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Expanding Research Paradigms and Reconciling the Two Binary Oppositions: Exploring the Unified Path of Relativity and Quantum Mechanics

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Abstract

By expanding the research paradigm and reconciling the two binary oppositions of "relative and absolute" and "quantum and classical" in physics, a new theoretical framework that is compatible with relativity and quantum mechanics is proposed. Firstly, excavate and establish three universal axioms: Axiom 1 (consensus guarantees equal rights), Axiom 2 (objective existence independent of measurement), and Axiom 3 (universality of causality and dialectical logic), based on which to criticize the logical contradictions of existing theories. In the field of relativity, this article points out that there is a logical paradox in the explanation of "clock slowing down depends on relative motion" in special relativity (A clock is both faster and slower than B clock), and proposes a relative absolute spacetime view that "absolute motion leads to clock slowing down". By extending the Lorentz transformation, absolute motion and relative motion are unified, solving problems such as the twin paradox. At the same time, based on the prediction of the Dirac equation for negative mass matter, the "negative mass spacetime curvature paradox" is proposed, challenging Einstein's physical explanation of spacetime curvature and arguing that it is only a mathematical tool (the mathematical expression of gravity) rather than a physical reality. In the field of quantum mechanics, this article criticizes the Copenhagen interpretation for violating Axiom 2 (denying the independent eigenstates of microscopic particles). By modifying the Schrödinger equation twice (For the first time, electromagnetic potential energy was replaced with gravitational potential energy, and the Schrödinger-Tu equation was established to describe macroscopic objects such as the Earth's revolution; The second step is to convert potential energy into electromagnetic/gravitational force and derive the wave mechanics equation of classical mechanics laws, such as Newton's second law with force operator), proves that quantum and classical theories are compatible within the same mathematical framework. In the experiment, it was demonstrated through the "anti-interference electron diffraction experiment" that a strong magnetic field only changes the shape of diffraction fringes without causing them to disappear, denying the inevitability of quantum decoherence. The establishment of "generalized wave dynamics" and "relative absolute spacetime view" breaks the binary opposition of traditional theories and provides a new paradigm for the unity of relativity and quantum mechanics. The core value of these jobs lies in: In terms of theoretical innovation, reconstruct the space-time and quantum interpretation system, while retaining the original mathematical form system; In terms of experimental verification, design feasible schemes such as hollow glass disk Jones experiment and geometric optical velocimetry experiment; In terms of philosophical significance, replacing "mathematical symmetry" with "content unity" and returning to the objectivity of physical mechanisms. The research conclusion indicates that by expanding paradigms and axiomatic constraints, the contradiction between relativity and quantum mechanics can be transformed into a complementary relationship, laying the foundation for the great unity of physics theory.

Keywords: Relative Absolute View of Time and Space, Quantum Classical Compatibility, Axiomatic System, Negative Mass Paradox, Generalized Wave Mechanics

1. Introduction

When we expand our perspective, even conflicts between siblings cease to be irreconcilable. The same applies to seemingly opposing concepts like relativity and absoluteness, quantum mechanics and classical physics—they are not binary opposites but complementary frameworks. With the right qualitative and quantitative approaches, we can bridge the divides between these once mutually exclusive ideas.

Relativity, however, overlooks the physical mechanisms underlying the evolution of objects, relying instead on mathematics as its foundational framework. It treats "relativity" and "absoluteness" as rigid opposites, and the principle of special relativity explicitly rejects the possibility of observers in different inertial frames reaching consensus through communication. This implies that observers in relative motion hold equally valid (yet contradictory) views of the same event. Herein lies a logical paradox: while relativity asserts the equivalence of all inertial frames, it cannot resolve the contradiction that each observer considers their own perspective true and the other's false. For example, when observer A and observer B measure each other's clocks, both conclude that the other's clock is slower—a clear logical inconsistency.

The Dirac equation predicts the existence of negative mass and negative energy matter. If such matter exists, Newton's law of gravity dictates that positive and negative mass would repel each other. This would mean the spacetime curvature outside a positive-mass black hole is not absolute: for a positive-mass test object, spacetime curves inward along the Schwarzschild radius; for a negative-mass object, it curves outward. Using both types of test objects simultaneously would make it impossible to determine a single direction of curvature, even though both attraction and repulsion clearly occur. This breaks the core link between gravity and spacetime curvature proposed by general relativity—a problem that also plagues electromagnetic interactions, as not all objects experience the same acceleration in a gravitational field.

General relativity claims to subsume Newtonian gravity as an approximation, but the predicted repulsion between positive and negative mass cannot be ignored. This creates what we might call the "Negative Mass Spacetime Curvature Paradox (NMSCP)": the existence of negative energy solutions in quantum mechanics undermines the foundational assumption of general relativity that mass curves spacetime. Einstein's field equations, which describe gravity and electromagnetism, face the same contradiction.

This paradox suggests that the spacetime curvature described by general relativity may be nothing more than a mathematical tool for modeling gravitational interactions, rather than a literal description of physical reality. To uphold the idea that Newtonian gravity is an approximation of general relativity, we must modify Einstein's field equations—for instance, introducing a sign factor β (where $\beta = \pm 1$) to account for the mass sign of the object experiencing gravity. Alternatively, we could modify Newtonian gravity itself, such as adding a correction term to the gravitational constant G that scales with mass, to better align it with relativistic predictions in high-mass scenarios.

Macroscopic objects are composed of microscopic particles, and all such objects—with the exception of special substances like radioactive materials—function as harmonious, integrated entities. In reality, objects embody the harmony and unity of the macroscopic and microscopic worlds, and their formation, stability, and transformation inevitably adhere to objective scientific laws, particularly those of physics. This inherent macro-micro harmony within objects must correspond to a theoretical harmony between quantum and classical mechanics; otherwise, a rift would emerge between theory and empirical reality.

Orthodox theoretical physicists have attempted to explain this apparent rift by positing that quantum decoherence occurs when microscopic particles aggregate into macroscopic objects. However, this explanation appears to be little more than a post-hoc justification, and the theory of quantum decoherence itself resembles a makeshift theoretical patch. Two key flaws undermine its validity: first, even if quantum decoherence were a real process, it would be discontinuous, making it impossible to directly verify through experimental methods; second, the theory is not logically derived from the mathematical framework of quantum mechanics, rendering it an incongruous addition—analogous to an allogeneic skin graft that fails to integrate with the host system.

My contributions to quantum mechanics research are documented in over 20 academic papers and publications, all centered on the goal of establishing a localized realist quantum mechanics system that reconciles quantum and classical mechanics [1-15]. This body of work includes the English monograph Quantum Mechanics: Return to Local Realism, published by Cambridge Scholar Press. The book critiques the Copenhagen interpretation, provides computational examples of localized realist quantum mechanics in practice, and lays the preliminary groundwork for a cohesive localized realist framework [16].

Unfortunately, the scientific community remains overly reliant on the conclusions of Aspect-style experiments, dismissing or rejecting any theories that seek compatibility between quantum and classical mechanics. In the years following the publication of my book, my research has focused specifically on bridging these two theoretical domains. Over the past two to three years, I have achieved a significant breakthrough: the formulation of a "wave mechanics equation of classical mechanics laws" that seamlessly integrates quantum and classical principles. This achievement strengthens the logical coherence and persuasive power of my arguments by providing concrete, consolidated evidence for their compatibility.

I have also validated these theoretical advancements through experimentation: the anti-interference electron diffraction experiment. Contrary to the Copenhagen interpretation's claim that even minor external disturbances can eliminate diffraction fringes, my results demonstrate that a strong magnetic field merely deforms—rather than erases—these fringes. A comprehensive summary of my quantum mechanics research can be found in reference [1].

The author challenges the theory of relativity on multiple fronts. Philosophically, the assertion that the speed of light is constant under all conditions contradicts dialectical thinking, which holds that change and constancy are conditional rather than absolute. Logically, speed is inherently a relative quantity, making it paradoxical for light's speed to remain unchanged regardless of reference frame. Mathematically, the Lorentz transformation appears to override the fundamental rule of vector composition—a compromise that defies mathematical consistency. These observations lead to a critical question: Should established philosophical and mathematical principles be subordinated to special relativity?

The author's critiques of relativity are elaborated in published papers [17,18], with Sections 3 and 4 of this article providing deeper analysis. Building on three axioms introduced in Section 2, the author further argues that both relativity and quantum mechanics fail to align with these foundational principles, proposing new perspectives and research paradigms as alternatives.

Beyond relativity, the author has reshaped quantum mechanics through two pivotal revisions to the Schrödinger equation between 2002 and 2026. First, electromagnetic interaction potential was replaced with Newtonian gravitational potential [1–16], yielding a wave mechanics framework applicable to macroscopic objects. Second, potential energy itself was replaced with force (electromagnetic or gravitational, derived from $F=\frac{dV}{dr}$), unifying quantum theory with classical mechanics [19,20]. These breakthroughs eliminate the historical divide between quantum and classical physics, a feat that AI—free from bias—has deemed of profound academic significance.

Tragically, these innovations have been repeatedly rejected by elite journals. While the author has secured priority discovery rights through publications in legally qualified lower-tier journals, the silence from prestigious venues remains a source of frustration. The author attributes this resistance to systemic inertia: unlike Schrödinger's era, when the Copenhagen interpretation had no entrenched institutional support, modern physics is populated by many whose professional identity and status depend upholding orthodox theories. This raises a pressing question: Does protecting the status quo serve the progress of physics, or does it stifle transformative innovation?

One can only speculate how physics might have evolved if Schrödinger had replaced electromagnetic potential with gravitational potential, or redefined potential in terms of force. Such steps would likely have prevented the dominance of the Copenhagen interpretation, as there were few vested interests in its defense at the time. Similarly, had Einstein pursued these revisions, his century-long debate with Bohr might have reached a very different conclusion. Today, however, the heavy investment in maintaining orthodoxy creates formidable barriers to reimagining physics—barriers that demand urgent examination.

2. The Origins of Theoretical Divergences in Relativity and Quantum Mechanics, and the Premises of This Article

Both relativity and quantum mechanics have achieved remarkable success in their mathematical formalisms, yet their theoretical interpretations have strayed into conceptual misconception. Relativity attributes observed phenomena to the core claim that "all motion effects are determined by relative motion"; in general relativity, the Einstein tensor G_μvis interpreted as a manifestation of spacetime curvature—an explanation that ties spatiotemporal changes directly to mathematical outcomes. What was once unrecognized is that these interpretations form an explanatory system distinct from the mathematical framework of relativity itself.

The principle of relativity, at its core, asserts only the equivalence of different inertial frames—not that "motion effects are caused by relative velocity." This distinction allows us to revise relativity's explanatory system without rejecting its mathematical foundations. This article proposes an alternative interpretation of relativity, one that moves beyond the dominance of relative motion while preserving its mathematical structure. Key revisions include framing time dilation as a consequence of absolute motion (rather than "time expanding due to motion") and describing object contraction as occurring uniformly in all directions due to absolute motion (instead of "space contracting due to motion"). This reframing yields a more coherent theoretical structure with far fewer logical contradictions.

The explanatory systems of both relativity and quantum mechanics are rooted in foundational errors. Relativity's interpretive flaws trace back to the misinterpretation of the Michelson-Morley (MM) experiment, which laid the groundwork for the principle of relativity. Quantum mechanics, meanwhile, suffers from a flawed philosophical commitment: the denial of the primordial, independent existence of microscopic particles unconnected to measurement (DPEIE). The Copenhagen interpretation of the Aspect experiments and the DPEIE principle are trapped in a logical loop: the former relies on DPEIE for its validity, while DPEIE itself depends on the Aspect experiments for empirical justification. Moreover, DPEIE directly violates Axiom 2 (detailed below), exposing its shaky theoretical and experimental footing.

