

# The Photonic Universe Hypothesis: A Cyclic Model of Matter, Time, and Entropy Based on Photon Conservation

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Status: Preprint -- conceptual framework pending mathematical and observational formalization.

## 1. Introduction

The Photonic Universe Hypothesis (PUH) proposes that photons, rather than particles or fields, are the sole fundamental entities in the universe. All mass, time, entropy, and structure are emergent properties of photon folding and alignment.

In PUH, the universe is cyclic. It evolves through epochs of photon freedom, confinement (folding), and rebound (unfolding). Each cycle begins not with a singularity, but with a rebound of a cosmic-scale Planck star -- a photon reservoir undergoing pressure-induced release.

## 2. Core Axiom

Photons are the gas for the engine of the universe. No other energy exists. Photons are timeless, lasting forever.

This is the foundational axiom of PUH, guiding all interpretations of matter, energy, and cosmic evolution. It reframes every process in physics as a movement, folding, or liberation of light.

## 3. Photons, Mass, and Time

In PUH:

- Mass is a configuration of trapped photons.
- The photon's spin and trajectory define the topology of matter.
- Time begins where photons are trapped, due to delays in their motion.

Neutrinos, electrons, and other fundamental particles are stable photon folds. The indistinguishability of particle types (e.g., all electrons having identical mass and charge) arises from the universal geometry of these folds.

#### **4. Entropy and the Arrow of Time**

Entropy, in PUH, is not disorder, but delay:

- Systems with more trapped photons have higher entropy.
- The arrow of time reflects the net direction of photon trapping and release.

Matter-antimatter annihilation unfolds photon folds, releasing light and resetting entropy locally. This process illustrates photon conservation: no mass is lost, only unfolded.

#### **5. Planck Stars and the Cyclic Universe**

Black holes are Planck stars -- photon collectors.

- Time does not pass inside; it dilates infinitely.
- Trapped photon pressure causes rebound after reaching critical density.
- Rebound appears to take trillions of years externally, but is instantaneous internally.

The universe cycles:

1. Photon Epoch -> 2. Folding (mass creation) -> 3. Matter Epoch -> 4. Photon Capture -> 5. Planck Star Mergers -> 6. Rebound -> 7. New Big Bang.

#### **6. Hawking Radiation and Photon Return**

In PUH, Hawking radiation is structured photon release -- a repayment of borrowed photons folded into matter.

- Black holes emit polarized photons.
- Information is preserved in photon spin and geometry.
- Radiation is coherent and follows the structure of original matter.

This resolves the black hole information paradox and reinterprets virtual particles as photon fluctuations.

## **7. Photon Spin Alignment and Magnetars**

Magnetars are massive domains of aligned photon spin.

- Their magnetic field arises from coherent photon folds.
- X-ray polarization confirms photon spin memory.

These stars are natural analogues of large-scale polaritons -- systems where light and geometry define structure and force. Gravity and magnetism emerge as collective effects of spin-aligned photons.

## **8. Predictions of PUH**

Key testable predictions:

- Hawking radiation should be photon-dominated and polarized.
- Early galaxies should contain heavy elements (formed by folding).
- Matter-antimatter asymmetry arises from Planck star spin preference.
- CMB polarization retains memory of spin geometry.
- Entropy varies with photon confinement, not particle count.
- Massless photon folds may be simulated in lab conditions.

## **9. Connections to Existing Theories**

PUH aligns or reinterprets:

- General Relativity: Gravity is emergent from photon folding.
- Quantum Field Theory: Particles are stable photon configurations.
- Loop Quantum Gravity: Spacetime emerges from spin networks of photons.
- String Theory: Photon folding replaces strings as vibrational modes.
- CCC: PUH offers a photon-based conformal cyclic model.

PUH respects known physics while offering a unifying photon foundation.

## **10. Conclusion and Future Work**

The universe is not made of matter -- it is made of light.

PUH envisions a cosmos in which photons are folded into geometry, unfolded into energy, and conserved across all cycles. All forces, particles, and fields are aspects of this dynamic light fabric.

Future directions include:

- Mathematical formalization of photon folds and field topology.
- Experimental tests of photon-only Hawking radiation.
- Lab analogues of Planck star rebound.

PUH opens a path toward a simpler, unified view of the cosmos.