumen Half-Thickness and the Two-Sided Gain Window (Section 17).** Proposition 17.8 proves that the characteristic lumen half-thickness $3V/A = vR = gR_{62} = \frac{R_0}{u_0}\iota_{\text{eff}}\bar{P} = 153.44\ \text{nm} \times \iota_{\text{eff}}\bar{P}$ is invariant across both genome length $L$ and time $t$ within the period. Against the Rand–Parsegian hydration floor $w \in [2, 3]$ nm (H16), Theorem 17.10 and Corollary 17.11 bound the gain from below for the first time in the arc ($w/R_{62} \leq g \leq 1$), showing that uncharged chains ($z_c = 0$, $3V/A = 1.15$ nm) fail to open an interior and that $z_c \geq 0.74$–$1.61$ ionised side chains per released chain clear the floor (Proposition 17.12, Corollary 17.13, Scholium 17.14).

As recorded in Appendix E (pp. 1565–1566), the manuscript has already undergone a thorough internal revision (`2.1`–`6.1`). I recommend acceptance after the author removes the temporary drafting notes in Appendix G, completes the three `EDITOR` bibliography entries, synchronizes a few summary passages with Revisions `4.2` and `17.14`, and cleans up the minor typographical items detailed below.

## 2. Major Technical and Editorial Comments

- **M1. Removing Appendix G (Open drafting notes, p. 1566) and Completing the EDITOR Placeholders in the References (p. 1564).** Appendix G on p. 1566 carries the header "To be removed before submission" and lists five pre-submission checkpoints (i)–(v) corresponding to the EDITOR notes in the References on p. 1564. To assist in closing Appendix G and finalizing the reference list, the

exact bibliographic details for those items are: Reference [1] and Appendix G(ii): The Conditional Refinement, Part I is correctly cited as Article 55 in 1(2), 1015–1047, 2026; just replace the stray 5. before https:// with 2026. . Reference [5] (Article 65): Replace "The Ledger ... EDITOR: confirm title and pages" with the full title *The Chrysene-Reachable Material Ledger: Species, Properties, and the Allocation of a Single Pool*. References [6]–[10] (Articles 70–74): Update from their working titles to their published Vol. 1, No. 3 titles and page numbers: [6] Canonical Pairing Without Separation..., 1(3), 1432–1452; [7] Addressing the Division Clock..., 1(3), 1453–1471; [8] Cycle Integration..., 1(3), 1472–1483; [9] Fission at the Closure Scale..., 1(3), 1484–1492; [10] Division Without a Device..., 1(3), 1493–1502. Reference [12] and Appendix G(v): The primary two-part reference in Biochimie by F. Schuber and M. Pinck on aminoacyl-tRNA ester hydrolysis versus aminolysis is: F. Schuber and M. Pinck, "On the chemical reactivity of aminoacyl-tRNA ester bond. I. Influence of pH and nature of the acyl group on the rate of hydrolysis; II. Aminolysis by tris and diethanolamine," Biochimie 56(3), 383–390 and 391–395, 1974. Updating [12] to this exact citation discharges Appendix G(v).