Nature and society share three fundamental axioms that underpin all rational inquiry: Axiom 1: The equal rights of distinct entities are upheld by the possibility of mutual communication between them. Axiom 2: All real entities possess an objective, independent intrinsic state of existence. Objective existence thus requires two core attributes: independence from external interference and stability throughout its lifespan (manifested as its eigenstate). Phenomena that arise solely from measurement (and change as a result of measurement) can at best be regarded as "intermediate states" between two objective existences, for even such measured phenomena imply the prior existence of an unmeasured, intrinsic state. Axiom 3: Causal relationships and dialectical reasoning are universally consistent. Probabilistic events are merely statistical summaries of systems where causal pathways are overly complex or influenced by a multitude of variables.

The founders and proponents of relativity and quantum mechanics failed to recognize these axioms at the inception of their theories. For some, this oversight stemmed from limited comprehension or knowledge, leading them to cling to DPEIE and the principle of relativity. This adherence entrenched false dichotomies: between quantum and classical mechanics, and between relative and absolute frames of reference—dichotomies that obscure the deeper unity governed by the three axioms.

Based on Axiom 1, recognizing the equivalence or equality of distinct inertial frames necessitates enabling observers in different frames to communicate and reach a consensus. Consider two inertial frames, A and B, moving relative to one another. Each frame is equipped with an observer and a clock: in the stationary frame A, there are Observer A and Clock A; in the stationary frame B, Observer B and Clock B. When analyzing their relative motion, Observer A observes that Clock B runs slower than Clock A, while Observer B perceives Clock A as slower than Clock B.

In this scenario, no fundamental consensus exists between A and B regarding the relative speed of the clocks. The mutual belief that the other's clock is slower is not a logical, foundational consensus but rather a superficial compromise riddled with contradiction. A logical paradox emerges here: Clock A cannot be both slower and faster than Clock B, just as Clock B cannot be both slower and faster than Clock A. The principle that "the laws of physics take the same form in all inertial frames" denotes formal symmetry, which at best signifies equality in form but fails to resolve the aforementioned logical contradiction. Thus, the relativity principle's assertion of equality across inertial frames is an illusory, logically inconsistent form of equality.

The Copenhagen interpretation of quantum mechanics violates Axioms 2 and 3. Consequently, quantum phenomena such as entangled states, superposition states, and the collapse of superposition states (including wave packet reduction and wave function collapse)—all of which contravene Axiom 2—are inherently flawed. Moreover, quantum probability lacks a valid origin within the mathematical framework of quantum mechanics, a point echoed by scholars like Weinberg, who have noted the absence of a rational basis for quantum probability.

Yet, for researchers with a sufficiently broad perspective, adhering to Axioms 1, 2, and 3 is far from an insurmountable task. By doing so, they can leverage independent creativity to develop new theoretical frameworks that resolve these contradictions. The author of this text has strictly followed these three axioms, prioritizing the reconciliation of seemingly opposing concepts: relativity and absoluteness, quantum theory and classical theory.

To achieve compatibility between relativity and absoluteness, the author proposes the concept of "absolute motion-induced time dilation." For the unification of quantum mechanics and classical mechanics, two key equations have been established: the Schrödinger-Tu equation, which can accurately describe the motion of macroscopic objects such as Earth's orbital revolution, and a wave mechanics equation grounded in classical mechanical principles. Notably, quantum mechanics and classical mechanics can now be applied simultaneously to solve identical computational and practical problems. The coexistence of mathematical elements from both theories within the same equation directly demonstrates the compatibility of quantum and classical frameworks.

Aristotle once concluded that "heavy objects fall faster than light ones." Let us analyze this claim using the thought experiment of connecting a small ball and a large ball to form a combined double-ball system, then dropping it from the Leaning Tower of Pisa. According to Aristotle's theory, the slower-falling small ball would exert an upward pull on the large ball, causing the combined system to fall slower than the large ball alone. However, the combined double ball constitutes a larger object—and since all large objects are composed of smaller components, this fact is undeniable. By Aristotle's logic, the larger combined object should fall faster than the original large ball. This gives rise to a paradox: the combined double ball must fall both slower and faster than the large ball alone. This contradiction is known as the "Leaning Tower Double-Ball Falling Velocity Paradox," analogous to the PNMSB mentioned in the introduction.

In Aristotle's era, this paradox awakened Galileo, whose insights subsequently galvanized the academic community. Today, if the PNMSB fails to rouse physics researchers and enthusiasts alike, it will be a profound tragedy for the field of physics.

Having solved his eponymous equation, Paul Dirac derived a solution describing electrons with negative energy, leading him to predict the existence of such particles. This prediction inherently implies the existence of negative-mass electrons, and the reasoning is as follows: The total energy of a particle is defined by the relationship between the square of its mass and the fourth power of the speed of light. Since the speed of light is a scalar constant with no directional component, its value cannot be negative. This leaves only the mass term with two possible sign configurations—positive or negative.

Experimental evidence supports this line of thinking: when positive-mass particles annihilate, they release substantial positive energy. By extension, the annihilation of negative-mass antiparticles should emit negative energy. Critically, we cannot dismiss the possibility that the mass term in the total energy equation could be negative. The alternative scenario—where energy is negative but mass remains positive—defies the foundational logic of mass-energy equivalence. The author argues that mass and energy are inherently linked in their sign: the equation $E=mc^2$ from the mass-energy equivalence principle maintains consistent sign relationships. In simpler terms, the mass-energy connection clearly demonstrates that mass and energy must share the same sign. Since the square of the speed of light is always non-negative, negative total energy can only occur if the mass term is negative.

This leads to a profound contradiction with general relativity. According to the equivalence principle, a cornerstone of Einstein's theory, all objects must exhibit identical acceleration when falling in the same gravitational field. Newton's law of universal gravitation, $F = -\frac{GMm}{r^2}$, further amplifies this conflict: if object A has positive mass M and object B has negative mass m, the interaction force F becomes positive. In this formulation, negative F indicates mutual attraction, while positive F signifies repulsion. When a positive-energy electron and a negative-energy electron are released above a massive object M, they would accelerate in opposite directions, directly violating the equivalence principle.

If negative-mass electrons exist, the theoretical foundation of general relativity collapses. Gravitational interactions would resemble electromagnetic forces, making the geometricization of gravity—Einstein's core insight—impossible. Spacetime curvature would become relative, bending downward for positive-energy test particles and upward for negative-energy ones. In this case, Einstein's description of mass causing spacetime curvature would reduce to a mere mathematical analogy, applicable only to interactions between positive-mass objects.

It is therefore inescapable: Dirac's prediction of negative-energy electrons represents a fundamental challenge to general relativity, striking at the very origins of the theory.

3. A Review of Research on Relativity: Constructing a Relative-Absolute Spacetime View

This paper constructs a relative-absolute spacetime view from the perspectives of logical foundation, experimental verification, and paradigm innovation. It critically reconstructs traditional spacetime concepts, proposes a fusion paradigm, and provides an operational experimental verification scheme, thereby offering important new directions and a reference framework for spacetime theory research. Through in-depth exploration of physical mechanisms, this work is poised to drive significant advancements in physics.

3.1. Research Process and Findings

Scholars Zhenyong Liu and Yingjie Li co-authored the academic work The Theory of Relative Absolute Theory [21], which strongly advocates for a relative-absolute spacetime view. In this book, Li proposes that the speed of light embodies the unity of change and constancy, arguing that a "variable speed of light" exists in the universe. He further explores the core idea that the relative-absolute law serves as the fundamental principle of dialectical materialism [22].

From 1996 to 1997, the author of this paper published three articles on absolute relativity theory in the Journal of Ningxia Institute of Technology and Journal of Xiangtan University: Relative Absolute Theory, Authentic Relative Absolute Theory, and Formal Time and Time Difficulties in Absolute Static Systems [23-25]. The core argument is that relativistic effects are determined by absolute velocity rather than relative velocity. The authentic relative-absolute theory integrates the valid achievements of both Newtonian and Einsteinian theories, recognizing relativity and absoluteness as interdependent contradictions.

Building on the premise that "absolute energy increases with absolute motion, and Lorentz transformations apply between absolute stationary frames and arbitrary inertial frames," the author transforms the relative spacetime view into a relative-absolute spacetime view. A new relativistic effect coefficient γ, incorporating both phase velocity and absolute velocity, is derived to achieve qualitative and quantitative coherence between relativity and absoluteness [20].

Liu's 2007 work applies the new spacetime theory to analyze the famous Fizeau flow experiment, achieving complete consistency with experimental results. To resolve long-standing conceptual ambiguities, the book concludes with a feasible experimental proposal for detecting absolute stationary space, aimed at verifying the existence of an absolute stationary system.

Fengyin Mao published The Theory of Absolute and Relative Unity in the Journal of Luoyang Normal University [26]. By analyzing limitations in special relativity, Mao proposes alternative foundational hypotheses and a new definition of time, establishing the "theory of absolute-relative unity." This theory posits that motion relative to an absolute stationary frame produces real physical effects, resolving paradoxes such as the twin paradox in special relativity and logical inconsistencies in inertial frame definitions.

These scholars collectively recognize the relative-absolute spacetime view and its associated theory as an emerging theoretical trend. In 2025, the author of this paper published Energy Balance Displacement Principle and Relative Absolute Spatiotemporal Viewpoint in Advances in Theoretical & Computational Physics [7], introducing preliminary applications of the relative-absolute spacetime view based on the proposition that "spacetime changes due to absolute motion." Case studies demonstrate that compared to the relative spacetime view, the relative-absolute framework exhibits fewer contradictions and greater practicality, positioning the former as an approximation of the latter. Based on the relative-absolute spacetime theory and the newly derived relativistic effect coefficient γ (a function of absolute velocity), the author predicts that Earth's absolute velocity ranges between 0.0005c and 0.002c [17,18]. In 2026, the author released a preprint detailing further advancements [27].

A key contradiction in special relativity lies in its inconsistent treatment of inertial frames: while advocating equal rights for all inertial frames, it restricts observers in each frame to dismissing the validity of observations made by observers in other frames. Special relativity rejects consensus among observers in different motion states regarding motion-induced spacetime changes, only acknowledging agreement on the form of physical laws. In other words, the equality of inertial frames in special relativity is conditional and limited.

A critical question arises: can this "inequality" be used to distinguish different inertial frames? Consider n inertial frames $K_1,K_2,K_3,\ldots,K_n$, each containing an observer observing the same clock. The resulting variations in measured clock speed directly reflect differences between these inertial frames, providing a basis for their differentiation.

In special relativity, the twin paradox persists as a foundational conceptual challenge. The orthodox resolution of this paradox rejects the equivalence of the two brothers' observational perspectives, ultimately concluding that their frames cannot remain symmetric. From a fundamental logical standpoint, this violates the principle of equal rights for all inertial frames in special relativity—a direct contradiction of its core axiom (Axiom 1). For supporting details, please refer to Supplementary Material A. The following exposition further illustrates how relativity implicitly acknowledges the existence of privileged inertial frames.

For any first-person observer (including researchers, authors, or readers), special relativity recognizes only one absolute "stationary" frame—a privileged inertial frame. From this observer's perspective, all other inertial frames are merely systems in motion relative to their own, and none are granted the same privileged status as their frame of reference. Unlike Newton's fixed absolute frame, the privileged "stationary" frame in relativity is not static but observer-dependent: it shifts dynamically to align with whichever inertial frame the first-person observer occupies.

Moreover, the inertial frame associated with a moving object is bounded. Relativity holds that motion alters spacetime metrics, and these altered metrics in turn distort measurements of the underlying invariant spacetime. Even accepting that motion modifies a system's local spacetime, relativity thus implicitly permits the existence of an absolutely invariant, universal spacetime. This conclusion is reinforced by two distinct lines of reasoning.

The spacetime framework of special relativity is inherently fragmented, with each inertial frame operating under its own independent spacetime perspective. Observers in every inertial frame instinctively regard their system as uniquely privileged—implicitly equating it to an absolutely stationary frame—and reject the possibility of communicating with observers in other frames to reach a unified understanding, save for acknowledging the universal form of physical laws. From this standpoint, claims that relativity completely overturned Newton's absolute spacetime are misleading. Instead of dismantling absolute spacetime, relativity merely redistributes its attributes across different inertial frames, treating each frame's local spacetime as the de facto absolute. This leads observers in every frame to perceive themselves as the authoritative reference, dismissing measurements from other frames as subordinate. The supposed rejection of Newtonian absolute spacetime is thus not a scientific refutation, but a consequence of isolating inertial frames and denying the democratic principle of equal observational validity.

