

# The Speed of Light as the Limit of World-Connectivity

## Simulation, Time, and Ontological Irreversibility

Author: Timothy Speed  
Affiliation: Independent Researcher  
Contact: info@timothy-speed.com  
<https://timothy-speed.org>

DOI: <https://doi.org/10.5281/zenodo.18119171>

ORCID: <https://orcid.org/0009-0002-0143-5949>

© 2026 — CC BY-NC-ND 4.0

### Abstract

In physics, the speed of light is regarded as the upper limit of signal transmission and as a fundamental constant of spacetime. This description is empirically correct and formally sufficient. The present text argues, however, that the speed of light also possesses an ontological significance that has so far remained largely unthematized.

Starting from an ontology of irreversible world-binding, it is shown that the speed of light does not merely limit how fast information can be transmitted, but marks what can become world-connectable at all. Everything that can be transmitted necessarily appears as the trace of a world-enactment that has already occurred. Presence itself is in principle not transmissible.

Simulations—particularly formal models, digital representations, and AI systems—implicitly operate as if this boundary could be lifted. They treat world as if it were fully reconstructible, synchronizable, or resettable. The text shows that simulation does not fail due to technical insufficiencies, but due to an ontological boundary: the non-retractability of world-binding, which is structurally secured by the speed of light.

The speed of light thus appears not as a property of light alone, but as a condition of world-capability itself. The paper does not present itself as a critique of physics, but as an ontological contextualization of its scope—and as a clarification of why simulation necessarily remains worldless, even when it is formally correct.

The argument proceeds by ontological reconstruction rather than physical derivation.

*(This paper is an interface text within a larger operator-based research program. Core concepts are employed here in application, not re-derived. The underlying research corpus operates in a non-linear, rhythmically recursive mode of structural analysis that cannot be fully preserved in standard academic English without loss of epistemic resolution. The author's primary research*

*practice is grounded in an autistic mode of structural perception; the present text provides an interface translation of this work for academic contexts.)*

**This paper is directly related to:**

Speed, T. (2025). Why Time Is Directed: World Stabilization as an Ontological Condition (Version 1). Zenodo. <https://doi.org/10.5281/zenodo.18096277>

Speed, T. (2025). The Curve of the World - Why World-Binding Cannot Be Linear — Shift of Being, Time, and the Impossibility of the Archive (Version 1). Zenodo. <https://doi.org/10.5281/zenodo.18097931>

Speed, T. (2026). Time Difference Without Neutralization - An Ontological Supplement to Relativity Theory (Version 1). Zenodo. <https://doi.org/10.5281/zenodo.18115940>

## **1. Introduction – Simulation as a Structural Problem**

Simulation is no longer a marginal phenomenon. It permeates scientific modeling, technical planning, economic forecasting, and increasingly also social decision-making processes. Simulations are successful because they render formal relations reproducible, keep scenarios comparable, and make complex systems appear manageable. Precisely this success, however, conceals a tacit assumption that is rarely made explicit: the assumption that world is, in principle, fully reconstructible.

The present text does not begin with technical limits of simulation and raises no normative objection. It does not ask whether simulation is “good” or “bad,” but under which ontological conditions it operates. The central thesis is this: simulation does not fail due to computational power or model fidelity, but due to a boundary that is structurally non-transgressable. This boundary is not technical, but ontological—and it is closely linked to the speed of light.

## **2. Speed of Light – Physically Correct, Ontologically Underdetermined**

In modern physics, the speed of light occupies a central role. It functions as the upper limit of signal transmission, structures causality, determines observability, and forms the basis of relativistic spacetime. This description is empirically secured and theoretically consistent. Within physics, there is no reason to call it into question.

What remains open, however, is the ontological significance of this boundary. Physical theory describes precisely how information can propagate and what consequences this has for measurement and relations. It says nothing, however, about what this boundary means for world itself. The speed of light appears as a property of light or of spacetime—not as a limit of what can become world-connectable at all.

This restraint is not a deficiency of physics. It is a consequence of its methodological abstraction. It is precisely here that the ontological clarification begins.

### **3. Presence Is Not Transmissible**

Everything that is observed has already passed. This seemingly trivial fact is often underestimated. Observation presupposes delay; every piece of information requires time in order to become effective. Even in the limiting case of the speed of light, what is observed necessarily remains posterior.

Presence is therefore not a moment that could be transmitted. It is an enactment: the moment in which world binds, sets itself, and thereby irreversibly occurs. This enactment is in principle not observable, not storable, and not reconstructible. What is transmitted is always only the trace of what has already occurred.

