

AI-AUGMENTED PEER-REVIEW:
*The Abiotic Loom: Discrete Morse Theory and the
Geometric Resolution of Levinthal's Paradox in the
Chrysene Tensor Space*

Compiled by the Editorial Office

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REVIEW SCOPE AND OBJECTIVE

Prior to submission, this article underwent a Level 1 AI-Augmented review. Under Level 1, the author conducted an AI-augmented review of the manuscript, using review instructions provided by the editorial committee that restrict the AI system's task to identifying mathematical and logical flaws. Under Level 1, the AI-augmented review may also issue specific recommendations on how to correct identified flaws.

Upon submission, the editorial board evaluated the manuscript using the same review instructions provided to the author, in order to confirm the author-side findings. Human review was used to judge whether the manuscript adhered to the principles of the Chrysene Formalism, and whether it was grounded in the invariant chemistry that forms the axiomatic framework and tensorial space of the Chrysene Formalism. A more rigorous tier of AI-augmented peer review is currently in development and is being implemented for papers that will be published soon. It is anticipated that Level 1-reviewed papers will be subject to future audit, and, where warranted, updated versions of the manuscript may be issued.

DISCLOSURE OF AI USE

The author claims the use of AI in the development and writing of the manuscript.

AI-AUGMENTED REVIEW PROCEDURE

This submission was evaluated under the journal’s basic Level 1 AI-augmented review protocol, consisting of two independent stages:

- (1) **Author-Side Draft Check.** During manuscript preparation, the author employed an AI-augmented review system to screen the draft for mathematical and logical flaws prior to submission.
Model(s) used: Grok 4.6; Gemini 3.1 Pro (Extended).
- (2) **Editorial Meta-Review.** Following submission, the editorial office conducted a second, independent check for mathematical and logical flaws, also using AI-augmentation, to verify consistency with the foundational formalism prior to acceptance.
Model(s) used: Gemini 3.1 Pro (Extended).

Review workflow: Author-side: parallel review by Grok 4.6 and Gemini 3.1 Pro (Extended), with findings reconciled by the author. Editorial meta-review conducted independently using Gemini 3.1 Pro (Extended).

Scope of Review

AI-augmented review at this tier evaluates internal consistency, notational coherence, and alignment with previously established results in the formalism. It does not constitute independent verification of novel mathematical claims by a subject-matter expert, and it does not certify that a cross-field analogy invoked in the manuscript (e.g. between a result native to one field and the formalism’s invariants) is mathematically valid beyond the level of internal consistency and stated falsifiability. Readers evaluating a specific applied claim in this paper are encouraged to consult a domain specialist in the relevant field.

EDITORIAL BOARD & REVIEW COMMITTEE SUMMARY

Recommendation: Accept with Minor Revisions

The manuscript provides a rigorous, self-contained geometric resolution of Levinthal’s paradox by confining continuous conformational dynamics to the interstitial voids of the Chrysene Tensor Space $\mathcal{I}_C$. The construction is mathematically coherent, the dependence of theorems is correct, and the cooperative framing with respect to continuous energy-landscape models is exemplary. The paper successfully converts an exponentially growing continuous measure into a discrete counting measure whose local geometric support is finite.

The minor revisions requested below are intended solely to sharpen semantic precision for readers trained in classical Morse theory and continuum biophysics. None of the requested changes alter the logical structure or the principal theorems.

REVIEWER 1 (AI-AUGMENTED): MATHEMATICAL BIOPHYSICS & CONTINUOUS MODELS

1. Wording of the Main Measure-Collapse Theorem

Critique: Theorem 12 currently states that the cardinality of the support of ν_G is “independent of the number of residues.” While the local geometric repertoire of admissible voids is indeed length-independent, a long chain may occupy many successive voids and therefore possess a linearly growing number of critical simplices.

Recommendation: Soften the global cardinality claim to emphasize that the local geometric repertoire remains bounded by a constant fixed by Ψ_C , while the exponential continuum is still eliminated.

Author’s Reply

Theorem 12 has been retitled “Finite Local Support Independent of Length” and rewritten as follows: “For every biological graph G of finite length the support of ν_G is a discrete set of critical 0-simplices. The local geometric repertoire of admissible critical configurations ... is finite and bounded by a constant that depends only on the local geometry of the basis tensor Ψ_C . This local bound is independent of the number of residues. Consequently the exponential volume growth of the classical manifold $\mathcal{M}_n$ is replaced by a discrete set whose local cardinality remains uniformly bounded.”

2. Non-degeneracy of Critical Points of the Steric Morse Function

Critique: Definition 10 defines f_{steric} via inverse distance to the wall. Theorem 4 asserts that critical points are isolated, but classical Morse theory also requires non-degenerate Hessians.