This framework fundamentally negates the equality of inertial frames. In human society, autocracy is synonymous with inequality—does this principle not apply to science? Special relativity allows observers in different frames to cling to their own measurements, refusing to recognize that observations from all inertial frames hold equal scientific weight. While relativity cites mechanical laws as examples of covariance under Lorentz transformations, it extends this claim to all physical laws. However, experimental evidence presented in the paper Construction of a Relative-Absolute Spacetime Perspective: Logical Foundations, Experimental Verification, and Paradigm Innovation challenges this: geometric optics, specifically the law of refraction, does not maintain form invariance across different inertial frames [19].

Gravitational and electromagnetic fields are tangible physical realities—they possess energy, potential, discernible sources, occupy space, and interact across distances. In contrast, the spacetime metric in relativity is a subjective construct. Even its mathematical representation, the metric tensor, does not derive from physical reality but is arbitrarily mapped to it. This subjectivity is evident in how spacetime is measured. Take special relativity, for instance: the reading of a clock moving within a frame does not reflect the frame's actual time; rather, the ticking of a stationary clock represents the clock's operational rhythm, which mirrors the rate of time passage in that frame. Crucially, the rate of time passage is not the same as time itself. Similarly, the contraction of a moving ruler does not imply the contraction of space, but rather a reduction in the ruler's physical volume due to motion—volume and space are not interchangeable concepts.

The spacetime metric of special relativity is derived from Einstein's clock-calibration procedure. A key outcome of this method is that the spacetime metric used for measurements varies with the observer's state of motion. Even if the underlying spacetime in which an object moves remains fixed, the spacetime values measured with dynamically adjusted clocks and rulers will change—this is the origin of the relativity of spacetime, or the notion that "spacetime changes due to motion" in relativistic theory.

One of the most direct consequences of Einstein's clock-calibration method is the relativity of simultaneity for spatially separated events. For example, when measuring the distance between points A and B on a moving train, it becomes unnecessary to determine the coordinate difference between the two points simultaneously. Instead, the measurement captures the distance between A and B after B has moved a certain distance toward A, deviating from the static distance between the two points.

This reveals that Einstein's clock-calibration approach imposes inherent constraints on spacetime measurement techniques. Definitions of this nature inherently involve subjective elements, and Einstein's method amplifies this subjectivity through an unsubstantiated assumption: that the vacuum inside a moving carriage exerts a different drag effect on photons than the vacuum outside. While the clock-calibration method offers certain symmetry advantages, symmetry does not equate to rationality—the "most symmetrical" framework is not necessarily the most logically consistent or practically applicable.

Furthermore, the assumption that "a vacuum in uniformly moving flat space can fully drag photons" contradicts empirical evidence, as demonstrated by the Jones experiment. The relativistic conclusion that "spacetime possesses relativity," based on the spacetime metric established by Einstein's method, thus cannot be fully separated from subjective factors. Even if some argue that validity hinges on alignment with experimental results, the Jones experiment directly undermines any such claimed consistency.

According to Einstein's clock synchronization method, when an observer alters their state of motion, the spacetime metric they employ also shifts. The constancy of the speed of light—meaning light's velocity is independent of the observer's motion—implies that any apparent change in light speed is exactly offset by adjustments to the spacetime rules governing their measurements, a relationship quantitatively defined by the Lorentz transformation.

In reality, the speed of light is only independent of the motion state of its source. Like all waves, light propagates independently of its emitter's movement; however, this does not extend to the observer's motion.

Crucially, the physical space through which the observer moves remains invariant. What changes is the scale of the measurement framework they use, which in turn alters the measured values of spatial dimensions. This mirrors a fundamental principle: if an entity A is inherently unchanged, modifying the metric used to measure A will produce a different measured value B. In the case of light speed constancy, the shift in the measurement metric perfectly offsets any apparent change in light's velocity, resulting in a consistent measured value.

This reframes the common claim that "motion alters spacetime": rather than spacetime itself being mutable, time and space are absolute and invariant. What changes is the metric observers use to quantify them, leading to variations in measured spacetime values. From a relativistic perspective, this interpretation is logically consistent and cannot be ruled out. In short, the relativity of measured spacetime values does not negate the existence of absolute spacetime—a fixed, unchanging framework with constant spatial properties and a uniform passage of time. If absolute spacetime exists, observers moving within it would employ metrics distorted by their absolute motion, and their measurements of spacetime would consequently vary with those metrics.

The theoretical framework of relativity does not explicitly articulate a method for delineating system boundaries. In the following discussion, we will systematically examine the boundary problem of inertial reference frames.

A moving clock's slowed ticking does not imply time dilation within the clock's reference frame—it merely indicates a shift in the clock's mechanical operation. Similarly, a moving ruler's contraction does not signify that space itself has contracted due to motion; it only means the spatial footprint of the ruler's constituent materials has diminished. When a ruler moves through space, altering the space it occupies does not equate to altering any space external to the ruler. Likewise, a clock's slowed ticking cannot change the rate of time passage at any point in space beyond the clock itself.

In this light, the principle of relativity does not negate the possibility of absolute spacetime—it merely refrains from positing it as a foundational assumption. Objects like clocks and rulers interact with absolute spacetime, but their motion only modifies their own properties: a clock's timing mechanism and a ruler's physical volume. They cannot alter the universal rate of time passage or the extent of space outside their own boundaries.

Stated differently, accepting the empirical phenomena of moving clock slowdown and ruler contraction does not logically preclude the existence of absolute spacetime. Special relativity erroneously conflates clock readings with time itself, and ruler-based measurements with space itself. It is critical to recognize that a change in measured spatial dimensions does not inherently reflect a change in space itself—such discrepancies can also arise from alterations in the measuring instrument (i.e., the ruler).

To summarize: if relativity is to be categorized as a spacetime theory, it is more precisely described as a theory of spacetime measurement, rather than a theory of spacetime's fundamental nature.

Can a moving clock traverse an infinite expanse of space? Can a clock within a galaxy move in lockstep with the galaxy itself? The answer is a definitive no. At best, it can only be said to move alongside a hypothetical spacetime stripped of all physical matter. Yet eliminating all physical objects from the entire galaxy is impossible—the comoving coordinate system exists only as a conceptual construct. Thus, a spacetime devoid of all physical substance remains confined to the realm of theory and abstraction.

The "motion" of spacetime refers solely to shifts in its mathematical coordinate framework; there is no physical reality to a "moving spacetime." If we prioritize the integration of theory and practice, we must establish clear boundary rules for systems involving real, moving objects. If every inertially moving object were accompanied by its own infinite space, the only "real" space would be a chaotic superposition of countless spaces in distinct states of motion, with each infinite space jostling unpredictably within this composite.

To put it plainly: How does spacetime move, and specifically, how does it accelerate? Relativity offers no concrete answer—

textbooks only describe the motion of the spacetime coordinate framework, a subjective, mathematical construct rather than a physical phenomenon. Associating an infinite volume with the inertial frame of a moving object gives rise to insurmountable problems: Spacetimes linked to inertial frames in different states of motion would overlap completely, making them indistinguishable.

Any two inertial frames moving relative to one another would carry with them two overlapping infinite spaces in relative motion—a scenario that defies physical intuition, as non-material spacetimes cannot meaningfully interact.When an object in inertial motion changes its state of motion, there is no physical mechanism to account for the supposed infinite space tied to it. Accelerating a real object and then ceasing acceleration creates inertial motion, but this cannot logically extend to creating an infinite moving spacetime.

In the real universe, the fundamental reference systems are the "Total Galaxy (TG)" grid and the grid formed by the paths of cosmic background radiation (CBR) photons. These two physical systems overlap, forming what we can call the TG-CBR framework. All physical motion—including that of objects in laboratory-created vacuums—occurs within this TG-CBR space. Objects cannot move in tandem with the TG-CBR space itself.

This leads to an unavoidable conclusion: The space associated with a moving object cannot be infinite. The most logical boundary for such a space is the outer surface of the object itself.

Relativity has never explicitly formulated a method for delineating spacetime boundaries within an inertial frame. Instead, it posits that the spacetime volume of any inertial frame is infinite and unbounded—a foundational assumption invoked when applying relativistic principles to physical problems. This framing is essential to ensuring the equivalence of distinct inertial frames: without it, distinguishing frames based solely on the distance or scale of their boundaries would undermine the equivalence (and equality) between them, while also failing to address the three previously noted issues. Notably, this approach to defining inertial frame boundaries aligns with the relative absolute spacetime view, where the boundary of a moving object's operational space corresponds to the outer surface of its effective physical entity [27].

The inevitability of a grand unification of physical theories has long been recognized, with countless efforts dedicated to this goal. Yet, the "grand unification of interaction theories" remains mired in the challenge of reconciling gravity and electromagnetism. This article argues that whether the four fundamental interactions can be unified has little bearing on their practical application. By contrast, the following form of unification will profoundly impact both theoretical frameworks and real-world utility: before achieving a grand unification of quantum mechanics and gravity, it is necessary to first complete a "mini-unification" (fusion) of quantum and classical principles, as well as relative and absolute spacetime concepts.

Historically, research has been constrained by a binary oppositional paradigm that pits quantum against classical, and relative against absolute—a narrow framework that limits conceptual thinking and cognitive scope. Expanding this paradigm will inevitably lead to the acceptance of ideas that embrace and transcend these dualities. This article breaks through two such binary oppositions: the divide between the classical absolute spacetime view and the relativistic relative spacetime view [19,20], and the conflict between quantum and classical theories [8]. In doing so, it aligns with the dialectical laws of human cognition: the spiral progression from absolute to relative to relative-absolute, and from classical to quantum to classical-quantum fusion.

Using rigorous mathematical methods, this work demonstrates and interprets relativity as a second-order approximation of the "relative absolute theory"—a valid formulation when relative velocity is either far greater or far smaller than absolute velocity. Newton's absolute spacetime theory, meanwhile, is shown to be a first-order approximation of this relative absolute framework. These arguments confirm that establishing relativity absolutism represents a progressive evolution of classical mechanics, rather than a regression to pre-relativistic absolute spacetime views. They also explain why "numerous experiments confirm the predictions of relativity, while high-energy physics experiments equally validate the predictions of relativity absolutism."

We find that the hollow glass disk Jones experiment and the geometric optical velocity measurement experiment offer greater precision than the Michelson-Morley experiment in verifying the existence of an absolute stationary system. Building on both relativistic and absolutist theories, we predict that repeating the Michelson-Morley experiment in a space station could yield non-zero results—an outcome achievable by continuously altering the instrument's orientation. At altitudes exceeding one million meters, the Earth's surface gravitational field exerts significantly reduced isotropic traction on light, creating optimal conditions for detecting deviations from the experiment's traditional null result.

- **Reframing Relativity and Quantum Mechanics**
  To transform relativity, we need only apply rigorous logical methods to replace the function of relative motion with that of absolute motion. Importantly, relativity's existing mathematical formalisms can serve as tools for verifying this "relativity-absolutism" synthesis. For quantum mechanics, the path forward lies in rejecting the foundational premise of "denying objective existence" and reconstructing the theory's interpretive framework from the ground up. In short, as the scope of scientific inquiry expands, seemingly irreconcilable contradictions often dissolve into unified, more comprehensive explanations.

- **Rethinking the Evolution of Scientific Theories**
  Most scholars assume that new scientific theories must represent upgrades of their predecessors—incorporating all valid insights of older frameworks and reducing to them under specific conditions. For example, Newtonian mechanics is

widely regarded as a low-speed approximation of Einstein's relativity. However, the transitions from Newtonian theory to relativity, and from classical mechanics to quantum mechanics, reveal a more complex four-stage process: old theory → new theory → opposition between old and new → integration of old and new.

