Section 1. Introduction — The Problem of Time in Modern Physics

Modern physics inherited two monumental but deeply different conceptions of time. In classical mechanics, following Newton, time was treated as an external and universal parameter that flows uniformly everywhere, independent of matter, motion, and observation. In general relativity, following Einstein, time ceased to be external in that sense and became one coordinate of a four-dimensional spacetime manifold, inseparably mixed with space and dynamically shaped by gravity. Quantum mechanics, however, never internalized time in the same way. In the Schrödinger equation, time appears once again as an external parameter rather than an operator, an observable, or a dynamical constituent of the state itself.

This unresolved tension is not a minor technical inconvenience. It is one of the deepest fractures in modern theoretical physics. Quantum theory presupposes a fixed temporal background in order to define evolution, while relativity denies that any such universal background exists. As a result, the problem of time sits at the center of every serious attempt to unify the foundations of physics.

CUWF (Chayut Universe Wave Function) begins from a more radical stance: time is not a fundamental ingredient of reality at all. It is not an ontological primitive, not a universal container, and not a background parameter upon which the universe depends in order to exist. Instead, time is treated as a derived quantity—an emergent bookkeeping of how entropy geometry and collapse processes unfold in specific domains.

Paper A-7, CUWF Time Theory, is devoted to reconstructing the concept of time from the ground up within this framework. Its purpose is not to slightly modify standard temporal intuition, but to replace the usual starting point entirely. The paper will argue that much of what physics currently takes for granted about time is not a faithful description of the structure of reality itself, but a convenient projection generated by the limitations of observers embedded inside collapse-driven systems.

1.1 Failure of Classical Time Concepts

Classical time, in the Newtonian sense, is attractive because of its simplicity. It flows uniformly, applies equally to all observers, and merely labels the order of events. Yet this simplicity becomes a liability as soon as one confronts either experiment or the internal architecture of modern theory. What appears intuitive at macroscopic scale turns out to be structurally inadequate at deeper levels.

Three failures of the classical concept of time are especially important.

- First, classical time assumes a single global clock. In Newtonian mechanics, all events in the universe can be labeled by the same parameter t, and widely separated systems can share one notion of "now." Relativity decisively breaks this picture by making simultaneity observer-dependent.
- Second, classical time is absolute but passive. It does not interact with matter or energy; it does not curve, respond, emerge, or reorganize. It simply exists in the background. This stands in tension with the modern physical demand that meaningful quantities should be dynamical or relational rather than merely assumed.
- Third, classical time hides the role of entropy and information. It offers no foundational explanation for why time appears to have a direction, why memory is asymmetric, or why macroscopic processes overwhelmingly unfold from past to future even when the microscopic laws are reversible. The arrow of time is pushed outward into thermodynamics as an add-on rather than integrated into the core ontology.

From the CUWF perspective, these failures share one common source. Classical physics treats time as a primitive object, whereas CUWF treats it as the consequence of how the universe reorganizes its own degrees of freedom through collapse and entropic differentiation.

1.2 The Non-Temporal Foundation of CUWF

CUWF does not begin from spacetime, from a manifold equipped with a metric, or from a Hilbert space evolved by an external time parameter. It begins from a more primitive structure: the global Still Wave and the patterns of disturbance, entropy, and collapse that arise within it.

At the foundational level of CUWF, there is no time-axis. The universe is not "something evolving in time." It is a structured configuration of modes and entropic geometry within which certain processes later generate what observers interpret as time.

In this non-temporal foundation, the basic elements are wave configurations U, disturbance modes δU, collapse events C[U], and an entropic geometry R_E that describes how difficult or easy it is for the universe to move from one configuration to another. Time does not appear at this level as an independent coordinate or parameter. Instead, CUWF tracks how degrees of freedom are reduced, reconfigured, stabilized, or frozen through collapse.

What is ordinarily called time appears only when one examines how collapse events are indexed, ordered, and experienced by particular structured subsystems—brains, measuring devices, organisms, laboratories, stars, or any other domain capable of resolving difference. The key point is simple but radical: CUWF does not need time in order to define what the universe is. Time enters later, as a derived description of how certain parts of the universe interact with entropic gradients and collapse sequences.

1.3 The QM–GR Conflict Rooted in Time

The incompatibility between quantum mechanics and general relativity can be stated in many ways, but one of its deepest roots lies in their incompatible treatment of time itself.

