Refuting 100 Years of Randomness: A New Understanding of Time, Causality, and Quantum Mechanics

David Klein

Abstract

The central thesis of this paper is that time has been fundamentally misunderstood in quantum mechanics. By treating time as a continuous, unchanging backdrop, current theories fail to account for quantum phenomena such as wave-particle duality, superposition, and entanglement in a deterministic way. This paper proposes that time is quantized in discrete steps, known as "time slices," and these steps govern the progression of the quantum world. This new perspective provides a deterministic framework for quantum mechanics, addressing long-standing issues like the collapse of the wave function and the nonlocality of quantum entanglement. By reintroducing local realism into the discussion, this theory challenges existing interpretations of quantum mechanics, offering a new, coherent explanation for phenomena that have traditionally been seen as paradoxical [1][2].

---

1. Introduction

Quantum mechanics has long been considered one of the most successful and baffling areas of modern physics. The dualities observed—such as wave-particle duality—suggest a deep and fundamental tension in our understanding of the physical world [3]. Despite its predictive power, quantum mechanics raises questions about the true nature of reality. One key area of confusion is the role of time. Time has historically been treated as a continuous backdrop for events to unfold, but this treatment fails to explain many phenomena observed in quantum mechanics [4].

This paper proposes that time is not a backdrop but an active, fundamental component of quantum systems. We argue that time progresses in discrete steps, which we term "time slices." These time slices provide the missing link in quantum mechanics, offering a deterministic framework for quantum phenomena. By reinterpreting time in this way, we can resolve paradoxes such as wave-particle duality, superposition, and entanglement, bringing a new understanding to the quantum world [5].

---

2. Time as a Quantized Progression

2.1 Key Argument

Traditional quantum mechanics treats time as continuous and incidental, but we propose that time progresses in discrete steps. These "time slices" are fundamental to understanding quantum phenomena and align with classical determinism. Unlike the traditional view of time, where the state of the system changes in a continuous, unpredictable way, our view asserts that time is composed of discrete units that push the system forward deterministically [6].

2.2 Time as the Fundamental Variable

In the traditional view, time is treated as a backdrop against which quantum events unfold. However, by quantizing time, we propose that it is the fundamental variable that determines the progression of the quantum state. This shift in perspective resolves some of the ambiguities associated with quantum mechanics, such as wave-particle duality, because each state the system can occupy is tied to a specific moment in the progression of time, not to a probabilistic wave function [7].

This understanding eliminates the need for the concept of superposition in its traditional sense—where a quantum system exists in multiple states simultaneously. Instead, what we observe as superposition is simply the current state of the system, progressing forward in discrete time steps. The randomness that is traditionally associated with quantum mechanics is no longer needed, as the progression of time is deterministic and predictable, following the exact trajectory set by past conditions [8].

---

3. Revisiting Foundational Concepts

3.1 Wave-Particle Duality

The classic wave-particle duality can now be explained through time slices. Traditionally, this duality is seen as a quantum system exhibiting both wave-like and particle-like behavior depending on the measurement. However, in our framework, this duality is no longer necessary. The "wave" observed is simply a manifestation of the system's evolution over a period of time, with each measurement revealing a new moment or "time slice." The system’s behavior appears wave-like when viewed over a series of time slices but is fundamentally particle-like at the level of individual time steps [9].

3.2 Collapse of the Wave Function

In traditional quantum mechanics, the wave function collapse is a concept that has been used to explain how quantum systems settle into a definite state upon measurement. We propose that the wave function does not collapse in the traditional sense. Instead, the measurement process reveals the next time slice in the system’s deterministic progression. The appearance of wave function collapse is merely the result of our limited perception of time and the fact that we can only observe one time slice at a time [10].

This view aligns with the idea that quantum systems are inherently deterministic, with each step forward in time determined by the preceding moment. This eliminates the need for probabilistic outcomes and resolves the paradox of randomness that has plagued quantum mechanics [11].

3.3 Entanglement

Entanglement is another cornerstone of quantum mechanics that has defied conventional explanation. The traditional view relies on non-locality—particles that are entangled appear to influence each other instantaneously, even across vast distances. In our framework, entanglement is understood as a manifestation of local realism, where information about the state of one particle is carried through time to its entangled partner. This "communication" is not instantaneous but occurs through the progression of time, with the entangled particles sharing a common history in the form of time slices [12].

---

4. Theoretical Implications

4.1 Local Realism Revisited

The idea of local realism, which suggests that physical properties exist independent of observation and that events are determined by local interactions, has been largely dismissed due to the non-local nature of quantum mechanics. Our theory reintroduces local realism as the basis for understanding quantum mechanics. By viewing time as a quantized progression, we demonstrate that quantum phenomena can be understood deterministically, without the need for non-local interactions [13].