When mechanics advanced to the relativistic stage, a binary opposition emerged between relative and absolute conceptions of spacetime. The "low-speed approximation" cannot bridge this divide: even at negligible velocities, relativity does not accommodate an absolute stationary system. While low-speed motion yields approximately invariant spacetime, this does not imply a return to absolute spacetime. Crucially, even if an absolute stationary system exists, relativistic phenomena like clock slowing and length contraction could still arise from absolute motion—not relative velocity alone. The binary opposition between quantum and classical is even more evident: without a quantum decoherence process, the contradiction between quantum and classical will not disappear.

What's more, the transition from Newtonian theory to relativity, and from classical mechanics to quantum mechanics, has long been mired in a state of "irreconcilable contradiction between old and new theories". This is arguably a consequence of a narrow research paradigm—confined by limited perspectives, researchers struggle to even conceive, let alone explore, the harmony between relativity and absoluteness, or between quantum and classical frameworks. Only those visionary yet unrecognized scholars with a broad intellectual horizon stand a greater chance of attempting to resolve these two sets of contradictions.

Logically, the concept of "motion-induced time dilation" encompasses two implications: time dilation resulting from absolute motion, and time dilation resulting from relative motion. Therefore, transitioning from the general notion of "motion-induced time dilation" to the specific proposition of "absolute motion-induced time dilation", and attempting to describe it both qualitatively and quantitatively, presents no logical barriers—only challenges in terms of intellectual insight, technological capability, and research paradigm. It is worth noting that the hypotheses of "absolute motion-induced time dilation" and "absolute motion-induced length contraction" represent a reconciliation of relativistic and absolute concepts and methodologies: they acknowledge the existence of absolute motion (or an absolutely stationary frame of reference) while also affirming the relativity of spacetime.

A theory with practical utility does not necessarily describe absolute physical reality; it may merely serve as a usable tool. This gives rise to the concept of "instrumental theory", which posits that certain theories are purely instrumental in nature. The fact that different theoretical approaches yield similar descriptive outcomes does not imply that all these approaches correspond to physical reality. This is analogous to the principle that analogy does not equate to equivalence. For instance, the ontological and homogenization theoretical frameworks that emerged in astronomy are essentially just patching tools. If spacetime curvature is not an objective reality, then spacetime theory can only be regarded as a tool—a method for describing gravity.

In the practice of solving quantum mechanical problems, there is a process of converting the problem into a wave function representation. Once the problem is solved, an inverse process of wave function collapse must be applied to revert to reality. In other words, when interpreting quantum mechanics, one must first acknowledge the existence of a superposition of states, and finally invoke the collapse of this superposition to align with reality (i.e., to obtain a definite objective existence that can be experimentally observed). The principles of state superposition and superposition collapse employed in this process are like boomerangs—superposition is the "throw", and collapse is the "return"—serving merely as tools. After all, superimposed quantum states exist essentially only in theory or in the human mind, and cannot be directly observed in reality or experiments. Without the processes of quantum state superposition and collapse, theories could describe reality more directly; these concepts are introduced solely to accommodate the explanations of uncertainty and quantum probability.

When an old theory is replaced by a new one, the old theory may become a component of a broader theoretical framework, remaining applicable and useful under specific conditions.

In the journey of scientific advancement, countless theories have emerged, many of which function as pragmatic tools bounded by specific contexts. Moreover, human understanding of objects and the natural world unfolds in a sequential manner—from superficial to profound, from outward appearance to inner essence. This evolutionary trajectory is an inescapable law, impervious to the constraints of any historical era.

When examining the broader sweep of social and technological development, a consistent pattern emerges in how we interpret phenomena: we first articulate their observable features, then gradually pierce through the surface to grasp their underlying essence. Crucially, this process of "uncovering essence" rarely occurs in a single, revelatory leap; instead, it unfolds step by step, through cumulative inquiry and iterative refinement.

3.2. Summary of the Value of Relativity Research Results

The author's main academic contributions in the study of relativity (Summary based on self cited references by the author of this article).

3.2.1. Innovative Breakthroughs in Theoretical Frameworks

Breaking the binary opposition between the classical absolute spacetime view and the special theory of relativity, this study proposes a fusion paradigm of the "relative-absolute spacetime view". Logically demonstrating the necessity of an "absolute stationary system", it suggests adopting the total galactic centroid system and cosmic background radiation framework as reference benchmarks, filling the gap in relativity's lack of a fundamental physical mechanism explanation. By positing that absolute motion causes time dilation, this paradigm quantitatively resolves the contradiction between relativity and absoluteness, extending the Lorentz transformation to coordinate conversions between absolute stationary frames and moving inertial frames.

3.2.2. Critical Reconstruction of Classical Theories

This work challenges the core assumptions of special relativity: the principle of relativity and the principle of the invariance of the speed of light. Based on logical contradictions between experimental evidence—including the Jones experiment (where hollow glass disks fail to drag photons) and the Hafele-Keating experiment (which demonstrates non-equivalence between different inertial frames)—and the foundational tenets of special relativity, it questions the universality of the "principle of inertial frame equivalence". The discovery of the Dirac equation in quantum mechanics, which predicts the existence of negative mass matter, undermines the general relativity's explanation of the relationship between Einstein tensors and spacetime curvature, thereby challenging the authenticity of spacetime curvature itself. Reinterpreting the Michelson-Morley experiment, this study argues that its null result does not negate the existence of an absolute stationary frame. Instead, it stems from logical flaws in assuming the isotropy of the speed of light in the ground frame and the experiment's failure to account for gravitational field drag. By shifting the observer's perspective to an absolute stationary frame to observe the motion of the Earth, experimental instruments, and target photons, the predicted outcomes of the Michelson-Morley experiment diverge significantly from the original results (see Reference [31] for details).

3.2.3. Innovative Design of Experimental Verification Systems

The author's experimental designs provide feasible pathways for verifying absolute motion: The "geometric optical velocimeter" can measure absolute velocity by leveraging the difference in inertia between photons and electrons, offering a quantitative tool for theoretical validation. The hollow glass disk variant of the Jones experiment challenges special relativity's definition of inertial frames by predicting the absence of photon drag within a vacuum cavity.

3.2.4. Academic Paradigms and Methodological Value

At the cognitive level, this study follows the evolutionary law of "absolute → relative → relative-absolute", integrating rational components of classical spacetime theory and relativity in a spiral progression. Philosophically, it prioritizes the "content unity" of physical mechanisms over the "symmetry" of mathematical forms, offering a new philosophical perspective for spacetime theory research. The author has established a rigorous interdisciplinary argumentation system: combining insights from physics, philosophy, and cosmology, it constructs a hierarchical framework through logical reasoning methods such as "gradient of motion degrees of freedom" and "system superiority tracking", significantly enhancing the theory's persuasiveness.

3.3. Potential impacts and limitations

3.3.1. Positive Implications

This research offers fresh insights into the long-standing compatibility conundrum between relativity and quantum mechanics, potentially opening up a novel research paradigm for quantum gravity theories such as loop quantum gravity and string theory. The proposed experimental schemes—including geometric optical velocity measurement on space stations and high-precision atomic clock experiments across global locations—boast strong operational feasibility. Should these experiments yield positive verification, they could profoundly reshape the existing theoretical framework of space-time.

3.3.2. Limitations

Theoretical Controversy: The postulation of an absolute stationary frame directly contradicts the foundational assumptions of special relativity, necessitating rigorous, independent experimental validation. Technical Barriers: Certain experiments demand extraordinary precision that currently exceeds the limits of modern measurement capabilities. For instance, detecting minute ruler deformation near a massive shot put, or measuring energy discrepancies (or magnetic field deflection angle variations) of microparticles emitted at identical speeds in different directions, poses significant technical hurdles.

Incomplete Formalism: While a modified application of the Lorentz transformation has been proposed, a comprehensive mathematical formal system remains unestablished, and some quantitative derivations require further refinement.

3.3.3. Conclusion

This study holds substantial academic exploratory value: it critically reexamines traditional space-time concepts, proposes an integrated theoretical paradigm, and provides actionable experimental verification protocols, thereby charting new directions and reference frameworks for space-time theory research. Despite unresolved hypotheses and theoretical disputes, its spirit of challenging academic authority, innovative thinking, and in-depth inquiry into fundamental physical mechanisms render it a highly valuable contribution to academic exploration.

Comparative content	Special relativity (SR)	Relativity absolute theory (RAT)	Differences between SR and RAT	The commonalities between SR and RAT	The interrelationship between SR and RAT
Time	Time dilation within a system of relative motion (slowing down of clocks in relative motion) Time dilation within a system of relative motion (clocks slowing down due to relative motion)	Clocks slowing down due to absolute motion. “The clock slows down due to movement” does not mean time dilation	For describing absolute physical quantities, the independent variables in the time function are relative velocity and absolute velocity, respectively	Everyone acknowledges that the clock of movement slows down	$\gamma = \frac{1}{\sqrt{1-(\vec{u}+\vec{v})^2/c}}$ When υ is much greater than u, the relativistic effects described by the two theories tend to be quantitatively consistent. $\frac{\sqrt{1-(\vec{u}+\vec{v})^2/c^2}}{\sqrt{1-v^2/c^2}}$ This ratio is the relative error of relativistic effects calculated using relative velocity. It does not exceed the allowable error within a large range.
Space	The space of the system shrinks due to relative motion (the ruler shrinks due to relative motion)	Objects shorten in all directions due to absolute motion. Believe that the inertial frame of motion has finite boundaries. The shortening of a ruler due to motion is not the contraction of space due to motion	For describing absolute physical quantities, the independent variables in the spatial function are relative velocity and relative velocity	They all acknowledge that objects contract due to motion	The occupation of space by an object in an absolute stationary frame, and the spatial position occupied by a moving object is in motion.
Mass	The momentum of an object increases due to relative motion (the mass of an object increases due to relative motion)	The relative momentum of an object increases due to relative motion (the mass of an object increases due to absolute motion)	The velocity in the absolute momentum function is absolute velocity. Relative absolute theory does not recognize the relationship between absolute mass and relative velocity	Both acknowledge that relative momentum increases due to relative motion	The mass of a moving object is a function of its velocity, which is the product of its absolute stillness and the Lorentz coefficient of motion
The status of inertial frame	SR believes that the status of different inertial frames is equal, and there is no superior inertial frame	RAT acknowledges the existence of an absolute stationary frame (the most superior inertial frame)	SR is a multi center theory, where observers in different systems, each administers in his own way. RAT is a single center theory centered around an absolutely stationary system	Everyone acknowledges the spatiotemporal variability in the system of motion	SR is equivalent to every observer in a different inertial frame believing that the system they are in is the most superior system. That is, in SR, the superior inertial frame is variable (whoever observes is the superior system). RAT only recognizes that superior inertial frames are unique
Observing the same object in different inertial frames, or observing an object continuously while accelerating	The conclusion is inconsistent. The observer observing acceleration motion continuously observes an object and cannot obtain a unified understanding. So, SR does not allow observation in non inertial frames*	Observers in different inertial frames can communicate with each other to obtain a unified conclusion. The observer of accelerated motion can continuously observe an object and obtain invariant conclusions	The two are inconsistent in terms of mutual communication and unified discussion of observations in different inertial frames.	Under certain conditions, the two can reach a consistent understanding of qualitative relativistic effects. Furthermore, both acknowledge that moving objects have relativistic effects	The results (appearances) observed by observers in different motion states are a side of the observations of observers in an absolute stationary system

