Referee Report and Author Response: Article 103

From Fibrated Chrysene Networks to Molecular Machines
Registry-Programmed Geometry, Electromechanical Realization, and Constructive Existence

mathematical referee assessment

21 October 2026

Manuscript reviewed. Charles D. Schaper, Article 103, Volume 1, Number 5, submitted draft with provisional pages 4100–4114. The controlling text is the compiled draft preceding the revisions recorded in the accompanying response.

Recommendation. Minor revision. The explicit reduced-model existence result, the strict capture and release inequalities, and the conditional operational success bound should be retained. Several connector and hybrid-control interfaces require more precise specification; none requires replacing the numerical witness or reversing the principal conclusions.

Review status. This is a referee assessment, not a report issued by an external journal referee or a journal acceptance decision. Analytic proof inspection, executable numerical verification, and kernel-checked formal proof are distinct activities. The subsequent supplements must state their actual coverage and execution status.

1 Contribution and scope

The manuscript supplies a finite mechanical realization of an indexed chrysene reference architecture. It separates molecular addresses, current positions and orientations, local structural tensors, and auxiliary numerical meshes. A common reduced energy connects aperture deformation to substrate occupancy. An explicit pair of eight-core patches gives a nonempty witness family, rather than leaving every machine property as an abstract hypothesis.

The supplied registry-to-field map is constitutive data, not a derived molecular electrostatic calculation. This is stated in the manuscript. The contribution is the coordinated realization and certificate, not a new general minimization theorem, implicit-function theorem, or theory of finite Markov chains. The proposed peptide and machine-atlas extensions are appropriately distinguished from the constructed gate.

2 Assessment of the principal arguments

2.1 Finite geometry and mechanics

Finite restriction preserves inherited labels and closure equations. The positive minimum atomic separation follows from finiteness and injectivity, while extended-body clearance is treated separately. Port covariance is correct when endpoints, bridges, boundaries, and external fields are transformed consistently.

The compact-sublevel existence theorem is valid under its stated nonempty compact-sublevel hypothesis. The local controlled branch follows from the implicit-function theorem in independent constrained coordinates. The positive Hessian argument and persistence of strict performance margins are correct. The manuscript correctly separates local stable equilibria from a globally admissible connecting path.

The explicit generators have determinant 64 and a nonzero in-plane inner product. The sixteen-core count, internal edge counts, center-distance bound, core surface clearance, and substrate–core corridor bound are correct. Completing the square gives

$$a_s(c) = c - b_s/16, \qquad F_s(c, r) = b_s c - E_s(r) - b_s^2/32.$$

The aperture stiffness is 16, and the displayed branches remain interior. The optional positive transverse quadratic form is explicitly a constitutive extension, not a theorem about unspecified aromatic stacking.

The connector-routing paragraph needs the local repair R1 below. Its subsequent ambient transport and uniform lower distance factor $2/5$ are otherwise suitable for a continuous routing family.

2.2 Function and operational completion

The finite minimized-basin law is explicitly declared and is not misrepresented as the exact continuous Gibbs integral on a bounded aperture interval. The target/competitor odds and both endpoint probabilities follow from the same minimized energies. The positive-term exponential-series bounds establish the strict inequalities without relying on floating-point rounding.

The vacancy-mediated rates obey detailed balance and have the stated residence times. The finite-dimensional spectral argument yields the total-variation mixing estimate. Conditional release estimates uniformly over the initial occupancy justify multiplication of the lower bounds in the capture–release proposition; independence is not required. The strict product exceeds 0.95.

The active-clock construction is legitimate once control resets, paused interface durations, and clock conventions are made explicit. R2 and R3 repair this specification. They do not change the finite generator or its probability bounds.

2.3 Interfaces, information, and numerical certificates

The retention-tube estimate follows from the Lipschitz dependence of distance on center and excluded set, with the stated container condition. The energy-gap filtering bound includes rejected-state multiplicity correctly. The finite coding section exists on the image of the decoder, and nonunique coding fibers obstruct recovery of every historical code from the peptide alone.

The residual equilibrium certificate follows from strong convexity on a closed coordinate ball and an inward energy decrease at its boundary. Its error and energy-gap bounds are correct. The sampled-path bound correctly loses at most $Lh/2$ when both interval endpoints are sampled. Numerical eigenvalues or positive sampled clearances alone are not presented as universal certificates.

Composition requires a modest strengthening of its interface language, R4. The symmetry result should explicitly identify its clock, R6.

3 Recommendations

R1. Molecular ports and exposed connector exits

The core positions and ports are only required to lie inside a unit-ball envelope. A connector beginning at an interior port cannot meet its incident envelope only at that port. Moreover, disjoint arbitrary compact sets do not alone guarantee an accessible common exterior.

