The Breathing Geometry of Time: Symmetry Locking, Collapse, and the Return to Phase in Quantum Collapse Geometry

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Abstract

Quantum Collapse Geometry (QCG) is a framework in which physical reality emerges not from fundamental fields or spacetime but from the collapse-stable topologies of entropic coherence within a structured phase lattice. In this paper, we extend the QCG formalism by completing the symmetry cycle that governs reality's ontological scaffolding. We propose that the experience of time is not linear, but arises from the bidirectional standing wave of symmetry locking and symmetry decoupling. Collapse creates classical projection through constraint convergence, while classical structures dissolve back into phase space via decoherence-induced symmetry divergence. This bidirectional flow defines time not as a dimension, but as a breathing structure of entropy geometry. We formalize this process with symmetry locking and decoupling operators and propose new cohomological metrics for collapse longevity and phase reintegration.

1 Introduction

Modern physics treats time as either a fundamental dimension (in relativity), a parameter (in quantum mechanics), or an illusion (in block universe cosmology). In Quantum Collapse Geometry (QCG), we propose a new origin: time is the dynamic, emergent boundary behavior of entropic coherence as collapse pathways stabilize into classical reality and dissolve back into undifferentiated possibility. In this paper, we introduce the notion of symmetry decoupling to complement the previously established collapse symmetry locking process, thus closing the dynamical loop that defines the ontological rhythm of reality.

2 Collapse Symmetry Locking

In QCG, the unitary evolution of a quantum system is not sufficient to produce classicality. Instead, collapse occurs when the local entropy gradient favors the stabilization of a particular phase configuration. This process is governed by a symmetry-locking mechanism wherein overlapping constraints converge to define a stable topological attractor. We define the collapse projection function as:

$$\mathcal{C} : \mathbb{P}(\mathcal{M}) \to \mathcal{G}$$

where $\mathbb{P}(\mathcal{M})$ is the space of collapse-prepared moduli over the phase lattice $\mathcal{M}$, and $\mathcal{G}$ represents the emergent classical geometry group.

This locking process enforces geometric projection, defining mass, time, and field identity as secondary characteristics of entropic stability.

3 Standing Wave of Collapse: Time as Emergent Coherence

Rather than a linear axis, time in QCG is experienced as a standing-wave coherence pattern formed by the symmetric pruning of phase space from both past and future directions. The forward propagation of collapse events defines a stable trajectory, while incompatible branches are pruned from the future probability field and from the decohered past. Thus, time is not a container, but a coherence-preserving rhythm.

> *"Time is not what moves—collapse does. Time is what remains coherent in its wake."*

This also allows for local time curvature to emerge from variations in entropy gradient, rather than from spacetime curvature.

4 Symmetry Decoupling and Return to Phase

As classical geometries dissipate or fail to propagate coherence, they undergo a process of symmetry decoupling. This is the reverse of the collapse locking mechanism. It is defined as:

$$\mathcal{D} : \mathcal{G} \to \ker(H^1(\mathbb{CP}^3, \mathcal{O}(n)))$$

This map takes classical geometric configurations and projects them back into the null kernel of cohomological overlap—the region of phase space where coherent projection fails, and the system dissolves into latent possibility. In this context, the kernel $\ker(H^1(\mathbb{CP}^3, \mathcal{O}(n)))$ represents the locus of decohered sheaves—regions where phase bundles have lost sufficient overlap to maintain classical projection, indicating a reversion to entropic indeterminacy.

Mechanisms include:

- Degeneration of Čech or Ext group coherence
- Collapse-lattice fracturing under entropy overload
- Sheaf disintegration on the twistor manifold

- Loss of fibration continuity over phase-attractor bundles

The collapse rhythm itself—i.e., the perceived rate of time—may vary across the phase lattice. It is modulated by local entropy density, coherence curvature, and the stability of the observer's phase topology. In this view, gravitational and quantum time dilation arise not from metric distortions, but from geometric modulation of collapse periodicity.

5 The Ontology of the Past and Future

Within QCG, the past is not permanently fixed. It is retained only as long as it participates in the coherence structure of the present. Once an event no longer contributes to present stability, its projection collapses and reenters the generic probability grammar. Likewise, the future is not "out there" waiting—it is constrained only by the lattice's admissible collapse paths and prunes dynamically as the system evolves.

6 Conclusions

This paper completes the symmetry cycle of QCG by introducing the reverse-flow mechanism of symmetry decoupling. With this, we propose a fully dynamic view of time as the breathing interface between collapse and decoherence. Geometry, mass, and causality are emergent behaviors of this breathing structure. Future work will focus on modeling the collapse rhythm in local curvature terms and identifying observable markers of symmetry decoupling in entropic boundary conditions.

References and Contextual Framework

This work introduces a novel ontological framework, Quantum Collapse Geometry (QCG), which is not a modification or extension of existing theories but a fundamental redefinition of the structure of physical reality. The references below are provided not as sources for QCG itself, but to contextualize its departure points, acknowledge neighboring inspiration, and situate the reader within the current theoretical landscape.

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