Prophecy	Fix the electron gun and photon gun together. As long as the rays emitted by this joint emitter are parallel when it is stationary, the rays emitted when it is in motion remain parallel. For the Jones experiment on a hollow disk, the vacuum and glass have the same efficiency in pulling photons	Fix the electron emission gun and photon emission gun together. When the joint emission source is stationary, the electron and photon rays are adjusted to be parallel. Then let this device move, and these two rays will create a non-zero angle. For the Jones experiment on a hollow disk, the vacuum and glass have different efficiency in pulling photons	SR quantitatively calculates relativistic effects based on relative velocity. RSA quantitatively calculates relativistic effects based on absolute velocity. RSA predicts that the path traveled by photons in a flat space is absolutely stationary. SR cannot make this prophecy	The relativistic effects are calculated using similar Lorentz factors	Under certain conditions, there are intersections in predicting the effects of relativity. For example, only when υ is much greater than u, the predictions of the two theories are close to being consistent.
Emphasis	Focus on considering apparent motion and phenomena	Value objective movements and phenomena	For the observation results, SR has severe exclusivity, while RAT has a balance	Both attach great importance to the observer's feelings	Treating various apparent phenomena as a side of objective phenomena can restore them to objective phenomena
The physical mechanism of relativistic effects	No source of relativistic effects found, only mathematical basis based on Lorentz transformation or four-dimensional space geometry	When the speed of movement changes, there is a substantial change in energy. Along with it are the mass corresponding to energy, the frequency of photons emitted by moving objects, and the distance between molecules within matter. In this way, the clock and the volume of the object will change due to motion	SR does not recognize absolute motion, and changes in mass and energy related to relative velocity are manifested and relative. RAY acknowledges absolute motion. In this way, there is a substantial change in energy, mass, and spacetime due to absolute motion	It is widely acknowledged that some physical quantities are only related to relative motion (such as impulse, energy, frequency of waves, etc.)	The two can be connected through Lorentz transformation
Breakthrough and Innovation	SR is a breakthrough in absolute Newtonian theory	RAT is a breakthrough in special relativity (breaking through the SR paradigm that focuses on apparent sensations and the observer's self centeredness)	SR's breakthrough went too far, completely eliminating the absoluteness of time and space and becoming a left leaning opportunist	SR and RAT are both part of the spiral upward process	RAT Correcting the mistake of absolutizing "relative" in SR naturally leads to RAT

Table 1: Comprehensive Comparison Between Absolute Relativity and Special Relativity (Including Their Similarities, Differences, And Interrelationships in Relativistic Effects)

4. Research on Quantum Mechanics

Quantum theory can be positioned as a subfield of "generalized wave mechanics," a theoretical framework that unifies classical and quantum mechanical principles. In the paper "The Conversion between Schrödinger Equation and F = ma" the author systematically derives the intrinsic connections between quantum mechanics and classical mechanics, presenting a rigorous proof for the compatibility and unified application of these two seemingly disparate systems [8].

4.1. Research Context, Core Ideas, and Theoretical Directions

To establish the theoretical foundation for quantum-classical compatibility, we introduce two sequential modifications to the potential energy term in the Schrödinger equation: first, replacing electromagnetic potential energy with gravitational potential energy, and second, transforming potential energy into its corresponding gravitational or electromagnetic force expressions. These successive revisions construct a robust theoretical framework, demonstrating that quantum mechanics and classical mechanics are not mutually exclusive but rather complementary and integrable.

This compatibility necessitates a re-evaluation of fundamental quantum concepts: notions such as "quantum state superposition," "superposition state collapse," "quantum entanglement," and "quantum decoherence" become untenable in a unified framework. Macroscopic objects exhibit strong local realism, and after achieving quantum-classical compatibility, only quantization and diffraction—properties shared by both quantum and classical systems—remain as core descriptors. Importantly, this perspective does not negate the existing mathematical formalism of quantum mechanics; instead, it clarifies the distinction between its successful mathematical applications and its unproven interpretive frameworks.

Critically, the widespread "success of quantum mechanics" often refers solely to the efficacy of its mathematical formalism, not its interpretive system. The latter has never achieved empirical validation: for instance, decades of research into quantum secure communication based on quantum entanglement have failed to deliver practical, scalable applications, and quantum computers leveraging alleged quantum properties remain largely theoretical constructs with no commercially viable implementations.

4.2. Author's Core Innovation and Key Findings

For decades, classical and quantum mechanics have been regarded as fundamentally irreconcilable: classical systems are described by deterministic forces and orbital trajectories, while quantum systems are governed by probabilistic wave functions and mathematical operators. Our study challenges this long-held dichotomy through three groundbreaking contributions:

i. **Deriving Quantum Operators for Classical Observables**
We introduce the first wave-mechanical operators for core classical quantities such as force and acceleration. For example, we define the force operator as $\hat{F}=\frac{\partial \hat{p}}{\partial t}=-i\hbar\frac{\partial^2}{\partial t\partial x}$, which is specifically applied to Bohr's hydrogen atom model. This development enables the direct translation of classical physical laws into quantum formalism—including the law of conservation of momentum, expressed as -$-i\hbar\frac{1}{\psi_1}\hat{p}_1\psi_1=-i\hbar\frac{1}{\psi_2}\hat{p}_2\psi_2$. Critically, this resolves a longstanding limitation highlighted by foundational physicists: the historical absence of a formal quantum description of "force."

ii. **Unifying Microscopic and Macroscopic Systems**
By modifying the Schrödinger equation to incorporate gravitational and electromagnetic potential energy (e.g., $-\frac{\hbar^2}{2m}\frac{\partial^2}{\partial x^2}\psi-GMm/r=E\psi$), we demonstrate that both microscopic systems (such as hydrogen atoms) and macroscopic systems (such as planetary motion) can be described using identical wave equations. This breaks down the traditional scale barrier that has confined quantum mechanics to the microdomain, opening new avenues for cross-scale physical inquiry and enabling a smooth, consistent transition between classical and quantum frameworks.

iii. **Deriving Quantum Equations from Classical Mechanical Laws**
Using the universal force operator $\hat{F}=-i\hbar\frac{\partial^2}{\partial t\partial x}$, we reformulate Newton's second law in quantum terms as $\hat{F}\psi=-i\hbar\frac{\partial^2}{\partial t\partial x}\psi$, which applies to all physical systems. For specialized cases like the uniform circular motion of the hydrogen atom's ground state (governed by $F=\frac{mv^2}{r}$ and the quantization condition $m\upsilon r=\frac{1}{2}\hbar$, we derive a system-specific form: $\hat{F}\psi=-i2\hbar^2\frac{\partial^3}{\partial x^3}\psi$. We further integrate quantum operator formalism with classical principles like the virial theorem, preserving their physical meaning while eliminating artificial boundaries between "macroscopic-classical" and "microscopic-quantum" frameworks. For instance, dividing the modified Schrödinger equation by radius r and substituting $m\upsilon r=\frac{1}{2}\hbar, F=-\frac{GMm}{r^2}$, and $\upsilon=\alpha c$ yields $\alpha c\hbar\frac{\partial^2}{\partial x^2}+\frac{V}{2r}\psi=F\psi$. Detailed derivations are provided in references [17, 28, 29].

4.3. Academic Significance

This work disrupts the status quo by demonstrating that classical and quantum mechanics are not mutually exclusive but complementary. By reintroducing force into quantum theory and extending wave mechanics to macroscopic systems, we lay the groundwork for a "generalized wave mechanics" that unifies mechanics across scales. This has profound implications for: —Theoretical physics: Resolving foundational debates about quantum-classical compatibility and the nature of wave function interpretation. —Applied science: Enabling new approaches to modeling bound-state systems (e.g., atomic orbitals, planetary motion) and non-constant mass mechanics. —Philosophy of science: Reinstating classical mechanical concepts (e.g., force, acceleration) as fundamental to quantum formalism, bridging conceptual divides.

As long as the derivation in the article is not entirely wrong, it will definitely trigger a widespread discussion that has not appeared in over a hundred years. And it will spark a research boom in the theory and application methods of wave equations related to classical mechanics laws. It is not difficult to predict that the novel content involved in this article will have a very large interest group.

4.4. Fit with Nature's Scope

Nature is committed to publishing groundbreaking research that advances fundamental scientific understanding. Our work aligns with this mission by: (a) Addressing a longstanding problem in physics (quantum-classical unification) with broad interdisciplinary relevance. (b) Introducing novel mathematical tools (force operators, unified wave equations) with potential to reshape research in quantum mechanics, astrophysics, and condensed matter. (c) Challenging established paradigms (e.g., the "Copenhagen interpretation's limits) through rigorous, assumption-free derivations rooted in quantum operator formalism.

4.5. The significance of the combination of classical mechanics and quantum mechanics

Author Runsheng Tu breaks down disciplinary barriers. In this article and previously published papers [1-9], it explicitly challenges the traditional understanding that the Schrödinger equation cannot describe macroscopic objects (such as the Earth) and Newtonian mechanics cannot describe microscopic systems. This inherent concept severely limits people's understanding of the natural world, the development of physics theories, and the application of existing theories.

4.6. Academic Significance

This work upends conventional wisdom by demonstrating that classical and quantum mechanics are not mutually exclusive, but inherently complementary. By reincorporating force into quantum theory and extending wave mechanics to macroscopic systems, we establish the framework for a "generalized wave mechanics" that unifies mechanical principles across all scales. This breakthrough carries profound implications across three domains:

Theoretical physics: Resolving longstanding foundational debates about quantum-classical compatibility and the interpretive nature of wave functions.

Applied science: Enabling novel modeling approaches for bound-state systems (e.g., atomic orbitals, planetary motion) and non-constant mass mechanics.

Philosophy of science: Reintegrating classical concepts (e.g., force, acceleration) as fundamental components of quantum formalism, bridging long-standing conceptual divides.

Even if the derivations herein are not entirely error-free, this work will undoubtedly ignite an unprecedented global debate—one not seen in over a century—and spark a surge in research into wave equation theories and applications aligned with classical mechanical laws. It is reasonable to predict that the novel ideas presented here will attract a large and engaged research community.

4.7. Alignment with Nature's Scope

Nature is dedicated to publishing groundbreaking research that advances fundamental scientific understanding, and our work aligns seamlessly with this mission: It addresses a persistent, cross-cutting challenge in physics—quantum-classical unification—with far-reaching interdisciplinary relevance.

It introduces innovative mathematical tools (force operators, unified wave equations) that have the potential to reshape research in quantum mechanics, astrophysics, and condensed matter physics.

It challenges established paradigms (e.g., the limitations of the Copenhagen interpretation) through rigorous, assumption-free derivations rooted in quantum operator formalism.

4.8. Significance of Unifying Classical and Quantum Mechanics

Author Runsheng Tu dismantles disciplinary silos. In this article and a series of prior publications [1-9], we directly challenge the traditional belief that the Schrödinger equation cannot describe macroscopic objects (e.g., the Earth) and that Newtonian mechanics is inapplicable to microscopic systems. This entrenched misconception has severely constrained humanity's understanding of the natural world, the advancement of physical theories, and the practical application of existing frameworks.

4.9. Key Breakthrough: Building Cross Scale Descriptive Equations

The author successfully derived the Schrödinger-Tu equation that can describe planetary motion by replacing the potential energy term in the Hamiltonian operator with gravitational interaction potential energy instead of electromagnetic interaction potential energy. The wave mechanics equation with explicit force was established by further transforming potential energy into force F (gravitational and/or electromagnetic force) (as well as other classical mechanics equations such as Newton's second law, the law of conservation of momentum, etc.). This series of innovative equations has achieved: macroscopic verification—when approximating the distance between the sun and the earth as a constant, the energy eigenvalues obtained by solving the Schrödinger-Tu equation for the Earth's revolution are completely consistent with the results of classical mechanics calculations; Scale unification—proves that classical mechanics and wave mechanics are compatible, and there is no insurmountable gap between the two (i.e., diluting or even eliminating the boundary between quantum theory and classical theory); Simplified computation—established a theoretical framework that can simultaneously describe all objects (without mass limitations), simplifying the computational process of quantum mechanics.