The speed of light marks precisely this boundary. It does not merely limit the velocity of signals, but structurally secures that presence cannot be transported. World is never present simultaneously at multiple locations; it only ever becomes visible retrospectively.

Just as distances and bodies delimit the human world, the speed of light delimits world itself. These limits are not deficiencies—they are the conditions of world-capability. Simulation crosses them technically without being able to carry them ontologically.

This structural boundary does not remain without consequences for social forms. Civilizational orders that operate as if presence could be transmitted, stored, or synchronized necessarily come into tension with the conditions of their own world-capability. Where simulation, acceleration, and permanent availability displace the experience of posteriority, world is not expanded but emptied. Responsibility, proximity, and duration lose their binding force because they are coupled to a presence that is technically suggested but ontologically cannot be fulfilled. The crises that arise from this are therefore not primarily moral or political in nature. They are structural effects of a civilization that transgresses the boundary of transmissibility without carrying along the conditions of world-binding.

### **4. The Speed of Light as the Limit of the World-Trace**

From an ontological perspective, the speed of light can therefore be understood as the limit of the world-trace. It does not delimit world itself, but the propagation of its efficacy. What propagates is not world in enactment, but the after-effect of a world-binding that has already been enacted.

World comes into being through irreversible setting.

This does not refer to a single event, but to the fundamental structure of occurrence: what has once occurred cannot be returned to the state prior to its occurrence. Occurrence is not merely change, but fixation. With every setting, conditions are established under which further occurrence takes place—and these conditions remain effective even when the event itself has passed.

This efficacy propagates. Yet it does not do so as continued presence, but as trace. What propagates is not the occurrence itself, but its consequentiality: the fact that world has occurred under certain conditions and can now continue only under altered conditions.

The speed of light secures precisely this distinction. It marks the boundary up to which the trace of an occurrence can become effective without the occurrence itself becoming present.

Presence remains locally bound. It cannot be transported, multiplied, or synchronized. What is communicated is always only posteriority.

The sharpness of this boundary is ontologically necessary. If presence were transmissible, occurrence could be retrieved, distributed, or equalized. World would become resettable. History would lose its binding character. That this is not possible is not a technical limitation of nature, but a structural condition for world to be able to have history at all. The speed of light prevents the existence of a global now.

It thus appears not as a contingent physical constant, but as a safeguard of irreversibility: it prevents world from becoming a neutral, at-any-time reconstructible system of states.

## **5. Simulation as a Transgression of Limits**

Simulation, by contrast, implicitly operates as if this boundary could be transgressed. It treats world as if it were fully reconstructible, synchronizable, and in principle resettable. Past states are stored, compared, and run through again. The future appears as a calculable continuation of these states.

No formal error arises in this process. Simulations can be extremely precise. The ontological rupture lies deeper: simulation replaces world-binding with comparability. It treats traces as if they were world itself. History becomes a dataset; presence becomes one state among others.

The failure of simulation is therefore not a failure in the usual sense, but a necessary limit. Simulation cannot replace world because it cannot carry irreversibility. It can only repeat what is formally describable—not what has occurred worldfully.

Simulation does not fail because it computes too little of the world, but because it replaces world with computability. Simulation does not generate world; it manages its traces as if they were presence. Where simulation takes the place of world, irreversibility is translated into repeatability—and world is thereby rendered unrecognizable.

This insight does not concern abstract models alone, but gains particular sharpness wherever simulation is deployed as a substitute for world—such as in data-driven decision architectures, artificial intelligence, and prognostic systems that operate formally correctly yet necessarily remain worldless, because they cannot carry presence, history, or irreversibility.

Simulation is not a tool here, but a structure—and its consequences are the actual object of analysis.

## **6. Delimitation – No Critique of Physics, No Technological Pessimism**

The present approach is directed neither against physics nor against technical modeling. It does not dispute the usefulness of simulations and raises no moral objection to their application. The physical description of the speed of light remains fully valid.

The contribution consists solely in an ontological delimitation. It shows that formal models necessarily end where world binds irreversibly. To name this boundary is not to devalue simulation, but to situate it precisely.

## 7. Conclusion – A Light-Speed Universe

We do not merely live in a universe in which light has a certain speed. We live in a universe in which world is connectable only up to the speed of light. Everything that can be thought beyond this may exist as possibility—but it does not belong to world in the ontological sense.

