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ORTHOGONAL REVIEW RECORD

Exchangeability and the Exclusion of Equilibrium Assembly: Necessary Conditions on Throughput, Entropy, and Fidelity in the Chrysene Formalism

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Scope of Review

The manuscript derives necessary conditions on throughput, entropy, and fidelity for placement in the Chrysene Formalism. It shows that equilibrium assembly is excluded: the mean orientation error rate of an equilibrium process is one half, uniformly in the registration free energy and the cleavage fraction, against an error budget of 1.0×10^{-5}. No parameter closes a gap of 4.97×10^{4}. Non-equilibrium discrimination is forced.

Compiled disposition

Accept with minor revisions. The dual-agent orthogonal review by independent agents (Referee A: mathematics and physics; Referee B: concordance) reversed the paper's submitted

headline. Of the twelve major points raised by Referee A and the six raised by Referee B in the first round, all eighteen were accepted. Referee B recommended reject on the submitted article. The second round accepted all further points. The principal finding was replaced twice—first by a stronger one, then by a more careful statement of the stronger one. The verification script grew from eight blocks to nine. Nothing was rebutted.

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1 Stage summaries

Dual-agent architecture and the reversed headline

Referee A confined to mathematics and physics; Referee B confined to concordance. Neither saw the other's report. Both then read the revision. The submitted article derived six bounds and ranked them, with a headline demanding $15.3\,k_BT$. That number is gone. Both referees reached the same defect: H_{therm} was contradicted by Article 84's blindness theorem. The honest outcome is that non-equilibrium discrimination is forced. It is now Theorem 8.2. The mean orientation error rate of an equilibrium process is one half against an error budget of 1.0×10^{-5}.

Mathematical and physical findings (Referee A)

A-M1 through A-M12 accepted in full (first round). A-N1 through A-N8 accepted in full (second round). H_{therm} deleted; free-energy inversion removed; Theorem 8.2 and Corollary 8.4 built from the contradiction. Gap carried correctly; $n = 42{,}200$ corrected to the anchor term; $\ell = 54$ corrected to the box of 45 contacts; invented species term withdrawn; script rebuilt.

Concordance findings (Referee B)

First round: reject, six major failures (B-C1 through B-C6), all accepted. Second round: accept with minor revision; all points discharged (B-D1 through B-D7). H_{therm} attributes to H_{rgy} a discrimination the corpus rules it does not supply. The 42,200 is treated against Article 65's own allocation. Article 84 illustrates with no numeric Δ. The initiator exception is restored.

2 Full dual-agent review history (verbatim)

The following is the complete text of the dual-agent orthogonal review history by independent agents, including both rounds and all dispositions.

Editorial note on the process

This article was reviewed under the journal's *AI-augmented peer review by orthogonal constraint*. Two referees read the submitted manuscript independently and without sight of each other's reports, each confined to one constraint: Referee A to the mathematics and physics—the derivations, the error model, the dimensional arguments, and whether the verification script checks what the appendix says—and Referee B to concordance, that is to whether every claim the manuscript makes about another document is true of that document. Neither referee was told what the other was asked. Both then read the revision and reported again.

The editor adjudicated each point under the journal's standing instruction: a recommendation is not implemented in order to discharge it, and a recommendation whose implementation would alter the paper disproportionately to the validity of the comment is rebutted rather than followed. On this article that instruction did almost no work. Of the twelve major points Referee A raised and the six Referee B raised in the first round, all eighteen were accepted, because all eighteen were right. Referee B recommended *reject*.

What the review did to the paper

The submitted article derived six bounds and ranked them, and its headline was that the tightest—an error budget—demanded a registration free energy of $15.3\,k_BT$, "an order of magnitude larger than the corpus supposes". That number is gone, and so is the hypothesis that produced it.

Both referees reached the same defect from opposite directions. Referee A observed that the paper's H_{therm}, which converted an error budget into a free energy through a Boltzmann factor $\varepsilon = 1/(1 + e^{\Delta})$, was contradicted by the very theorems the paper's own sensing section imported: Article 84 proves the registration weight independent of the alignment bit at every delivered contact but initiator–initiator, so at essentially every contact the model gives $\varepsilon = \frac{1}{2}$ at every Δ. Referee B, searching the corpus rather than the mathematics, found that Article 85 had already registered a separate hypothesis to extract from H_{rgy} a far weaker statement than this paper was extracting, and had said in terms why: that hypothesis "pric[es] a guest which fails to present the pattern rather than two orientations of one that does". The paper had used Article 84's blindness theorem to forbid a *sensor* from reading the alignment while assuming a *Boltzmann factor* could read it. It could not have both.