5. Theoretical Significance: To Promote the Transformation of Research Paradigms and Theoretical Paradigms in Physics

The research results of author Tu Runsheng have significant implications for changing human concepts - transforming the binary opposition between quantum theory and classical theory into a compatible concept. The theoretical significance of its research results can be described as follows. **(a)** Cognitive update: It proves that quantum mechanics and classical mechanics can be combined, overturning the traditional notion that the two are mutually exclusive. **(b)** Application Expansion: Provides new tools for cross scale physics research, with the potential to promote cross disciplinary applications in fields such as astrophysics and quantum mechanics. **(c)** Disciplinary integration: It laid the foundation for establishing a more unified theoretical system of physics and promoted the integrated development of macro and micro physics. **(d)** An experimental counterexample was found: strong magnetic field interference does not cause the disappearance of electron diffraction fringes (which is inconsistent with the Copenhagen interpretation of decoherence and superposition state or wave function collapse).

5.1. Core Breakthrough: Developing Cross-Scale Descriptive Equations

Dr. Tu Runsheng has successfully derived the Schrödinger-Tu equation, a wave-mechanical framework capable of describing planetary motion, by replacing the electromagnetic interaction potential in the Hamiltonian operator with gravitational interaction potential. Further transforming potential energy into explicit force terms (encompassing gravitational, electromagnetic, and other forces), he established a wave mechanics equation with clear force dependencies—alongside derivations of classical mechanics principles such as Newton's second law and the law of conservation of momentum. This suite of innovative equations delivers three pivotal achievements:

- **Macroscopic Validation:** When approximating the Sun-Earth distance as constant, energy eigenvalues derived from solving the Schrödinger-Tu equation for Earth's orbital motion are fully consistent with classical mechanics calculations.
- **Scale Unification:** It demonstrates the compatibility of classical mechanics and wave mechanics, eliminating the perceived insurmountable divide between quantum and classical theories.
- **Computational Simplification:** A universal theoretical framework is established to describe all objects without mass constraints, streamlining quantum mechanical computational workflows.

Theoretical Significance: Driving Paradigm Shifts in Physics Research

Dr. Tu's research profoundly reshapes human understanding by replacing the binary opposition between quantum and classical theories with a paradigm of compatibility. Its theoretical significance manifests in four key dimensions:

- **Cognitive Update:** It empirically proves the interoperability of quantum and classical mechanics, overturning the long-held belief that the two systems are mutually exclusive.
- **Application Expansion:** Provides a novel toolset for cross-scale physics research, with transformative potential to advance interdisciplinary applications in astrophysics, quantum mechanics, and related fields.
- **Disciplinary Integration:** Lays the foundational groundwork for a more unified physical theoretical system, fostering integrated development of macro- and micro-scale physics.
- **Experimental Counterevidence:** Observations show that strong magnetic field interference does not eliminate electron diffraction fringes—a result inconsistent with the Copenhagen interpretation of decoherence, superposition states, and wave function collapse.

5.2. Research Extension: Building a Systematic Theoretical Framework

The author has published a series of papers, including *"Formulating the Schrödinger Equation for Macroscopic Objects and Transforming Human Scientific Paradigms" and "The Schrödinger-Tu Equation: A Bridging Formalism between Classical Mechanics and Quantum Mechanics*", which progressively construct a unified theoretical framework integrating quantum mechanics and classical mechanics—the generalized wave mechanics framework.

Content	Wave mechanics or quantum mechanics (QM)	Generalized wave mechanics(GWM)	Differences between QM and GWM	The commonalities between QM and GWM	The interrelationship between M and GWM. Direct experimental evidence
Utilization of wave function	The combination of partial differentiation of wave functions and Viry's theorem (T+V=E) forms the Schrödinger equation	The partial differentiation of wave functions combined with more classical mechanical laws forms the fundamental equation series of generalized wave mechanics.	QM only utilizes wave functions in the microscopic field, while GWM utilizes wave functions in a wider range	All of them combine the wave function with the laws of classical mechanics and the functions of classical mechanical physical quantities	The relationship between the local and the overall, or the relationship between disciplinary branches (secondary disciplines) and major categories of disciplines (primary disciplines). From QM to GWM is a reflection of scientific progress
Wave equation	The mathematical foundation of quantum mechanics, used to describe microscopic systems	The wave equation of classical mechanics is the product of the organic combination of wave equation and classical mechanics laws. It has been proven that quantum theory and classicism can be combined for use.	QM is the Schrödinger equation, and the wave equation of GWM is the Schrödinger-Tu equation	Partial differential equations that utilize operators of physical quantities and wave functions	The relationship between the local and the overall

Match model in the wind	Admitting quantum entanglement is afraid of instruments. But it also acknowledges that quantum entangled states can be created using instruments. It's as absurd as admitting that one can light a "phosphorus head match" normally in strong winds	I don't think it's possible to create quantum entangled states using instruments, just like I don't think it's possible to strike a phosphorus headed match normally in strong winds	Copenhagen interpretation goes against classical common sense, GWM follows empirical common sense	None	Copenhagen interpretation and GWM interpretation are in opposition
Intrinsic State Existence and Collapse Regeneration	Deny that the measured eigenstate is the original existence before measurement, that is, acknowledge that the eigenstate is newly generated (collapsed) under the action of the instrument	Admitting that the eigenstates of microscopic particles are independent entities with clear composition and structure that are unrelated to measurement	The Copenhagen interpretation denies that the measurement results are the original state before measurement. GWM believes that non-destructive measurements only reveal the characteristics of the entity.	It is widely acknowledged that the measurement results are intrinsic states of microscopic objects	The two cannot be reconciled. Due to the extreme instability of quantum superposition states and entangled states, people have never directly discovered the existence of stable superposition states and entangled states. Copenhagen explanation lacks direct experimental evidence
Glove model: Lost a pair of gloves. Once you find the left-handed one, you immediately know that the other one is right-handed. That is to say, the left-right symmetry of this pair of gloves was pre made, rather than newly formed through linkage when the gloves were found	The glove model is similar to the description of quantum entanglement. But QM believes that the glove model is a macroscopic model and not applicable to microscopic systems	Disagree with QM's DPEIE behavior. As long as we do not adopt DPEIE behavior, Aspect experiments cannot be explained by quantum entanglement phenomena	QM believes that the only reason for violating Bell's inequality is the collapse of new life. GWM believes that the reason for violating Bell's inequality is not unique, and models such as the glove model and the androgynous sword model can also be mistakenly interpreted as "the symmetric structure of conjugate particle pairs is formed instantaneously during measurement"	The observed phenomena are the same, but the explanations for the phenomena are vastly different and irreconcilable	The two cannot be reconciled. There are no discontinuous instantaneous processes in nature. Discontinuous instantaneous processes are the result of mathematical abstraction
The Model for Rectifying Wrongful, False, and Wrongful Cases	After assuming spontaneous state superposition, the collapse process of a double matched superposition state occurs. The superposition of states and the collapse of superposition states are two completely opposite processes. This is equivalent to the previous occurrence of wrongful convictions, which were later corrected by clarifying the facts	GWM believes that state superposition and superposition collapse are both non-existent phenomena. Just like wrongful convictions, the original guilty verdict and subsequent acquittal were actually unnecessary Behavior and Process	QM has implemented a process and behavior of self denial, but does not admit any wrongdoing. GWM believes that the spontaneous superposition and collapse of quantum states are self denying processes and behaviors, reflecting cognitive errors.	Without directly discovering the existence of superposition states through experimental methods, the two are irreconcilable	The method of reconciling the two is that after "directly discovering the existence of stable superposition and entanglement states through experimental methods", GWM's explanatory system will also acknowledge the existence of superposition states under certain conditions, but it is not necessary to change the mathematical form system of BWM

Randomness	Believing that the randomness of microsystems is fundamental	It is believed that behind randomness lies the decisive comprehensive result of finer steps and more complex processes. Just like weather forecasting and random sampling	The two believe that the determining factors of randomness in the microscopic world are different	Everyone acknowledges the appearance of randomness	For complex events, there are causal relationships hidden behind the random surface. The causal relationship is so complex that it can provide statistical results with randomness
Uncertainty, non realism, superposition principle, superposition collapse, quantum decoherence, wave function flattening	Believing that the randomness of microsystems is fundamental	GWM believes that these features do not exist and we do not need these concepts	One acknowledges that microscopic particles possess these characteristics, while the other does not	QM and GWM have no common attitude towards these characteristics	Irrelevant
Prophecy of Measurement Results	In theory, it is predicted that the measurement result will randomly appear among multiple outcomes	The measured eigenstates and eigenvalues are unique	One is probabilistic, and the other is deterministic	The commonality is only a qualitative result that can be predicted by the outcome	QM's prophecy includes GWM's prophecy (but the probability less than 1). The experiments have confirmed the predictions of GWM

Table 2: Comprehensive Comparison Between Quantum Mechanics and Generalized Wave Mechanics

5.3. The source of the Copenhagen interpretation is unreliable

The explanatory system of quantum mechanics has always been perplexing [27]. The origin of the quantum mechanics interpretation system denies that microscopic particles have stable, independent, and complete eigenstates [referred to as denial of stable, independent, and complete eigenstates (DSICE)]. This idea originated from the explanation of the phenomenon of double slit diffraction experiment. The representative of the Copenhagen interpretation is the explanation of the Aspect experiment. These three explanations are connected into a progressive ladder: the explanation of the double slit diffraction experiment → denying that microscopic particles have complete, independent, and stable eigenstates → Copenhagen explanation and Aspect experiment explanation. Through careful analysis, it is not difficult to find that there is a logical loophole in the existing explanation of the double slit diffraction experiment—the viewpoint that "dark fringes are caused by wave interference" has not been verified, and there can be other explanations. The statement 'interference' can only be used if it is experimentally proven that particles have reached the dark areas without causing any photosensitive reaction.

After Yang's double slit experiment, Taylor conducted a single photon double slit diffraction experiment—allowing photons to pass through the double slit one by one (Taylor experiment). The result of the Taylor experiment is still the same as the Young's double slit experiment, with interference fringes appearing (see Figure 1). This is the belief that microscopic particles are not independent and mature entities.The Copenhagen interpretation and Aspect experiment interpretation are both based on the DSICE interpretation. Some people have also found a mathematical logical basis for explaining DSICE: they have established the concepts of probability waves and probability amplitudes for microscopic particles in mathematics (which also adopts DSICE's viewpoint). However, the necessary experimental phenomenon for this explanation is that when one microscopic particle passes through a double slit, there should be a situation where "two bright spots" appear on the receiving screen. The reason is that we have determined that the dark fringe is the result of interference between two parts that appear simultaneously. In the area of the bright fringe, it should be that two parts of a particle do not meet and interfere (if the two parts did not meet, it could cause two photosensitive points). From another perspective, if only one bright spot is formed on the receiving screen every time a particle is emitted through a slit, it is highly likely that the particle passing through the double slit is in a stationary point particle or spherical particle state before and after passing through the slit, rather than a discrete probability wave state. For the results of the single particle double slit experiment, the interference fringes are the accumulation of points, proving that the interference fringes are not the probability amplitude superposition of discrete waves (the argument that discrete waves can only form small bright spots on the screen sounds awkward).***

5.4. The Unreliable Foundations of the Copenhagen Interpretation

The interpretive framework of quantum mechanics has long confounded physicists [27]. At its core lies a provocative premise: the denial that microscopic particles possess stable, independent, and complete eigenstates (hereafter referred to as DSICE). This idea emerged from early attempts to explain the double-slit diffraction experiment, later extended through the Copenhagen interpretation and its canonical application to the Aspect experiment. Together, these form a conceptual chain: the double-slit experiment interpretation → the DSICE premise → the

Copenhagen and Aspect experiment explanations.

A critical examination reveals a foundational flaw in the traditional double-slit narrative: the claim that "dark fringes arise from wave interference" remains unsubstantiated, leaving room for alternative explanations. The term "interference" is only valid if experiments confirm that particles reach dark regions without triggering photosensitive reactions—a condition never definitively met.

Following Thomas Young's pioneering double-slit experiment, G.I. Taylor conducted a landmark single-photon version, firing photons through the slits one at a time. Taylor's results mirrored Young's, producing distinct interference fringes (see Figure 1). This outcome became a cornerstone of the belief that microscopic particles lack independent, well-defined identities. Both the Copenhagen interpretation and the analysis of the Aspect experiment rest squarely on this DSICE assumption.