- **M2. Synchronizing the Abstract and Summary Registers with Revision 4.2 ("ample" / $\Delta E$ vs. $\Delta B$) and Scholium 17.14 ("wide margin" vs. the Hydration Floor).** In Appendix E (Item 4.2), the revision table records: "AE is not AB | Concession moved into Prop. 14.4; 'ample' withdrawn". While Proposition 14.4 and Remark 14.6 carefully distinguish the equilibrium bending shift $\Delta E$ from the neck barrier drop $\Delta B$, the word "ample" remains in the Abstract, Section 1.2, Scholium 14.5, Section 18.1 entry 13, and Proposition 18.12(x). Qualifying "ample" as "commands energy of the required order (10.3 to 52.4 $k_B T$)" in those summary sentences will complete Revision 4.2. In Scholium 17.14 and Appendix F, the manuscript explains that because the lumen half-thickness at $z_c = 0$ (1.15 nm) falls below the hydration floor $w \in [2, 3]$ nm, the low gains of Section 6 represent a lower bound to be cleared via side-chain charge rather than a one-sided "wide margin". However, the Abstract completely omits Section 17's hydration floor and still concludes its first paragraph with "so the orbit of the integrated cycle exists with a wide margin". Adding one sentence to the Abstract stating that the invariant lumen half-thickness imposes a lower hydration floor $w/R_{62} \le g \le 1$ cleared by one to two ionised side chains per released chain will bring the Abstract into full alignment with Section 17.1.
- **M3. Clarifying the Syntax of Lemma 5.1(b)–(c) (p. 1548).** In Lemma 5.1, the lead-in and clauses (b) and (c) read without commas isolating the prepositional/conjunctive phrase. Without commas, the prose reads as if the phosphate is transferred to the hydroxyl, whereas by Hypothesis 2.9 it is the peptidyl chain (ester) that transfers onto the adjacent site's $2'/3'$-OH and is then hydrolysed by the locally bound phosphate. Rewriting (b) and (c) to isolate the phrases will make the chemical sequence clear.
- **M4. Distinguishing Total Period Particles $P$ from Per-Acceptance Particles $\bar{P}$ in Section 17.1 (pp. 1548, 1558–1559).** In Notation 2.2 and Theorem 4.1, $P$ denotes the total number of lumen particles added in a period (of order 49.3 at $L = 200$). In Proposition 17.8, Theorem 17.10, and Proposition 17.12, the same letter $P$ is redefined to mean the dimensionless lumen particles per residue-producing acceptance. Denoting the per-acceptance quantity in Section 17.1 by $\bar{P}$ (or $p_{\mathrm{acc}}$) so

that $P = \iota_{\text{eff}}\lambda\bar{P}$ and $g = G\bar{P}$ will avoid any symbol collision.

### 3. Minor Structural and Typographical Corrections

- **m1. Ordering of Items in Proposition 18.12, Appendix B, and Table 1.** Moving clause (xvii) of Proposition 18.12 to sit immediately after (viii) restores the logical order. Moving block T7 to its numerical position between T6 and T8. Sorting hypothesis rows H10–H16 into numerical order in Table 1.
- **m2. Corrupted or Misplaced Formulas and Table Headers.** Section 1.3: delete the duplicated "omes". Theorem 4.1: restore $z_c$ and $z_m$. Proof of Theorem 4.2: $\iota_{\text{eff}}\lambda$. Table of Proposition 6.2: second column header should be $q$. Proposition 7.1: remove the stray vertical bar. Table of Proposition 8.1: correct column headers. Proposition 12.2: remove duplicated $v$. Table of Proposition 12.7: correct header and missing entry. Theorem 13.2: restore the garbled inequality. Corollary 13.3 table: correct header. Theorem 15.5 and Proposition 15.8: correct headers and $\rho \leq 1$ to $g \leq 1$. Theorem 17.10 and Proposition 17.12: restore garbled text and correct stop density.
- **m3. Unrendered Greek Symbols and Status Labels.** Blank Greek symbols $(\psi, \rho, \lambda, \theta, \delta, \phi, \kappa)$ in multiple locations. Blank or collided status labels in Convention 2.1, Hypotheses, Propositions, Theorems, Rulings, and Section 18.1.

## Recommendation

Accept with minor revisions. The first-round required corrections were incorporated. Remove the temporary drafting notes, complete the bibliography placeholders, synchronize the summary passages, and clear the typographical items. No further computation is required. The counting identity, the barrier criterion, and the dusk-gate mechanism stand.

## References

[Art75] C. D. Schaper. Constructive genetic code-table realization. *Annals of the Chrysene Formalism* 1(4):1503–1544, 2026. Article 75.

## Revision history

| Version | Date | Notes |
|---|---|---|
| **v1.0** | 2026-10-24 | Review record published with Article 76. |

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