Recommendation: Add a brief clarifying sentence in the proof of Theorem 4 (or in a remark) noting that the function may be smoothed in a neighborhood of the walls while preserving the infinite barrier, thereby guaranteeing non-degenerate critical points in the interior of each open cell.

Author's Reply

A clarifying sentence has been inserted into the proof of Theorem 4 stating that the inverse-distance function may be smoothed in an arbitrarily small neighborhood of the lattice walls while preserving the infinite barrier, thereby guaranteeing that all interior critical points are non-degenerate.

REVIEWER 2 (AI-AUGMENTED): DISCRETE GEOMETRY & OPERATOR ALGEBRAS

3. Origin of the Numerical Pitch Values

Critique: Theorems 6 and 8 state that the helical and strand spacings evaluate to 5.4 Å and 3.4 Å by “direct evaluation of the interplanar minimum.” A pure-mathematics reader may desire either a short explicit calculation or a precise forward reference.

Recommendation: Insert a one-sentence forward reference (or a short appendix note) indicating the volume of the Chrysene Formalism in which the interplanar potential of Ψ_C is defined and minimized.

Author's Reply

Both Theorem 6 and Theorem 8 now contain an explicit forward reference to the volume of the Chrysene Formalism in which the interplanar potential of Ψ_C is defined and minimized.

4. Physical Consistency Argument for PCET Restriction

Critique: Proposition 10 argues that a non-critical configuration would leave a residual force incompatible with the Born–Oppenheimer separation.

The reasoning is physically sound within the framework but is slightly more interpretive than the surrounding purely geometric arguments.

Recommendation: Retain the proposition, but add a short clarifying clause that the restriction follows from the joint requirements of zero net charge flux and vanishing nuclear force at equilibrium, thereby keeping the statement fully internal to the axioms already adopted.

Author's Reply

Proposition 10 has been amended with a short clause stating that the restriction follows directly from the joint requirements of zero net charge flux ($\Delta q = 0$) and vanishing nuclear force at equilibrium, both of which are already present in the standing axioms.

AUTHOR'S CONCLUDING REMARKS

Dear Members of the Review Committee,

I thank you for a careful and constructive review. The requested revisions have been adopted in full. By clarifying the non-degenerate nature of the steric Morse function and appropriately bounding the local support of the measure-collapse theorem, the theoretical apparatus has been significantly tightened.

In addition to implementing all four recommendations, the residual “[?]” citation artifact noted in Appendix A has been corrected. I believe the manuscript is now rigorously complete and ready for publication.

Sincerely,

Charles D. Schaper, Ph.D.

Chief Editor, Annals of the Chrysene Formalism

FINAL REMARKS FROM THE EDITORIAL REVIEW COMMITTEE CHAIR

The editorial meta-review of this manuscript has been completed. Using the journal's AI-augmented evaluation protocol, the editorial office assessed the submission's alignment between its stated mathematical formalism and its applied biophysical claims, and confirmed that the manuscript satisfies the journal's standard for internal consistency at this review tier. The manuscript's treatment of the finite local support of the measure-collapse theorem, the non-degeneracy of critical points of the steric Morse function, the forward-referenced origin of the numerical pitch values, and the axiomatic grounding of the PCET restriction was found to be consistent throughout. The geometric filtration of continuous conformational space and its

resulting resolution of Levinthal’s paradox was noted as the manuscript’s central contribution.

The manuscript is formally accepted for publication in the *Annals of the Chrysene Formalism*, Volume 1, Number 1.

REVISION HISTORY

Version	Date	Notes
v1.0	2026-08-23	Initial publication.

Living Document Notice

As with any actively developing field, the mathematical and applied claims in this article are subject to periodic re-evaluation as the surrounding formalism matures and as the journal’s AI-augmented review tooling advances. Consistent with standard scientific practice for provisional or fast-moving frameworks, this article and its review record may be re-audited by subsequent review systems, and a revised version bearing an updated review history may be issued to reflect developments in the field. Readers should consult the Revision History table above, and the journal’s records, for the current version number and audit date of this article.

Editorial Disclaimer

The *Annals of the Chrysene Formalism* aims to develop the Chrysene Formalism through the application of advanced mathematics, using AI systems selected as well suited to this task. In pursuing this aim, it is possible that errors occur during the mathematical progression and analysis of the formalism, including within the review and editing process itself. However, the formalism is constructed within a multidisciplinary, horizontal framework that is grounded in a specific instantiation of molecular matter and its associated networks, an instantiation that is invariant and falsifiable. For this reason, the editorial office considers the formalism well suited to an AI-augmented approach, and anticipates that this approach will continue to be adapted as AI models and the surrounding mathematical understanding advance.