Loop Ontology of Space | LOS

Foundational Principles

Abstract

This paper derives unavoidable properties of space from the axiom *Something Is, Nothing Isn't* and from established results in modern physics. The axiom prohibits the existence of void, requiring closure as the minimal condition for persistence. Empirical evidence demonstrates that the vacuum is energetic, dynamic, and bounded below by the Planck scale. The Planck scale represents not distance but the boundary of scale, where being must reflect back upon itself. Together, these results imply that space is not an elastic void but a structured presence composed of indivisible closures. Gravitational and optical phenomena follow naturally from variations in the saturation of energy within these closures.

1. The Axiom

Axiom: Something Is, Nothing Isn't.
Logical consequences:
1. Existence cannot dissolve into "nothing," since nothing cannot exist.
2. There is no "outside" of being.
3. Persistence requires closure: an entity must be self-contained.
4. The minimal closure is the loop, the simplest topological form that prevents leakage into non-being.

2. Established Physical Facts

1. Vacuum is not empty. Quantum fluctuations (Casimir effect, Lamb shift) and dark energy confirm that space has measurable energy content.
2. Space is dynamic. General Relativity describes spacetime as stretching, curving, and supporting gravitational waves. This dynamism is experimentally verified (GPS corrections, LIGO detections, black hole imaging).
3. Planck boundary exists. At lengths below ~10■³■ m and times below ~10■■³ s, current theories break down. This indicates a lower limit to divisibility, consistent with a fundamental structural unit.

3. Planck as Boundary of Scale

- The Planck scale is not simply the "smallest distance" but the edge and center of being.
- It is a boundary of scale: beyond it, division cannot proceed without invoking "nothing," which the axiom forbids.
- At this edge, being must close back onto itself, producing self-reflective loops.
- The universe, at its most fundamental level, therefore "looks in on itself" at the Planck boundary.
- This closure guarantees persistence and prevents dissolution into non-being.

4. Consequences for Space

From the axiom and physical facts:
1. Indivisible closures. The Planck scale defines the smallest possible loop; these units cannot shrink or stretch.
2. No elastic curvature. Since loops are invariant in scale, Einstein's curvature cannot be interpreted as literal bending of an elastic medium.
3. Energy saturation. Variations in energy correspond to different saturation levels of indivisible loops, not to changes in their number or size.
4. Photon geodesics. Light follows the structure of space. In regions of higher saturation, paths deviate, producing gravitational lensing without invoking "void bending."
5. Gravitational attraction. Highly saturated regions influence surrounding loops, creating the observed effect of attraction as loops relax into unified closure.

5. Logical Extensions

1. Continuity of being. There can be no gaps in existence; space must be continuous up to the Planck boundary.
2. Universality of closure. Closure holds at all scales: Planck loops, atoms, stars, and galaxies are nested manifestations of the same principle.
3. Persistence requires invariance. The Planck length and time are necessary constants; without invariance, closure could break and being would dissolve.
4. No true emptiness. Even "vacuum" regions are structured with loops; otherwise they would be nothing, which is impossible.
5. No external frame. With no "outside" of being, all measures of distance and time are internal relations within the loop fabric itself.

6. Proof by Elimination

1. Void-space (true emptiness). Contradicts the axiom and is falsified by vacuum energy.
2. Infinite divisibility. Requires sub-Planck "nothing," contradicting the axiom and physics.
3. Elastic void curvature. Implies stretchable units, contradicting Planck invariance.
4. External frame. Requires an "outside," which is impossible under the axiom.

Therefore, the only consistent description is: space is closure, composed of indivisible loops at the Planck boundary, varying in energy saturation but not in unit size.

7. Conclusion

The combination of logical necessity and empirical fact establishes:
- Space cannot be void; it is structured being.
- This structure is closed at the Planck limit and indivisible.
- The Planck scale represents the edge of scale, where being reflects back upon itself in closure.

- Gravitational and optical phenomena are consequences of variations in energy saturation within indivisible loops, not of curvature through nothingness.
- Closure, continuity, and invariance are universal properties at all scales, ensuring the persistence of being.

Thus, the Loop Ontology of Space | LOS provides a logically and physically grounded foundation: space is closure, and its dynamics are intrinsic expressions of being itself.