Referee A then wrote the sentence that rebuilt the article: that the honest outcome was that non-equilibrium discrimination is *forced*, not one horn of a disjunction, "a stronger result than the paper claims, and one worth rewriting the headline around". It is now Theorem 8.2. A contact with no registration gap has no Boltzmann preference between its two orientations, so its orientation error rate is one half at every free energy;

and on the second reading, Article 85's exchange involution makes a *sensitive* contact's preference point the correct way only half the time, so that class errs at one half as well. The mean orientation error rate of an equilibrium process is therefore one half—uniformly in the registration free energy and in the cleavage fraction, the two parameters the corpus leaves open—against an error budget of 1.0×10^{-5}. No parameter closes a gap of 4.97×10^{4}.

The editor records that the finding is not the author's and not the referees' either: it is Article 84's blindness theorem, which has been in the corpus for two articles, read for the first time as a constraint on placement rather than on separation. What the review supplied was the reading. The second round sharpened it again, Referee A showing that the σ-dependent form the author had first written was both weaker and not approached as the free energy grows, and Referee B restoring the initiator exception the stronger form had erased—Article 84's own headline, and the one contact whose preference does point the right way, which turns out to be too rare by seven orders of magnitude to orient anything.

Referee A — mathematical and physical constraint

First round: accept with major revision, twelve major points. **Second round:** accept with major revision, eight. All twenty accepted.

A-M1. *H_{therm} is contradicted by the theorems the paper's own sensing section imports.*

Disposition: Accepted, and it became the paper. See the note above. H_{therm} is deleted, the free-energy inversion with it, and Theorem 8.2 and Corollary 8.4 are built from the contradiction instead. The referee's own suggestion—that horn (b) is forced—is the article's title.

A-M2. *The gap g is dropped; the paper prices at $g = 1$ where Article 85 concentrates at $g = 2$, and B5 and B8 price the same contact at one and four registrations.*

Disposition: Accepted; the inconsistency no longer arises. With the inversion gone there is no gap-dependent translation to get wrong. The gap is carried in the notation and in the new theorem's three-class proof, and the contact is priced at $\nu = 2$ and $\nu = 4$ explicitly and with the reason for each.

A-M3. *$n = 42{,}200$ is the wrong n: it is the whole per-period material draw, 97.6 per cent of which is osmolyte and lipid.*

Disposition: Accepted in full. Article 65's allocation is now a numbered proposition quoting that paper's Prop. 8.1 and Hyp. 8.8, the three terms are emitted separately, and the error budget runs at $n = 1{,}000$ anchor units. A scholium says the distinction costs the paper a factor of forty and is worth it.

A-M4. $\Delta_{\text{illus}} = 2$ *is a hardcoded, uncited, misattributed literal carrying the headline ratio.*

Disposition: Accepted in full. Deleted with the ratio. Referee B established independently that Article 84 illustrates with no numeric Δ at all and that 1 and 2 are Article 79's, which would have been a second reason to strike it.

A-M5. $\ell = 54$ *is a* $3 \times 3 \times 6$ *box, not a column of 54; and §8 voids the object §4 and §6 price.*

Disposition: Accepted in full. The object is now the box, 54 nodes and 45 contacts, on the authority of Article 85's Rem. 10.6 and Article 84's own verification block, which the second round showed to disagree with that paper's prose.

A-M6. *"At most* $\log_2 3$*" is not an upper bound and contradicts Article 84's own price.*

Disposition: Accepted in full. The invented species term is withdrawn and Article 84's hexamer price substituted, with a remark recording the withdrawal. This raised the information bound by a factor of nearly two and cost the paper its "slack" label for the thermodynamic floor—see A-N4.

A-M7. *The per-period information figures apply a column datum to units that carry no field.*

Disposition: Accepted in full. Quoted over the anchor term only.

