

Section 1. Introduction — Why Spacetime Must Be Questioned

Modern physics is built upon one of its most powerful and least examined assumptions: that spacetime exists first, and that all physical processes unfold within it. This assumption has shaped the architecture of classical mechanics, quantum field theory, and general relativity alike. Its predictive success is undeniable. Yet predictive success, however extraordinary, does not by itself settle the ontological question of what is fundamentally real.

The central claim of Paper A-13 is that spacetime should no longer be treated as the primitive stage of reality. Within the Chayut Universe Wave Function (CUWF) framework, spacetime is not the substrate of the universe, but a stable projection emerging from deeper relational collapse dynamics. Geometry is not what reality is made of at the deepest level. It is what stable relational history looks like once collapse has already organized accessibility, recordability, and structure.

This paper therefore does not begin by modifying spacetime. It begins by questioning whether spacetime belongs in the foundational layer at all.

1.1 The Historical Success and Hidden Assumption of Spacetime

From Newtonian absolute space to Einstein's four-dimensional manifold, modern physics has almost always treated spacetime as the arena in which all physical phenomena occur. Even when Einstein removed absolute frames and replaced them with a dynamical geometric structure, spacetime itself was retained as the basic container of physical meaning.

The inherited ordering is therefore deeply familiar:

$$\text{Reality} \rightarrow \text{Geometry} \rightarrow \text{Dynamics} \rightarrow \text{Observables}$$

Geometry is assumed first, and dynamics are written on top of it. Coordinates may be generalized, manifolds may be curved, and fiber structures may be added, but the existence of spacetime itself is almost never removed from the base ontology.

This point matters because it reveals that spacetime is not merely a technical convenience in modern physics. It functions as an unspoken axiom. Most theories do not prove that spacetime is fundamental; they assume it before the first equation is written.

General Relativity provides the strongest expression of this structure. Its empirical success in gravitational lensing, redshift, black-hole physics, and cosmological evolution is one of the great achievements of theoretical science. Yet the Einstein field equations explain only how geometry responds once it already exists:

$$G_{\mu\nu} = 8\pi G T_{\mu\nu}$$

They do not explain why geometry exists at all, nor how geometry could emerge from a deeper non-geometric regime. In that sense, general relativity is a theory of geometric behavior, not of geometric origin.

CUWF accepts the empirical strength of GR while challenging its ontological placement. What GR describes, in the CUWF interpretation, is not fundamental geometry itself, but the behavior of a stable projection layer generated by deeper relational collapse dynamics.

1.2 The Quantum–Gravity Tension as a Structural Problem

The long-standing tension between quantum theory and gravity is often described as a technical problem of unification. CUWF argues that this diagnosis is incomplete. The conflict is not merely mathematical. It is structural.

Quantum theory is fundamentally relational. Correlation amplitudes, entanglement structure, operator relations, and measurement outcomes are defined through interaction, accessibility, and collapse among states. General relativity, by contrast, assigns physical meaning directly to the geometry that contains those relations. One framework begins from relational event-structure; the other begins from the geometric stage on which events are said to occur.

This is why gravity resists quantization so persistently. One is not merely trying to quantize a difficult interaction. One is trying to quantize the very stage that the formalism presupposes as already

given. In CUWF language, one is attempting to quantize the projection rather than the mechanism that produces it.

Quantum field theory can tolerate a degree of background uncertainty because its core syntax remains relational: operators, amplitudes, and correlations do not require a perfectly rigid coordinate picture in order to remain meaningful. General relativity is far more deeply bound to geometry. Once the geometry itself becomes uncertain, the semantic anchor of the theory is destabilized.

This should not be read as a flaw in GR. It should be read as a clue. Spacetime may not be the wrong thing because it fails empirically. It may be the wrong thing because it is not the object that should be made fundamental in the first place.

CUWF therefore states the problem in direct form: spacetime is not what should be quantized. What should be formalized at the foundational level is the collapse structure that generates relational accessibility, stable records, and the projection later interpreted as geometry.

1.3 Objective of This Paper

Paper A-13 has three explicit objectives.

First, it removes spacetime from the foundational layer of ontology. The aim is not to slightly deform spacetime, discretize it, or repackage it in more abstract mathematical language. The stronger move is to deny that a manifold, metric, or clock-like structure belongs at the base level of physical reality. In the CUWF framework, what exists fundamentally is relational collapse dynamics.

Second, it reconstructs geometry as an emergent projection. Distance is reinterpreted as accessibility cost. Angle is reinterpreted as relational constraint. Metric structure becomes a coarse-grained shadow of stabilized relational organization following collapse. Geometry is therefore not abolished, but relocated.

Third, the paper aims to preserve empirical success while revising ontology. CUWF does not reject general relativity where geometric description remains stable and successful. It re-locates GR to

the projection layer. The predictions remain where they work; what changes is the meaning of what is being described.

The final thesis of this introduction may therefore be stated succinctly. Spacetime is not the stage of the universe. It is the shadow cast by relational collapse dynamics.