In quantum mechanics, time appears as an external parameter t. The state $|\psi(t)\rangle$ evolves with respect to that parameter, yet time is neither an operator nor an observable, and it does not belong to the state space in the same way that measurable quantities do. In general relativity, by contrast, time is internal to the geometry of the world. It is one coordinate of a curved spacetime manifold, and different worldlines possess different proper times. There is no single universal temporal background shared by all observers.

The clash is therefore not superficial. Quantum theory wants a fixed time parameter in order to formulate dynamics, whereas relativity insists that time is observer-dependent, geometrical, and dynamically entangled with energy and momentum.

Most attempts at unification try to quantize spacetime, geometrize quantum evolution, or otherwise force these incompatible temporal notions into one formal container. CUWF chooses a different route: it removes time from the fundamental ontology altogether.

From the CUWF point of view, the common structure behind both quantum mechanics and general relativity is not time but the organization of degrees of freedom through entropic geometry, collapse, and curvature. The apparent conflict arises because physics has tried to patch together two incompatible time-concepts—external parameter and geometric coordinate—without first questioning whether time should be fundamental at all. Once time is reinterpreted as an emergent measure of entropic evolution and collapse-indexing, QM-like dynamics and GR-like curvature can be understood as different projections of a deeper non-temporal structure.

1.4 Removing Time from the Ontology of the Universe

To remove time from ontology does not mean pretending that time does not exist. It means refusing to treat time as a primitive building block of reality. In CUWF, the basic ontology is instead organized around the Still Wave U_0, disturbance modes δU, collapse events C[U], entropic geometry R_E, and entanglement structures Ξ linking distant domains in statistically constrained but nonlocal ways.

Time is absent from this foundational list. What is conventionally called time emerges only when one selects a domain, follows how its collapse nodes are updated along entropic gradients, and introduces a parameter that summarizes how much reconfiguration has occurred along a path in configuration space.

CUWF therefore introduces an emergent time parameter τ not as an input, but as an output of structural change. In formal terms, the theory later allows relations of the form:

$$d\tau = f(\|\nabla R\_E(x)\|)\, d\lambda$$

Here λ is a path parameter in the space of configurations, while ∇R_E encodes the entropic slope of the landscape. Time is not presupposed. It is extracted from how reality changes its own internal structure.

This shift yields three immediate advantages. It avoids the QM–GR conflict at its root. It provides one entropic language for the arrow of time, time dilation, and the apparent breakdown of time near black holes. And it opens the possibility of a unified explanation of both physical time and psychological time, since both become special cases of how collapse sequences are sampled and stitched by an observer.

1.5 Purpose and Scope of Paper A-7

The central aim of Paper A-7 is therefore clear: to reconstruct the concept of time from the CUWF foundation without assuming time as fundamental, and to show that familiar temporal phenomena can be reinterpreted as emergent properties of entropic geometry and collapse dynamics.

More specifically, the paper will:

- define time in CUWF as a measure of entropic evolution, rather than as a spacetime coordinate or an external parameter;
- introduce a two-scale architecture of time, distinguishing reality-time from observed-time;
- derive the arrow of time from entropy gradients and collapse ordering rather than from any built-in temporal direction in the laws of nature;
- reinterpret causality without temporal sequence, showing cause and effect as co-solutions of the same entropic wave geometry;
- analyze perception and measurement to explain why observers experience a seemingly smooth time-flow despite having access only to discrete collapse frames;
- show how variations in entropic curvature generate phenomena that resemble time speed-up, slowdown, and dilation, including a reinterpretation of gravitational time dilation;
- explain the apparent breakdown of time near black holes using entropic gradients and collapse conditions rather than singular spacetime geometries;
- identify domains where time has no meaningful existence, including pre-collapse superposition regions and entropic stillness states;
- integrate the theory of time with other parts of the CUWF program, including cosmic breathing, causality, gravity, and observer structure.

For many readers, this will require a fundamentally new way of thinking. Instead of asking, “How does the universe evolve in time?”, CUWF asks a different and deeper question:

How does what we call time emerge from the way the universe reduces, reshapes, and entangles its own degrees of freedom?

The sections that follow develop this answer step by step, beginning with the formal definition of time as entropic evolution in CUWF, and then descending into the detailed structure of reality-time, observed-time, causality, perception, and cosmology.