

Referee Report on “Three Impossible Theories”

Edoardo Livolsi
Independent Researcher
(Dated: January 2026)

This report presents a critical assessment of the manuscript “Three Impossible Theories”. Despite its authoritative tone, the paper does not constitute a physical theory nor a rigorous no-go theorem. Its conclusions rely on a set of conjectural assumptions elevated to universal principles, combined with an improper application of thermodynamic arguments outside their domain of validity. No fundamental dynamics, variational framework, or falsifiable predictions are provided. The manuscript functions as an ideological veto rather than a scientific result.

KEYWORDS

Leonard Susskind; black hole physics; quantum gravity; cosmology; peer review; critical assessment; falsifiability; variational principles

I. SUMMARY OF THE MANUSCRIPT

The manuscript argues that three classes of cosmological scenarios — eternal inflation, cyclic universes, and universe creation via tunneling — are impossible. The argument is based on a “central dogma” asserting that any causal patch of spacetime can be described as an isolated quantum system with a finite number of degrees of freedom proportional to horizon area.

Using this assumption, the author applies entropy and detailed balance arguments to claim that the considered scenarios violate the second law of thermodynamics or are otherwise inconsistent.

II. FUNDAMENTAL LOGICAL STRUCTURE

The manuscript has the following logical form:

Assume central dogma $\Rightarrow$ derive contradictions.

No independent justification of the central dogma is provided. As a result, the manuscript does not demonstrate the impossibility of the proposed theories, but only their incompatibility with an unproven assumption.

This constitutes conditional reasoning, not a physical no-go theorem.

III. MAJOR CONCEPTUAL DEFICIENCIES

A. Unjustified Central Dogma

The identification of a causal patch with an isolated quantum system of finite entropy is postulated rather than derived. No microscopic Hamiltonian, Hilbert space construction, or dynamical justification is given.

All subsequent conclusions inherit this conjectural status.

B. Misapplication of Thermodynamics

The manuscript applies entropy and detailed balance formulas to entire cosmological spacetimes without defining:

- microstates,
- ensembles,
- system boundaries,

- dynamical equilibration mechanisms.

Thermodynamic relations valid for well-defined statistical systems are extrapolated to contexts where their applicability is not established.

C. False Identification of Causal Patches as Isolated Systems

A causal patch is treated as an isolated system. This is physically incorrect. Horizon degrees of freedom, entanglement with inaccessible regions, and quantum fluxes invalidate the isolation assumption required by the second law of thermodynamics.

D. Tautological Exclusion of Cosmological Scenarios

The exclusion of Big Rip and cyclic cosmologies follows directly from the assumed identification of entropy with horizon area. This reasoning is tautological and does not constitute a dynamical demonstration.

No field equations are analyzed, and no entropy production mechanisms are calculated.

E. Inconsistent Use of Probabilities Across Regimes

In the discussion of universe creation via tunneling, probabilities derived from semiclassical instanton calculations are directly compared with entropy-based detailed balance probabilities. These quantities are computed in incompatible regimes and cannot be consistently equated.

This constitutes a domain-of-validity error.

F. Absence of Predictive Content

The manuscript provides no quantitative predictions, no observable signatures, and no constraints that could be tested experimentally or observationally. Its conclusions are immune to falsification.

IV. ASSESSMENT OF SCIENTIFIC CONTRIBUTION

The manuscript does not introduce new physics. It does not derive fundamental dynamics, does not propose a variational framework, and does not yield testable predictions. Its role is limited to reorganizing existing assumptions into a rhetorical argument framed as impossibility.

The work should therefore be classified as speculative commentary rather than a scientific result.

V. RECOMMENDATION

REJECT

The manuscript fails to meet the methodological standards of theoretical physics. It relies on unproven assumptions, misapplies thermodynamic reasoning, and presents conditional arguments as physical conclusions. Accepting this work would legitimize ideological vetoes in place of derivation, dynamics, and falsifiability.

APPENDIX A: TECHNICAL ANALYSIS OF THE CLAIMED IMPOSSIBILITY ARGUMENTS

In this Appendix we demonstrate that the “impossibility” claims presented in the manuscript do not follow from any closed dynamical or variational framework and therefore lack the status of physical no-go theorems.

A. Absence of a Variational or Dynamical Basis

A genuine impossibility theorem in physics must be derived from a well-defined dynamical structure, typically specified by an action functional $F[\Phi]$ whose stationarity condition determines the allowed physical configurations.

No such functional is introduced in the manuscript. Consequently, no equations of motion, stability conditions, or conserved quantities are derived. The exclusion of entire classes of cosmological models is therefore not dynamical but declarative.

B. Non-Derived Identification of Entropy with Horizon Area

The manuscript assumes an identification between entropy and horizon area and elevates this relation to a universal principle. No derivation is provided showing that this identification remains valid across cosmological evolution, tunneling processes, or non-equilibrium regimes.

As a result, conclusions based on entropy monotonicity are conditional on an unproven assumption.

C. Invalid Use of the Second Law of Thermodynamics

Thermodynamic arguments are applied to entire cosmological spacetimes without defining microstates, ensembles, or equilibration mechanisms. The second law is used as a global constraint rather than as an emergent statistical statement valid within a specific domain of applicability.

This constitutes an extrapolation beyond the regime in which thermodynamics is defined.

D. Inconsistent Probability Comparisons

The manuscript compares probabilities computed using semiclassical tunneling methods with probabilities derived from entropy-based detailed balance arguments. These quantities are defined in different theoretical regimes and cannot be consistently equated.

This mismatch invalidates the probabilistic conclusions drawn in the text.

E. Conclusion of the Appendix

The technical analysis shows that the manuscript does not establish physical impossibility results. The arguments are conditional, assumption-dependent, and lack a closed mathematical structure. The claims therefore do not qualify as no-go theorems in theoretical physics.

REFeree CONFIDENTIAL NOTE TO THE EDITOR

This manuscript does not present a physical no-go theorem. Its conclusions are entirely conditional on an unproven “central dogma” and on the extrapolation of thermodynamic arguments beyond their domain of validity.

No variational principle, dynamical equations, or microscopic model is provided. Entire classes of cosmological theories are excluded by assumption rather than by derivation.

The work functions as a conceptual veto framed as inevitability. Accepting this manuscript would set a precedent in which authority and narrative replace dynamics and falsifiability.

I therefore strongly recommend rejection.

Declaration of Authorship and Conceptual Integrity

This work has been written independently by the undersigned author. All analyses, critiques, and methodological assessments reflect the author's own standards for theoretical physics, based on closed variational principles, explicit mathematical derivations, and falsifiable physical content. Any reuse, citation, or redistribution of this document must explicitly acknowledge its authorship and conceptual origin.

Edoardo Livolsi – Independent Researcher

ORCID: <https://orcid.org/0009-0009-1266-8204>

License

Creative Commons Attribution–NonCommercial–NoDerivatives 4.0 International (CC BY-NC-ND 4.0)

Copyright

(c) 2026 Edoardo Livolsi. All rights reserved.