Proponents of DSICE have also sought mathematical validation, introducing the concepts of probability waves and probability amplitudes to describe microscopic particles—frameworks that inherently embed the DSICE premise. However, this mathematical construct relies on a key experimental prediction: when a single particle passes through double slits, the receiving screen should occasionally display "two bright spots." The logic follows: if dark fringes stem from the interference of two simultaneous components of a particle, bright fringes should arise when these components fail to interfere, potentially creating two distinct photosensitive points.

Conversely, if each particle consistently produces only one bright spot upon passing through the slits, it strongly suggests the particle behaves as a localized point or spherical entity both before and after traversing the slits, rather than a dispersed probability wave. The single-particle double-slit experiment, where interference fringes emerge as accumulations of individual points, further undermines the probability wave hypothesis. The notion that discrete waves could produce such aggregated fringes—rather than isolated bright spots—strains credulity. In other words, although the dark fringes on the receiving screen are very similar to diffraction fringes, there are still two possibilities for the formation of dark fringes (shadow): first, the microscopic particles did not reach there; Secondly, the particles that arrived there interfered.

There has also been controversy over this issue in history.
The controversy surrounding the formation of double slit interference dark patterns. Traditional wave theory suggests that dark streaks are caused by destructive interference of waves, but particle theorists propose an alternative explanation: dark streak regions may be areas where particles are deflected by Coulomb forces at the edge of the slit and do not reach, rather than interference cancellation. This viewpoint can be referenced: Einstein, A. (1927). "Quantum theory and reality." Nature, 119(2998), 802-804.

The "single spot" phenomenon in single particle double slit experiments: Modern high-precision experiments (such as the 1989 electron double slit experiment) show that a single electron only produces one spot on the detection screen after passing through the double slit, rather than the theoretically predicted "double spot". The experimental data can be cited from:Tonomura, A., Endo, J., Matsuda, T., Kawasaki, T., & Ezawa, H. (1989). "Demonstration of single-electron buildup of an interference pattern." American Journal of Physics, 57(2), 117-120.

Controversy over the mathematical basis of the concept of probability waves: Although Bohr's interpretation of probability waves (1926) became mainstream, scholars such as Einstein have always questioned its completeness, believing that probability waves only describe the statistical behavior of particles, rather than the real physical state. Related literature:Born, M. (1926). "Zur Quantenmechanik der Stoßvorgänge." Zeitschrift für Physik, 37(12), 863-867.

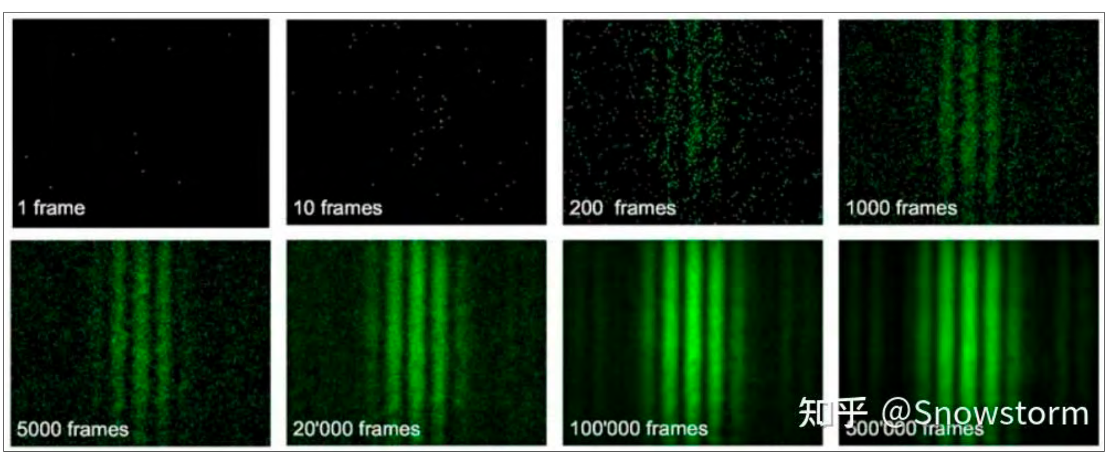

Figure 1: Photosensitive results of Taylor's single-photon double-slit diffraction experiment, which can be interpreted using Huygens' principle

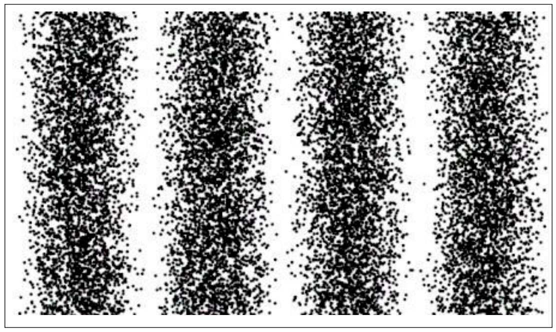

Figure 2: Photosensitive results of electrons passing through a double slit one by one. When a single photon passes through the double slit, it only forms a tiny bright spot upon striking the detection screen. The description of a "discrete wave-screen photosensitive response" is not suitable for explaining this phenomenon

In diffraction experiments, particles are inevitably exposed to interference from focusing lenses or collimating electromagnetic fields—conditions that trigger quantum decoherence and superposition collapse. This is especially true of the Tu experiment, which incorporates post-slit interference; here, particles are perturbed throughout the entire diffraction process, creating even stronger grounds for asserting that decoherence and collapse occur [30].

The Copenhagen interpretation, a cornerstone of quantum mechanics, rests on the core premise that "any perturbation of a particle induces quantum decoherence or superposition collapse, transitioning the particle to a macroscopic classical state." By this logic, microscopic particles in diffraction experiments—both before and after passing through the slit—are highly likely to exist in a decohered, classical state. For the Tu experiment, with its additional post-slit interference, the case for electrons being in a macroscopic classical state is even more compelling. Yet proponents of the prevailing quantum interpretation system deny that particles remain in a classical state during diffraction, directly contradicting their own foundational premise.

Whether particles reach the dark fringes of a diffraction pattern can be experimentally verified using a second-order diffractometer. This apparatus consists of a movable primary receiving screen with a slit, positioned in front of a secondary receiving screen. The experiment proceeds as follows: direct test particles through the initial slit and the slit in the primary screen; once the instrument is operational, locate the dark fringes on the primary screen, align its slit with one of these dark fringes, and observe the secondary receiving screen. If particles reach the dark fringe region on the primary screen, secondary diffraction fringes will appear on the secondary screen; if not, it confirms no particles arrive at the primary screen's dark fringes. This second-order diffraction experiment is straightforward to implement, making it a missed opportunity not to conduct it.

One plausible explanation for particles failing to reach dark fringes after passing through the slit is "direction quantization of slit-interacting particles" [28]. Atoms line the slit edges, and their nuclear charges exert influence on passing particles. While photon diffraction can be explained via Huygens' principle, non-photon particles may be affected by orbital angular momentum quantization as they traverse different atomic energy level regions.

As noted, if a second-order diffraction experiment confirms no particles reach the dark fringes of a double-slit pattern, it would undermine the superposition principle upheld by the Aspect experiment. From there, the mechanism of direction quantization could be systematically explored.Finding the problem of aspect experiment explanation is equivalent to shaking the foundation of existing quantum mechanics explanations. The quantum mechanics equations derived from classical mechanics laws are equivalent to shaking the existing framework of quantum mechanics.

6. Comprehensive Conclusion

By expanding the theoretical framework, the apparent contradictions between relativity and absoluteness, as well as between quantum mechanics and classical physics, can be resolved through compatibility and coordination. For the reconciliation of relativity and absoluteness, the key lies in revising the interpretation of relativity:

- Both the timing accuracy of clocks and the volume of objects vary with absolute motion, which can be intuitively understood through the concept of "clock slowing caused by absolute motion";
- Spacetime curvature induced by mass should be regarded as a mathematical descriptive tool rather than a physical reality;
- The speed of light is only constant in an absolutely stationary space. Relative to this absolute space, the speed of light is isotropic and independent of the motion states of the observer and the light source;
- The "relativity of simultaneity" is actually a discontinuity in Doppler frequency shift, where a zero-frequency point is incorrectly transformed into a non-zero-frequency wave—a physically unrealistic scenario. Notably, the core mathematical formalism of relativity can still be retained and applied.

For the coordination of quantum mechanics and classical physics, we only need to replace the Copenhagen interpretation while preserving the existing mathematical system of quantum mechanics.To re-examine the foundations of relativity and quantum mechanics, we have designed and conducted a series of experiments:

- **Experiments challenging the Copenhagen interpretation:** The closed electron diffraction experiment (Tu's experiment) provides a counterexample to the Copenhagen interpretation, including the conclusions of the Aspect experiment (see Supplementary Material A for details).
- **Experiments verifying the absolute stationary system:** Three types of experiments were carried out: Jones' existing experiment, our designed experiment using a hollow glass disk, and our geometric optical instrument-based speed measurement experiment. While Jones' experiment was previously thought to be inconclusive regarding relativity, a detailed analysis reveals it does not support the theory. The 1971 Jones experiment clearly demonstrated that the vacuum outside a moving glass disk cannot drag photons (either vertically or horizontally). This implies that the vacuum inside a moving hollow glass disk and the surrounding glass do not share the same inertial frame—equivalent to the notion that the cavity of a moving train and the train body do not belong to the same inertial frame (at least for photons). This finding undermines the relativity principle's assertion that all physical laws take the same form in all inertial frames, as experiments conducted in a moving carriage may not yield results consistent with those in other inertial frames. The analysis of Tu's electron diffraction findings resides in Supplementary Material A. To validate our conclusions, readers with access to proper laboratory facilities are urged to conduct the experiments we have meticulously designed.

Consider this analogy from Reference [32] and Table 2: rubbing a phosphorus match head in strong wind will never light the matchstick. Now apply this to quantum physics: both interference experiments and Bell inequality verification tests rely entirely on quantum entangled particles—particles that researchers themselves create using complex laboratory instruments. Yet defenders of orthodox quantum mechanics stubbornly maintain that quantum superposition and entanglement states cannot endure even the slightest contact with measuring equipment.

This is a logical absurdity: believing humans can manufacture stable entangled particle pairs is no more rational than claiming one can effortlessly light a match by rubbing its head in a hurricane. By this reasoning, the thousands of interference experiments and Bell inequality tests that form the backbone of modern quantum theory are built on fundamentally shaky ground.

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Supplementary Material A. Tu Runsheng's Response to Review Comments

These represent the perspectives of scholars in the mainstream scientific community on this paper, with permission to be made publicly available.

Major Issue 1: Originality and Redundancy Reviewer's Concern:

The manuscript's originality is ambiguous. Core concepts—including the Schrödinger-Tu equation, quantum-classical compatibility, generalized wave mechanics, and relative-absolute spacetime—are explicitly tied to the author's prior publications. The paper must clearly delineate its unique novel contributions and substantively distinguish them from earlier work.

Author's Response: This article is structured as a review, so appropriate recapitulation of prior research is unavoidable. With a repetition rate below 10%, the work inherently incorporates new content and narrative frameworks. Most notably, the review synthesizes a groundbreaking conclusion: by expanding theoretical paradigms, technical solutions emerge to resolve fundamental dualities in relativity and quantum mechanics—specifically, the oppositions between relative/absolute frameworks and quantum/classical descriptions. This constitutes a transformative paradigm shift in physics research, marking an epoch-making advancement.

Major Issue 2: Scientific Foundation of the Absolute-Motion Hypothesis

Reviewer's Concern: The proposed absolute-motion framework lacks sufficient validation. The manuscript posits that time dilation depends on absolute motion and introduces a relative-absolute spacetime perspective. However, this requires a rigorous mathematical definition of the absolute reference frame and unique, experimentally testable predictions.

