

Resolution Boundaries, Informational Manifolds, and the Limits of Observation: An Ontological Framework

itzhexen

June 21, 2025

Abstract:

This paper explores a novel ontological framework in which the universe is defined by the flow and resolution of information through structure. Observation is reframed as informational collapse, which generates events and time. A fundamental boundary exists—an edge of resolution—beyond which no further collapse or observation occurs, implying a timeless domain. This boundary differentiates this informational manifold from Einstein's spacetime manifold and mirrors Gödelian incompleteness: limits are intrinsic to the system. The model suggests the universe is self-contained, not embedded in a larger resolving system, with the timeless substrate existing as unresolved, non-participatory information.

1. Introduction: Observation as Informational Resolution

Traditional views of observation often rely on consciousness or measuring devices. Here, observation is redefined as any structural channel through which information flows and collapses, producing resolution. Resolution events mark the formation of identity, boundary, and time. Without resolution, no event or temporal ordering can emerge.

2. The Flow-Resolution Model

All entities and processes are informational. Information flows through structures, and when uncertainty collapses within these structures, a resolution event occurs. Time is the shape left by such resolution events. The observer is any structure enabling this collapse, not necessarily conscious or intentional.

3. The Resolution Boundary: An Ontological Edge

The universe contains a fundamental boundary where resolution ceases. Beyond this boundary, informational flow exists but does not collapse, resulting in no events, no time, and no observation. This boundary is not a spatial or geometric horizon but an operational limit where the structure of observation fails.

Side note: This resolution boundary calls to mind the structure of an eye's retina – a physical boundary where information resolves into form. Inside, structure enables observation; beyond, the lack of structure means no resolution occurs. It's an analogy about how structure defines the limits of observation.

4. The Timeless Substrate: Unresolved Information

The domain beyond the resolution boundary is a substrate of information that does not permit resolution. It is not chaos or nothingness but a foundational presence where information exists without transitioning into identity or event. This timeless substrate is a region permanently outside time, observation, and transformation.

5. Self-Containment and the Limits of Embedding

Because resolution defines participation in time and observation, the universe cannot be part of a larger resolving system. If it were, it would have passed through resolution within that system. Thus, the universe is self-contained, bounded

by its resolution edge, which acts as an ontological insulation.

6. Comparison to Einstein's Manifold

Einstein's spacetime manifold is a smooth, continuous, four-dimensional geometric object where gravity is curvature. In contrast, the informational manifold here is a discrete, relational network of resolution events connected by information flow. The "edge" in this framework is a limit of observation and resolution, not a geometric or topological boundary.

7. Gödelian Parallels: Incompleteness as Structural Limitation

Like Gödel's incompleteness theorems showing formal systems cannot prove all truths internally, the universe's resolution boundary represents a fundamental ontological incompleteness. There are domains that cannot be observed or unified because they lie beyond resolution, similar to truths beyond formal proof.

8. Analogy: Water and Information

Just as water can flow through pipes and reservoirs, sometimes passing through without interacting or transforming, information can flow without resolution. Resolution is like water pooling or freezing – a transformation marking structure. The timeless substrate is like a vast reservoir of water never engaging in these transformations.

9. Implications and Conclusion

This framework shifts the foundations of ontology and physics from continuous geometry and external observation to structural information and internal resolution. It posits a universe defined by its capacity to resolve information, bounded by a non-resolving substrate. Time, identity, and observation emerge only within this boundary. This offers a new lens to understand limits in physics, cosmology, and metaphysics.