A-M8. *The ordering is not a ranking of commensurables.*

Disposition: Accepted in full. Demoted from theorem to proposition, with a scholium stating plainly which ranks have a corpus reference magnitude and which are judgements about enzymes and instruments.

A-M9. *"Slack by two orders" is not what the script computes.*

Disposition: Accepted in full. Deleted.

A-M10, A-M11, A-M12. *Script tautologies and unverifiable guarantees; the sensing theorem's unqualified claim and missing additivity citation; the period's absent source.*

Disposition: All accepted in full. The script was rebuilt: the assertion that the rate is "of order one per second" had been written as a rounded equality that *failed at both alternative periods the same block computed*, and is now an order-of-magnitude test over every period and genome length; the imported literals are declared by name in the appendix; the registry term is asserted *equal* to the box's contacts-per-node ratio rather than printed beside it. The sensing theorem now restricts to alignment information and cites Article 85's Cor. 9.2 for additivity. The period is cited to Article 78's Rem. 7.2, with the forcing-period identification declared as this paper's own.

Second round

A-N1. *"The bound being approached as $\Delta \to \infty$" is false on the paper's own evidence; the sign argument sitting in a remark gives a stronger, σ-free theorem.*

Disposition: Accepted, and it is the second strengthening. Confirmed: with the sign symmetric a sensitive contact errs at $\frac{1}{2}\theta + \frac{1}{2}(1-\theta) = \frac{1}{2}$ identically. The theorem now reports one half uniformly in Δ *and* in σ, with $(1-\sigma)/2$ demoted to a remark as the weaker sign-agnostic reading—and labelled there as not approached and as dependent on a source design variable, which the referee rightly noted left a scope hole the stronger form closes.

A-N2. *The corollary and abstract drop the theorem's stock-column scope.*

Disposition: Accepted in full. Closed by A-N1's σ-free form, and the deeper conditionality—that blindness at an interior lattice node is unproved in the corpus—is now stated at the corollary itself and not only in the falsification register.

A-N3. *The in-plane propagation is wrong: adjacency is within a z-layer, so a box has six components, not one.*

Disposition: Accepted in full. Confirmed by computing the components. The surviving freedom is one flip per layer—six choices, sixty-four states—and the block now computes the components instead of emitting a hardcoded 1.

A-N4. *"Energy: slack" no longer follows from the paper's own numbers.*

Disposition: Accepted in full. At Article 84's hexamer price the selection cost is $3.23\,k_BT$ per unit, which *exceeds* the disubstituted contact the stream overwhelmingly makes. The rank is relabelled *comparable*, the scholium records the withdrawal, and the block now asserts in both directions. The referee observed that this was the restructure's own doing—accepting A-M6 raised the price while removing the inflated Δ that had made the old figure possible—and that the label had been carried over unchanged. It had.

A-N5. *The 65 figure is an evaluation at $\Delta = 1$, not a bound.*

Disposition: Accepted in full. $1/\sigma = 31$ is the bound and is free of Δ; 65 is reported as the $\Delta = 1$ evaluation with its monotonicity stated. Referee B had argued the opposite in the first round and conceded the point on reading this.

A-N6, A-N7, A-N8. *The lattice conditionality is deeper than the register says; H_{indep} does not carry the corollary; a bare tautology in B6.*

Disposition: All accepted in full. N7 is in the paper's favour and is now stated: even perfectly correlated failures permit only $\varepsilon \le 1 - F = 0.01$, still fiftyfold below the floor, so the corollary does not rest on the independence hypothesis at all. The register is corrected accordingly.

Referee B — concordance constraint

First round: *reject*, six major failures. **Second round:** accept with minor revision, all six discharged.

B-C1. *H_{therm} attributes to H_{rgy} a discrimination the corpus rules it does not supply.*

Disposition: Accepted in full. With four verbatim quotations, including Article 85's own registration of a separate hypothesis for a weaker claim. The hypothesis is deleted and Ruling "Article 79" now records the withdrawal explicitly.

B-C2. *It applies at every placement a law the corpus applies at a fraction σ of contacts, and at the wrong gap.*

Disposition: Accepted in full. No such application survives.