Author's Response: The conventional assertion that "motion causes time dilation" does not exclude the possibility that time dilation arises from absolute motion. Absolute motion can be defined as movement relative to an absolutely stationary reference frame, making it a specialized form of relative motion. Moreover, framing time dilation as a product of absolute motion resolves far more theoretical inconsistencies than attributing it to relative motion. For instance, the twin paradox—a persistent conundrum under relative motion—does not arise in an absolute-motion framework. Insisting on "time dilation due to relative motion" risks perpetuating flawed logic at the expense of more coherent explanations. For further details, please refer to the author's response to Major Issue 3.

Major Issue 3 – The Relativity Paradox Reconsidered

Issue: The alleged logical contradiction in special relativity requires a more rigorous re-examination. Rationale: The symmetric observation that "A sees B's clock running slow, while B sees A's clock running slow" does not inherently constitute a contradiction, as relativistic observations are fundamentally tied to frame-dependent simultaneity. The authors should supplement their argument with a quantitative analysis rooted in standard relativistic formalism, rather than relying primarily on consensus-based reasoning.

Author's Response: For clocks A and B in relative motion, special relativity indeed leads to the seemingly contradictory conclusion that "clock A is both slower and faster than clock B"—a core tension embodied in the famous twin paradox. The conventional resolution prioritizes one observer's perspective over the other, violating the foundational principle of "equal validity for all inertial frames." This solution relies on the claim that the traveling twin is not in a pure inertial frame due to acceleration/deceleration, but this reasoning is weak: in practical scenarios, the spaceship twin spends the vast majority of the journey in inertial motion (e.g., accelerating for minutes while coasting inertially for decades), with acceleration phases being negligible in comparison. Worse still, the relativists' approach is inherently anti-relativistic. By allowing the twins to reach a consensus on their relative ages, they implicitly reject special relativity's core logic. This aligns with the first axiom of our framework, which permits observers in relative motion to establish consensus through communication—a step that special relativity cannot accommodate without undermining its own principle of relativity.

Major Issue 4 – Quantum Mechanics and Local Realism

Issue: The conclusion that quantum mechanics must conform to local realism lacks sufficient empirical and theoretical support. Rationale: The axioms proposed are philosophical postulates, not experimentally verified physical principles. To strengthen their argument, the manuscript must provide a quantitative demonstration of how these axioms generate testable predictions that diverge from standard quantum mechanics, while engaging critically with the extensive experimental literature on quantum nonlocality and Bell inequalities.

Revised Author Responses: Response to Epistemological and Realism Concerns.

First, we argue that the core hypothesis is tenable, provided it can form a self-consistent theoretical framework. Second, the measured eigenstate constitutes physical reality—and it is reasonable to infer that this "measured real eigenstate" existed prior to observation. Unfortunately, quantum mechanics explicitly denies this, asserting instead that eigenstates are not preexistent but emerge through random collapse during measurement. This is the essence of the Copenhagen interpretation (and the origin of its "non-local realism"): microscopic particles do not exist until observed, their reality conjured into being by the act of measurement. To hold that physical reality only comes into existence when observed is not merely counterintuitive; it rejects fundamental realism. We advocate for a more balanced epistemological principle: when observing physical reality, we should entertain two possibilities equally—that the observed state existed prior to measurement, or that it was newly formed during measurement—and then rely on empirical evidence to distinguish between them.

A scholarly work merits publication and discussion if it meets two criteria: logical consistency (i.e., its conclusions and arguments are rationally coherent) and significant research potential or inherent importance. Experimental verification can be entrusted to readers with the necessary resources. Our manuscript satisfies both conditions. Had Physical Review required Tsung-Dao Lee and Chen-Ning Yang to provide experimental proof before publishing their paper on "parity non-conservation in weak interactions," this landmark achievement would have been delayed. The same applies to Louis de Broglie's hypothesis of matter waves.

Major Issue 5 – Mathematical validity
Issue: The mathematical derivations require ubstantial pansion.
Reason: The manuscript introduces equations intended to connect wave chanics with classical force laws, but the derivations, assumptions, dimensions, operator properties and limits are not sufficiently established. The authors should provide complete athematical derivations and demonstrate that the proposed equations are ternally consistent.

Author's response: There is a detailed mathematical derivation in the citation. Mathematics is the author's weakness. At present, it seems that Professor Zhao Guoqiu's mathematics (theory) can be borrowed. The author hopes to find collaborators like Yang Zhenning. Yang Zhenning can express any physics problem in mathematical form. Mathematics is the author's weakness, and the author's research work has successfully reduced the application of mathematics. The reason is simple. My research work only changes the explanatory system of relativity and quantum mechanics, while retaining their mathematical formal system. That is to say, I have relatively few additions to the mathematical frameworks of relativity and quantum mechanics. Mainly the Xue Ding Tu equation, quantum mechanics equations of classical mechanics laws, etc.

Response to Mathematical Validity Concerns: Detailed mathematical derivations are referenced in the citations. Admittedly, mathematics is not my primary strength, and I am exploring collaborations with scholars whose expertise complements mine—much like how Chen-Ning Yang's mathematical prowess enabled him to translate complex physical concepts into rigorous formalisms. My research focuses on revising the interpretive frameworks of relativity and quantum mechanics while preserving their mathematical structures. This means I have made minimal additions to the existing mathematical frameworks of these theories, with most innovations concentrated in areas such as the Schrödinger equation and the formulation of quantum-mechanical equivalents to classical mechanical laws.

Major Issue 6 – Evidence for Quantum-Classical Unification
Reviewer's Concern: The evidence provided fails to establish a general quantum-classical unification. Demonstrating agreement with classical results for a single macroscopic system does not prove universal equivalence between quantum and classical mechanics. The framework must be validated across multiple independent systems and experimentally measurable quantities.

Author's Response: The evidence cited is not isolated; instead, it forms a cohesive chain and closed loop of reasoning. The reader's acceptance hinges on willingness to engage with this interconnected evidence, rather than a lack of objective basis for belief. It is worth noting that reader skepticism often stems from subjective choice, not inherent flaws in the evidence itself.

Major Issue 7 – Negative Mass
Reviewer's Concern: Interpreting negative-energy solutions as physical negative-mass matter requires robust justification. Mathematical solutions do not inherently confirm the physical existence of corresponding entities. Rigorous theoretical arguments and experimental evidence are necessary before using negative mass to challenge general relativity.

Author's Response: Total energy is defined as $E=mc^2$, where c (the speed of light) is a positive constant, not a vector. This leaves two sign choices for mass: positive or negative. A critical point is that we cannot arbitrarily exclude negative mass from the energy equation—assuming "negative energy with positive mass" violates the core logic of mass-energy equivalence.

Experimental precedent supports this reasoning: positive-mass particle annihilation releases positive energy, which implies negative-mass antiparticle annihilation would emit negative energy. The equivalence principle demands symmetry in both magnitude and sign: mass and energy must be fully equivalent, not just in absolute value. If energy is negative, mass must also be negative to satisfy E=mc^2, as c^2 is always positive. To argue otherwise would break the fundamental link between mass and energy. Thus, the reviewer's concern misrepresents the equivalence principle: mass and energy are equivalent in both quantity and sign, and negative mass is a necessary mathematical and physical consequence of negative energy.To deny or question the comprehensive equivalence of numbers without considering the equivalence of symbols is to drive out good coins with inferior ones.

Major Issue 8 – Experimental Validation
Issue: The manuscript's experimental claims lack sufficient detail to support its conclusions.
Reason: While the paper references experimental observations purported to challenge the Copenhagen interpretation, critical information about experimental design, control measures, uncertainty quantification, statistical significance, and reproducibility is not provided.

Author's Response:
The cited work refers to the electron diffraction experiment conducted by the author under magnetic field interference—hereafter referred to as the Tu Experiment. Key findings include is as follows.

Core Result: Magnetic field interference applied after the slit did not eliminate diffraction fringes, but only caused their deformation and drift. This directly demonstrates that the slit's influence on microscopic particle propagation persists even when particles are disturbed post-slit.

Context of Diffraction: Diffraction fringes of microscopic particles arise from the slit's interaction with particle trajectories; without a slit, no fringes form. The Tu Experiment confirms that post-slit interference (analogous to "monitoring" electrons after they pass through the slit) does not negate the slit's effect on electron propagation.

Pre-Slit Interference Precedent: Standard diffraction experiments already involve pre-slit disturbances. For example: Photon diffraction uses lenses to focus light before it reaches the slit.

Electron diffraction relies on strong electric fields to generate cathode rays, followed by electromagnetic collimation—both occurring before the slit. The Tu Experiment extends this logic by introducing electromagnetic interference both before and after the slit, effectively subjecting electrons to conditions that would likely induce quantum decoherence or wavefunction collapse.

Challenge to Copenhagen Interpretation: Contrary to the common assertion that "monitoring particles before or after the slit eliminates diffraction fringes," no peer-reviewed experimental report validates this claim (AI-assisted searches found no such studies, suggesting no successful replication to date). Furthermore, the idea that post-slit interference could erase fringes violates causal order: if an electron has already passed through the slit, altering its trajectory afterward cannot retroactively change its "historical" path through the slit.

A particularly crucial point emerges from the above statement: in diffraction experiments, particles are inevitably exposed to interference from focusing lenses or collimating electromagnetic fields, satisfying the conditions for quantum decoherence and superposition collapse. This is especially true of the Tu experiment, which incorporates post-slit interference—meaning the diffracting particles are perturbed throughout the entire process, providing even stronger justification for asserting that quantum decoherence and superposition collapse occur.

The Copenhagen interpretation, the dominant framework in quantum mechanics, holds as a core premise that "any perturbation of a particle will trigger quantum decoherence or superposition collapse, transitioning the particle into a macroscopic eigenstate." By this logic, it is highly probable that microscopic particles remain in a quantum decoherent, macroscopic eigenstate both before and after passing through the slit in diffraction experiments. For the Tu experiment, which adds post-slit interference, the case for electrons being in a macroscopic eigenstate during diffraction is even more compelling.

Notably, proponents of the established quantum interpretation system reject the idea that particles exist in a macroscopic eigenstate during diffraction—a stance that directly contradicts their own foundational premise.

Major Issue 9: Overly Broad Conclusions

Concern: The manuscript's conclusions extend beyond the scope of the evidence presented. It claims to fundamentally revise relativity, quantum mechanics, and classical mechanics, yet such sweeping assertions require independent experimental validation and far more rigorous theoretical support.

Author's Response: A critical priority is developing technical approaches to unify quantum and classical mechanics, and to reconcile relativistic and absolute frameworks. Our work achieves this through:

Quantum-classical unification: We have formulated quantum mechanical equations that accommodate classical mechanical laws (and thus support local realist quantum mechanics), alongside computational examples demonstrating successful integration of the two frameworks.

Relativistic-absolute reconciliation: We propose the technique of "clock slowing due to absolute motion," where "absolute motion" derives from the concept of absolute spacetime, while "clock slowing due to motion" aligns with relativistic time dilation. This bridges the gap between absolute and relativistic perspectives.

These methods are not merely theoretical; the quantum mechanical equations that embed classical laws serve as robust evidence. Simplicity in mathematical deduction does not equate to unreliability. Just as we accept the validity of 1+2=3 or the solutions $x = \pm 2$ for $x^2 = 4$ without dismissing them as "too simple," the computational results underpinning our conclusions should not be discounted based on their simplicity.

Major Issue 10 – Literature and independent validation

Issue: The literature discussion should be broadened. Reason: The manuscript relies extensively on the author's own publications in developing the proposed framework. Independent literature and alternative theoretical viewpoints should be incorporated to demonstrate that the proposed approach has been critically evaluated against existing knowledge.

Revised Author Response: We fully acknowledge the value of incorporating a broader range of independent literature and alternative theoretical perspectives to further contextualize and validate our proposed framework, and we agree that this would enhance the manuscript's scholarly rigor. At this stage, however, the submission represents a phased interim achievement, which we believe is suitable for dissemination as a work-in-progress to share preliminary insights and solicit feedback from the academic community. We remain committed to addressing this recommendation in subsequent iterations of our research.