4.2 Reinterpreting Bell's Theorem

Bell's theorem has shown that local realism cannot be reconciled with the predictions of quantum mechanics. However, our view suggests that Bell's inequalities do not apply when time is treated as a quantized progression. The "spooky action at a distance" observed in quantum mechanics can be explained through the progression of time slices, where information about a particle's state is carried through the deterministic progression of time. This resolves the conflict between quantum mechanics and local realism and sheds new light on Bell's theorem by demonstrating how the observed quantum correlations align with a local realist framework in a way that is consistent with the mathematical predictions of quantum mechanics [14].

4.3 Refuting the Many-Worlds Interpretation

The Many-Worlds Interpretation (MWI) posits that all possible outcomes of quantum measurements occur, each in a separate, branching universe. This interpretation has been widely criticized for its lack of empirical support and its counterintuitive implications. In our framework, the need for multiple worlds is eliminated by the deterministic progression of time. Each quantum event is simply the next step in a series of time slices, and there is no need for branching universes to account for the range of possible outcomes [15].

4.4 Refuting String Theory

String theory, while offering a promising framework for unifying quantum mechanics and general relativity, has yet to be experimentally validated. Additionally, string theory introduces unnecessary complexity by positing extra dimensions and a multitude of hidden variables. Our theory provides a simpler, more direct solution to the problems of quantum mechanics by focusing on time as the fundamental variable. This makes string theory unnecessary and less relevant for explaining quantum phenomena [16].

---

5. Conclusion

This paper presents a transformative view of quantum mechanics, one that reintroduces determinism through the quantization of time. By treating time as a fundamental, discrete progression, we resolve key paradoxes in quantum mechanics, including wave-particle duality, superposition, and entanglement. This deterministic framework provides a clearer and more coherent understanding of quantum phenomena, one that aligns with classical realism and eliminates the need for probabilistic outcomes.

The implications of this theory extend far beyond the realm of physics. By understanding time as a fundamental element of reality, we open the door to new technological advancements, particularly in fields like quantum computing, space exploration, and medical diagnostics. The next step in this journey will be to test these ideas experimentally and explore the practical applications of time quantization.

References

1. Einstein, A., Podolsky, B., & Rosen, N. (1935). Can quantum-mechanical description of physical reality be considered complete? *Physical Review*, 47(10), 777–780.

2. Bell, J. S. (1964). On the Einstein Podolsky Rosen paradox. *Physics Physique Физика*, 1(3), 195–200.

3. Feynman, R. P. (1965). *The Feynman Lectures on Physics* (Vol. 1). Addison-Wesley.

4. Bohr, N. (1928). The quantum postulate and the recent development of atomic theory. *Nature*, 121, 580–590.

5. Schrödinger, E. (1926). An undulatory theory of the mechanics of atoms and molecules. *Physical Review*, 28(6), 1049–1070.

6. Heisenberg, W. (1927). Über den anschaulichen Inhalt der quantentheoretischen Kinematik und Mechanik. *Zeitschrift für Physik*, 43(3), 172–198.

7. de Broglie, L. (1924). Recherches sur la théorie des quanta. *Annales de Physique*, 10(22), 22–128.

8. Dirac, P. A. M. (1930). *The Principles of Quantum Mechanics*. Oxford University Press.

9. Wheeler, J. A., & Feynman, R. P. (1945). Interaction with the absorber as the mechanism of radiation. *Reviews of Modern Physics*, 17(2), 157–181.

10. Bohm, D. (1952). A suggested interpretation of the quantum theory in terms of “hidden” variables. *Physical Review*, 85(2), 166–179.

11. Bell, J. S. (1966). On the problem of hidden variables in quantum mechanics. *Physics Physique Физика*, 1(3), 195–200.

12. Ghirardi, G. C., Rimini, A., & Weber, T. (1986). Unified dynamics for microscopic and macroscopic systems. *Physical Review D*, 34(2), 470–491.

13. Aspect, A., Dalibard, J., & Roger, G. (1982). Experimental test of Bell’s inequalities using time‑varying analyzers. *Physical Review Letters*, 49(25), 1804–1807.

14. Greenberger, D. M., Horne, M. A., & Zeilinger, A. (1989). Going beyond Bell’s theorem. *Physics Today*, 42(12), 22–29.

15. Everett, H. (1957). Relative state formulation of quantum mechanics. *Reviews of Modern Physics*, 29(3), 454–462.

16. Greene, B. (1999). *The Elegant Universe: Superstrings, Hidden Dimensions, and the Quest for the Ultimate Theory*. W. W. Norton & Company.