B-C3. *H_{therm} voids the paper's own information bound, by a mechanism Article 84 names; and the hypothesis register is wrong about its own dependencies.*

Disposition: Accepted in full. The referee's remark that "a concordance stage cannot pass a register that is wrong about its own dependencies" is accepted without qualification. Article 84's Thm. 7.10(b) is now cited as the term that *would* break the floor—where the missing physics must sit—rather than assumed, and the register has been rebuilt twice, the second time to add Article 85's Thm. 8.1 and Thm. 8.2 on the referee's second-round finding.

B-C4. *"A heritable column of 54 sites" contradicts a settled result of Article 85 without declaring it.*

Disposition: Accepted in full.

B-C5. *The 42,200 is treated as 42,200 placements against Article 65's own allocation, and in contradiction of the manuscript's own non-implication.*

Disposition: Accepted in full; this is A-M3 from the other side. The two referees found the same defect independently, one by asking what a placement is and the other by reading Article 65's allocation table.

B-C6. *"7.6 times the largest magnitude Articles 84 and 85 illustrate with" is wrong in both factors.*

Disposition: Accepted in full. Article 84 illustrates with no numeric Δ; 1 and 2 are Article 79's; Article 85 computes at 1, 2, 3 and 6 and checks to 24. The ratio and its denominator are deleted.

Second round

B-D1. *The inference from a zero mean to a symmetric sign is not licensed by the theorem cited; the licensing statement is Article 85's Thm. 8.1, which is uncited.*

Disposition: Accepted in full. The referee is right that $\mathbb{E}[\nu_0 - \nu_1] = 0$ does not imply $\mathbb{P}(\nu_0 > \nu_1) = \frac{1}{2}$. What licenses it is the measure-preserving involution that exchanges

the two registration numbers, making their joint law exchangeable. Both that theorem and the scholium that states its consequence in words are now cited, and the register carries them.

B-D2. *The theorem erases the initiator exception, which is Article 84's own headline.*

Disposition: Accepted in full, and it improves the paper. There are three classes of contact and the submitted proof had two. At an initiator contact the involution is unavailable and Article 84 fixes the direction—three registrations aligned against two—so that is the one contact whose preference points the correct way. The floor is now one half absent the initiator and 0.499999876 with it, the proof has three classes, and the block computes the mixture. A new remark makes the point the referee makes: the one place the architecture orients itself thermodynamically is too rare to orient anything.

B-D3 to B-D7. *Ruling labelling; the 45 is in Article 84's own verification block; appendix inconsistency at B6; weak assertions; the 19,343 provenance; the alternating-sequence scope of the information bound.*

Disposition: All accepted in full. Of these the scope point matters most: Article 84's hexamer price is for a specified alternating D, T sequence, so extending it per unit across the anchor term is this paper's inference. The proposition is relabelled [D] and the assumption stated.

Summary of dispositions

Round	Disposition	Points
A, first	accepted in full	M1–M12
A, second	accepted in full	N1–N8, m1–m9
B, first	accepted in full	C1–C6, c1–c6, U1, U3–U7
B, first	conceded by the referee	U2 (the 65 figure; see A-N5)
B, second	accepted in full	D1–D7

Nothing was rebutted. The verification script grew from eight blocks and 54 emitted values to nine blocks and 83, and two of its assertions were found to be incapable of failing while a third was found to *fail* at values the same block computed and print "ok" regardless. One hypothesis was deleted outright, one invented quantity was withdrawn in favour of a figure the corpus already had, and the paper's principal finding was replaced twice—first by a stronger one, then by a more careful statement of the stronger one.

The editor thanks both referees. Referee B's recommendation to reject was correct on the article submitted, and the article that replaced it exists because Referee A wrote down what the honest conclusion would have to be. The finding it now reports was available in the corpus for two articles and nobody had read the theorem that way.

Recommendation

Accept with minor revisions. The dual-agent orthogonal review by independent agents is complete. The principal finding—that equilibrium assembly is excluded and non-equilibrium discrimination is forced—strengthens the corpus. The verification script and hypothesis register have been rebuilt. No further computation is required.

References

[Art84] C. D. Schaper. The placed source. *Annals of the Chrysene Formalism* 1(4):1703–1731, 2026. Article 84.

[Art85] C. D. Schaper. Equivariance of the source measure off the pure limit. *Annals of the Chrysene Formalism* 1(4):1732–1748, 2026. Article 85.

Revision history

Version	Date	Notes
v1.0	2026-11-02	Review record published with Article 86.

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