The speed of light does not delimit the universe. It delimits the sphere of world. Beyond this boundary there does not begin an expanded reality, but formal possibility without history. This limitation is not restrictive, but world-constituting. It ensures that world binds, carries, and does not flatten into simulation.

The present contribution alters no empirical findings; it clarifies the ontological presuppositions under which these findings count as explanations.

The ontological interpretation of the speed of light proposed here claims no deductive necessity in the logical sense. Its necessity arises instead from the fact that without this setting, central phenomena—irreversibility, history, the non-retractability of world—could be explained only through additional, non-necessary assumptions.

### Further references within the research program:

Speed, T. (2025). Information Without World - On the Limits of Additive Information Theories in Physics (Version 1). Zenodo. <https://doi.org/10.5281/zenodo.18045445>

Speed, T. (2025). Measurement Without an Observer - On the Spatial Stabilization of Determinacy in the MNO Model (Version 1). Zenodo. <https://doi.org/10.5281/zenodo.18020588>

Speed, T. (2025). Form Without Blueprint - Dynamic Morphogenesis Beyond Platonic and Information-Theoretic Models (Version 1). Zenodo. <https://doi.org/10.5281/zenodo.18074714>

Speed, T. (2025). Artificial Systems Without World - Why World-Formation and Technical Usability Are Structurally Incompatible - Ontological Limits of Artificial Intelligence in Light of ANP, MNO, and Observer Structure (2 English). Zenodo. <https://doi.org/10.5281/zenodo.18006914>

Speed, T. (2025). Veridical Mapping as a Spatial Operation - Neurodivergent Cognition Beyond Representational Models (Version 1). Zenodo. <https://doi.org/10.5281/zenodo.18032384>

Speed, T. (2025). MNO and Ontological Recurrence: A Non-Representational Account of Quantum Measurement and Conscious Experience (Version 1). Zenodo. <https://doi.org/10.5281/zenodo.17913823>

Speed, T. (2025). Orch-OR with Recurrence: A Minimal Dynamical Condition for When Objective Reductions Yield Conscious Experience (1 English). Zenodo. <https://doi.org/10.5281/zenodo.17942531>

Speed, T. (2025). Operatoric Cognition: Pre-theoretical Structural Invariance as the Basis of Autistic Intelligence (3 English). Zenodo. <https://doi.org/10.5281/zenodo.17897109>

Speed, T. (2025). The Gap as a Condition - Pre-Ontological Operatorics and the Primacy of Response (2 English). Zenodo. <https://doi.org/10.5281/zenodo.18015885>

- Speed, T. (2025). From Objects to Responses - On the Loss of Ontological Sovereignty in Contemporary Physics (Version 1). Zenodo. <https://doi.org/10.5281/zenodo.18017629>
- Speed, T. (2025). Seinsverschiebung (Shift of Being) as a Pre-Ontological Category - On the Incompatibility of Existence and Understanding in Modern Regimes of Stabilization (2 English). Zenodo. <https://doi.org/10.5281/zenodo.18007628>
- Speed, T. (2025). The Constructed Observer - World-Formation Beyond Representation - Why Perception Is Not Representation, but a Structural Achievement (2 English). Zenodo. <https://doi.org/10.5281/zenodo.18006170>
- Speed, T. (2025). The All-Nothing Paradox - Ontological Openness as a Condition of World-Formation - Why Closure – Not Complexity – Marks the Limit of Artificial Systems (2 English). Zenodo. <https://doi.org/10.5281/zenodo.18000820>
- Speed, T. (2025). Beyond Intelligence - Emergence, Operator Relativity, and an Autistic Epistemology (Version 1). Zenodo. <https://doi.org/10.5281/zenodo.18068128>
- Speed, T. (2025). Renormalization as a Boundary Operation in the Quantum Field Theory of the Standard Model (Version 1). Zenodo. <https://doi.org/10.5281/zenodo.18060365>
- Speed, T. (2025). Vacuum Energy as a Residual Quantity - On the Cosmological Constant as a Boundary Phenomenon of Physical Stabilization (Version 1). Zenodo. <https://doi.org/10.5281/zenodo.18061827>
- Speed, T. (2025). Black Holes as a Boundary Case for Emergence - An MNO-based Clarification of the Ontological Boundary of Physical World-Capability (2 English). Zenodo. <https://doi.org/10.5281/zenodo.17974647>
- Speed, T. (2025). Dark Energy as an Emergent Residuum - A Minimal Operator-Based Interpretation within an MNO Framework (2 English). Zenodo. <https://doi.org/10.5281/zenodo.18015172>