Retain the enclosing balls and specify an attachment sleeve from each selected port to an exposed exit anchor, permitting intended overlap with its incident envelope. Apply exterior tube-clearance claims only after this attachment region and to nonincident bodies. The reference exterior routes should lie in the common exterior of the balls and the corridor cylinder. Transport these declared interfaces with the same ambient map. This is a coarse geometric convention, not an atom-resolved tether synthesis claim.

R2. Actuator resets and their work

After an occupancy jump, the zero-endpoint-velocity path lift generally begins at $c = a_{\mathrm{old}} + b_{\mathrm{new}}/16$, not at the previous operating control. Thus its concatenation uses instantaneous rest-control resets, whereas the differential power identity assumes smooth control on each continuous segment.

Explicitly permit piecewise-smooth controls with reset times, keep aperture continuous at a reset, and account for the control work

$$W_{\mathrm{reset}} = U_s(a; c^+, r) - U_s(a; c^-, r).$$

An occupancy change has its own energy/material exchange and should not be conflated with this work. The reset and continuous-segment accounts can then be added. No zero-cost or autonomous reset should be inferred.

R3. Active clock and complete duration hypothesis

For the constructed protocol, explicitly use $\lambda \in \{0, 1\}$ and the clock $\theta(t) = \int_0^t \lambda(v)\, dv$. During active dwell the control is restored to its operating setting. During every inserted transfer it is paused.

The bound $\tau_{\max}$ should cover the complete prescribed per-event handling, including corridor/reservoir transfer and settling, or declare those additional interfaces instantaneous in the ideal model. With a uniform bound, Poisson domination in active time gives almost-sure finite physical duration and finite expectation, but not a deterministic uniform deadline or the same physical-time semigroup.

R4. Guards and fresh resources in composition

Equality on shared coordinates alone does not establish a guard that reads an additional unsupplied input. Require a complete declared read set and satisfaction of every next-stage guard in the assembled current state, including certified fresh inputs and unused resource packets. The induction then proves composition without reusing consumed resources or silently substituting an independently prepared input.

R5. Relative geometric openness and programming terminology

State geometric openness relative to continuous, endpoint-compatible realizations of the fixed typed incidence, uniformly over the compact aperture interval. Preserve the attachment sleeves/exits, or

transport them compatibly, and include exterior clearance among the strict margins.

Retain in the concluding shorthand the distinction between inherited stacking labels η, the broader program, and the supplied field-control label r. The proved contrast uses the declared dipole–field map; it does not show that every change of an abstract stacking label necessarily produces that field.

R6. Clock-aware operational equivalence

State the generator-conjugacy proposition for finite Markov models compared at a common clock. If it is applied to the physical-time hybrid completion, transport the pause-duration rules, reset maps, and controlled mechanical trajectories as well. Equality of active-time generators alone does not imply equality at physical observation times.

R7. Actual supplementary coverage

Replace prospective verification language with a precise account of the executed Python suite and compiled Lean module once available. Distinguish exact rational/finite checks from floating-point examples and generic analytic proofs. A LaTeX listing that compiles is not by itself an executed program or a kernel-checked proof. The formal companion should explicitly identify any analytic, continuous-geometric, kinetic, or chemical results outside its machine-checked core.

4 Scope decisions and justified limitations

It would be inappropriate to require orthogonal reference directions: the revised axiomatic source intentionally permits the oblique architecture used here. It would likewise be inappropriate to infer stiffness, electrostatic coupling, rates, or chemical realization solely from the indexing lattice. Those are separately declared model data.

An experimental or electronic-structure calibration is a valuable next research step, but requiring it as a prerequisite to this conditional reduced-model existence theorem would change the paper's stated objective. Conversely, the manuscript should not claim experimental machine performance merely because its model has an explicit witness. The present distinction should be retained.

A demand that the gate already prove all proposed rotors, peptide-production mechanisms, or helicase-like functions would also exceed the established result. The atlas is a set of explicit future proof obligations, not a catalogue of experimentally or formally completed machines.

5 Conclusion

The work is suitable for revision within its present mathematical objective. R1–R6 clarify realizability and operational interfaces; R7 concerns reproducibility and proof-coverage reporting. The finite existence witness and its strict numerical conclusions remain supported. No major restructuring or replacement of the introduction is recommended.

Author response and revision record

6 Disposition

The recommendation of minor revision is accepted. All seven recommendations have been addressed. The principal reduced-model existence theorem, the strict target-capture and empty-release bounds, and the conditional joint-success bound remain unchanged. The Introduction is retained verbatim. The final concluding sentence is clarified to distinguish the labelled reference architecture from the supplied local program; its mathematical conclusion is not reversed or enlarged.

7 Point-by-point response

R1. Ports, attachment sleeves, and exterior routes

Accepted. The routing construction now supplies a port-to-exit sleeve in a radius-5/4 collar around each incident core, ending at a distinct exposed anchor. Intentional overlap with the incident core envelope is allowed in that attachment region. The disjoint collar geometry and the common exterior of the witness's balls are used, rather than a claim about arbitrary compact obstacles.

