

AI-AUGMENTED PEER-REVIEW:
*Geometric Origin of the Photosynthetic Macrocycle:
Dual-Chrysene Cage Rearrangement, 18π -Electron
Conservation, and the 1.1 Ga Geoporphyrin Record*

Compiled by the Editorial Office

Annals of the Chrysene Formalism

Schaper Systems Press

Paper ID: ACF-1.1-020

Issue: Volume 1, Number 1

AI-Augmented Review Tier: Level 1

AI-Augmented Review Focus: Internal Consistency Assessment

Submission Date: 2026-08-20

Acceptance Date: 2026-08-20

Online Publication Date: 2026-09-08

Document Version: v1.0

Last Audited: Initial Publication

Citation: Schaper, C. D. (2026). Geometric Origin of the Photosynthetic Macrocycle: Dual-Chrysene Cage Rearrangement, 18π -Electron Conservation, and the 1.1 Ga Geoporphyrin Record. *Annals of the Chrysene Formalism*, 1(1), 233–247. <https://chrysene.com/index.php/acf/article/view/20> • © 2026 Charles D. Schaper. Distributed under the Creative Commons Attribution 4.0 International License (CC BY 4.0). First published by Schaper Systems Press in the *Annals of the Chrysene Formalism*, Vol. 1, No. 1 (2026).

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.
- (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: Grok 4.6.

Review workflow: Single-model review.

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 successfully extends the Chrysene Formalism from the free-biomarker and kerogen archives into the solvent-extractable geoporphyrin record. The central geometric claim—that a dual-chrysene metal cage rearranges into an 18π -electron, metal-coordinated macrocycle whose carbon numbers fall inside the observed C_{28} – C_{34} window of the 1.1 Ga Taoudeni Basin assemblage—is clearly stated, carbon-parsimonious, and supported by a sequence of formal definitions, theorems, and propositions.

The inclusion of the lattice-preserving rearrangement operator, the combinatorial carbon-budget theorem, the π -electron invariance theorem, and the β -carotene-type linearisation result gives the paper a level of mathematical authority consistent with the standards of the *Annals*. The empirical sections remain appropriately cautious, the enzymatic-consistency discussion is carefully limited to a mastering-pattern argument, and the extension to heme is handled as a clean corollary.

The work is ready for publication after the minor points below are addressed.

REVIEWER COMMENTS & AUTHOR RESPONSES (AI-AUGMENTED)

1–6. Mathematical and Structural Validations

Critique: The committee has reviewed the core mathematical and geometric additions and notes the following positive assessments requiring no further changes:

- **Abstract and Introduction consistency:** The abstract and §1.2 now correctly state the C_{26} – C_{34} geometric interval and the C_{28} – C_{34} observed window.
- **Realisation map Φ :** The formal definition of Φ is clear and correctly placed at the opening of Section 3. The subsequent theorems correctly inherit their structure-preserving status from this map.
- **Carbon-budget theorem:** The combinatorial proof is short, self-contained, and sufficient. The accompanying Simulation 1 figure provides useful visual support.
- **π -Electron invariance:** The theorem elevating the 18π -electron count from a numerical observation to a structural invariance under the allowed bond scissions and re-closures is a genuine strengthening of the manuscript.
- **Linearisation / β -carotene branching:** The graph-theoretic statement and proof are rigorous. The two-line display of the branching pattern resolves the earlier column-width issue.

- **Lattice-preserving operator and error-correction reading:** The appendix operator $\mathcal{R}$ and the associated preservation theorem supply a clean mathematical counterpart to the physical claim that rearrangement of one cage does not disturb the surrounding π -stack. This is a valuable addition.

Author's Reply

The Committee's positive assessments of the realisation map Φ , the carbon-budget theorem, the π -electron invariance theorem, the linearisation result, and the lattice-preserving operator $\mathcal{R}$ are noted with appreciation. No further changes were required on these items.

7. Minor Residual Points

Critique: The committee notes a few minor residual points (all easily corrected) that should be addressed before final acceptance:

- In a few places the text still refers to “quasi- D_{4h} ” in spirit when discussing the final coordination environment. The symmetry-reduction proposition already uses the more accurate language of local four-fold restoration; a final global search-and-replace to keep that language consistent is recommended.
- The caption of Simulation 1 should explicitly cite Theorem (carbon budget) so that the figure is tethered to the formal result.
- One sentence in the enzymatic section could more explicitly recall that the negative-space imprint argument is offered only as geometric consistency, not as a claim about the historical order of enzyme evolution.

Author's Reply

All residual points have been addressed in the manuscript:

- A global consistency check has removed any residual “quasi- D_{4h} ” phrasing; the text now uniformly employs the language of local four-fold restoration established in the symmetry-reduction proposition.
- The caption of Simulation 1 has been revised to cite Theorem (carbon budget) explicitly.
- The enzymatic-consistency section now contains an explicit sentence stating that the mastering-pattern / negative-space argument is offered

solely as geometric consistency and does not assert a historical sequence of enzyme evolution.

AUTHOR’S CONCLUDING REMARKS

Dear Members of the Editorial Board and Review Committee,

I thank the Committee for its careful and constructive reading of the manuscript. All recommendations have been followed, and the minor residual points have been cleanly resolved. With these corrections, the manuscript is internally consistent and, I believe, 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 geochemical claims, and confirmed that the manuscript satisfies the journal’s standard for internal consistency at this review tier. The manuscript’s treatment of the realisation map Φ , the carbon-budget theorem, the π -electron invariance theorem, the linearisation result, and the lattice-preserving operator $\mathcal{R}$ was found to be consistent throughout, and the residual phrasing and citation points identified in review were resolved through a global terminology check and explicit cross-referencing of the simulation figure to its supporting theorem.

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	2026-08-20	Initial publication.

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.