The positive exterior-route and tube margins apply to nonincident portions. The same ambient map transports the sleeves, exposed anchors, and exterior routes continuously with the aperture. The existing core and corridor bounds, lower distance factor 2/5, and tube-radius budget are unaffected. No particular atom-resolved tether is inferred from this coarse interface.

R2. Hybrid control resets and work

Accepted. The operational completion now explicitly permits piecewise-C^1 controls with instantaneous rest-control resets at event times. Aperture is continuous, and reset work is the fixed-aperture energy difference

$$U_s(a; c^+, r) - U_s(a; c^-, r).$$

The smooth-segment power identity is retained on each segment, with reset increments added separately. Occupancy changes have their own reservoir exchanges. The text gives the state-dependent control needed to start a zero-velocity lift after an occupancy event.

The verification suite checks a nonzero reset-work example and the telescoping separation of occupancy energy from control work. The Lean module proves the corresponding rational reset-work identity. No free reset is assumed.

R3. Active clock and complete event handling

Accepted. The constructed protocol uses binary availability and the integral active clock. The operating control is restored during active dwell, and all inserted transfers pause that clock. A uniform per-event duration bound includes the entire specified transfer, corridor/reservoir handling, and settling stage, with no unmodelled occupancy changes during the hold.

Consequently the finite generator remains the active-clock law. Poisson domination and bounded paused stages give almost-sure finite physical elapsed time and finite expectation, not a deterministic uniform physical deadline. The success probability and its proof are unchanged.

R4. Actual guards and supplied resources

Accepted. Production interfaces now declare their full read sets. Both composition statements require that remaining inputs are supplied and every next-stage guard is certified in the actual assembled state, with no reuse of consumed resources as fresh packets. The proofs separate shared-coordinate identification from these additional applicability certificates.

This makes the conditional composition claim explicit. It does not assert that an abstract decoder supplies an unavailable chemical reaction or that independently nonempty stage models automatically compose.

R5. Relative openness and program terminology

Accepted. The geometric perturbation class is now explicitly continuous, endpoint-compatible, and uniform over the aperture interval. Attachment data are retained or transported compatibly, and exterior connector margins are included. The existing C^2 energy and strict-probability robustness argument remains intact.

The final summary now refers to a labelled reference architecture and a declared local program. The target contrast still comes from the supplied dipole–field channel, not from an unsupported identification of that field with every abstract stacking-label change. This is an editorial precision, not a change in the existence conclusion.

R6. Equivalence at a common clock

Accepted. Generator-conjugacy is stated for finite continuous-time Markov models compared at a common clock. The text adds that physical-time hybrid equivalence must transport pause-duration rules, reset maps, and controlled mechanical trajectories. Equal active-time generators alone are insufficient.

This preserves the source-comparison principle while making its physical-time implementation requirements explicit.

R7. Executed verification and formal coverage

Accepted. Prospective companion language has been replaced with the delivered execution status and coverage boundaries. The standalone verification document embeds the full Python source and identifies exact rational checks, finite samples, and floating-point tests. The formal-proof document embeds the complete Lean source and records the actual Lean 4.24.0 build and axiom audit.

The Lean module proves 47 theorems in the structural and exact rational core. It includes generic rational square completion and unique minimum, interface induction, coding representatives, rational occupancy sufficient bounds, finite geometry and arithmetic certificates, and reset-work algebra. It does not formalize every real analytic, topological, kinetic, or chemical result in the manuscript. Overleaf compilation typesets these sources; it does not itself execute Python or Lean.

8 Conclusions retained and scope defended

No substantive referee recommendation needed rejection. The accepted changes repair or clarify interfaces and reporting without withdrawing the main theorem. In particular, the gate constants and bounds $p_T > 0.98$, $p_0 > 0.97$, and joint success greater than 0.95 remain unchanged.

The response nevertheless preserves the appropriate scope boundaries identified by the report. An orthogonal lattice is not imposed, constitutive fields and rates are not claimed to follow from indexing alone, and a reduced-model witness is not promoted to experimental chemical existence. Full peptide synthesis, autonomous actuation, and all proposed atlas machines remain separate research tasks. Those stronger assertions would change the conclusions and are not introduced to make the paper appear more complete.

9 Delivered revision record

The revised manuscript retains the journal format, Article 103 designation, Volume 1, Number 5, and provisional start page 4100. Its source package and self-contained alternative are accompanied by this response, the referee report, standalone verification and formal-proof documents, raw program sources, and execution records. All reported build or test outcomes refer to those delivered versions.

Publication preparation note

The preceding review and response preserve the supplied historical record. The publication version is Article 103, Volume 1, Number 5, November 2026, beginning at page 1975. The former Article 102 source-comparison reference is now Article 99. Publication metadata, alphabetic reference labels, and DOI hyperlinks have been updated; these production changes do not enlarge the mathematical conclusions.