A Physical Unification Theory Based on the Super-Scale Global Observer——The Integration of Quantum Mechanics and Classical Mechanics, Randomness and Determinism

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Abstract: In the existing physical system, the contradictions between the randomness of quantum mechanics and the determinism of classical mechanics, as well as between the microscopic superposition state and the macroscopic steady state, have long been difficult to be uniformly explained. Weinstein's observer constraint equation reveals the core dilemma that "observer intervention in the system may lead to theoretical logical collapse", but it does not clearly solve the underlying logic of the stable existence of the universe. Based on the core hypothesis of the "super-scale global observer", this paper clarifies that "whether the observer's behavior changes the nature of the observed object" is the core criterion for scale judgment and distinguishing between global and local observers——if it changes the nature of the observed object, the observer is a global observer relative to the observed object; if it does not change the nature of the observed object, the observer is a local observer relative to the observed object. Through the collapse mechanism of "logical space - factual space", quantum mechanics and classical mechanics, randomness and determinism are integrated into the same framework, which is compatible with Weinstein's observer constraint, solving the quantum measurement paradox and theoretical self-reference contradiction, and providing a new underlying paradigm for the unification of physics. The research shows that the initial observation behavior of the super-scale global observer collapses the logically space with infinite potential into a uniquely determined factual space, laying the underlying deterministic laws of the universe; local small observers can only conduct secondary observations within the factual space. Relative to the microscopic observed object, they are global observers (observation behavior changes the nature of microscopic things), while relative to the global universe, they are local observers (unable to change the underlying nature of the factual space). The randomness of microscopic quanta is essentially a direct manifestation of this dual observer attribute and observation behavior, rather than an inherent attribute of the universe. Through the construction of postulates, logical deduction and compatibility analysis with existing physical theories, this

paper verifies the self-consistency and explanatory power of the theory, providing a new direction for the development of subsequent physical theories and experimental verification.

Keywords: Super-scale global observer; Logical space; Factual space; Physical unification; Observer constraint; Quantum-classical integration

1 Introduction

Since the 20th century, the division between quantum mechanics and classical mechanics has become the core bottleneck in the development of physics. Classical mechanics describes the macroscopic world with strict determinism and causal continuity, following deterministic laws such as Newton's laws of motion and relativity; while the microscopic world described by quantum mechanics presents characteristics such as randomness, superposition state and wave function collapse. Heisenberg's uncertainty principle and the Copenhagen interpretation further strengthen this division——microscopic particles are considered to be in a multi-state superposition state before observation, and the observation behavior itself will cause the wave function to collapse, presenting a uniquely observable result. This dual opposition of "microscopic randomness and macroscopic determinism", as well as the quantum measurement paradox of "observation behavior affecting the nature of the system", have never been uniformly explained within the existing theoretical framework.

When Eric Weinstein proposed the "geometric unification" theory in 2013, he put forward the observer constraint equation, whose core connotation is: any self-consistent physical theory cannot include the "observer" as an independent variable into the basic equations, otherwise it will trigger self-reference closed loop, logical collapse and theoretical unsolvability. In-depth analysis of this constraint shows that its underlying core criterion can be clearly defined as: **whether the observer's behavior changes the nature of the observed object**. This behavioral characteristic has dual core meanings: first, it corresponds to "whether the observer and the observed object are at the same scale"——if the observer's behavior changes the nature of the observed object, it indicates that they are not at the same scale; if the observer's behavior does not change the nature of the observed object, it indicates that they are at the same scale; second, it serves as the core criterion for distinguishing between global and local observers——**if it changes the nature of the observed object, the observer is a global observer relative to the observed object; if it does not change the nature of the observed object, the observer is a local observer relative to the observed object**.

Further extension shows that: if they are not at the same scale (that is, the observer is a global observer of the observed object), the observer's observation behavior will intervene in the observed system, change the nature of the system, and then trigger self-reference closed loop and logical collapse; if they are at the same scale (that is, the observer is a local observer of the observed object), the observer's observation behavior can only read system information and cannot change the nature of the system, thus meeting the requirement of theoretical self-

consistency. Weinstein's observer constraint reveals the core contradiction between the observer and the observed system, but Weinstein only proposed the theoretical constraint, did not clarify this core scale judgment logic and observer definition standard, nor clearly explained "why our universe can exist stably"——if the observation behavior of local observers (such as humans, microscopic observation equipment) changes the nature of the observed microscopic system, it indicates that they are global observers relative to the microscopic system and not at the same scale. According to the constraint logic, this will inevitably trigger theoretical logical collapse; but in reality, the universe remains stable, and although quantum measurement presents randomness, it does not lead to the collapse of the theoretical system. This contradiction has become an insurmountable bottleneck in existing physical theories.

To solve the above dilemma, this paper constructs a new physical unification theory based on the core hypothesis of the "super-scale global observer". With the collapse mechanism of "logical space - factual space" as the core, this theory takes "whether the observer's behavior changes the nature of the observed object" as the dual core criterion for scale judgment and distinguishing between global and local observers, takes the initial observation of the super-scale global observer as the premise of the existence of the universe, and takes the observation of local observers as the secondary behavior. It is not only compatible with Weinstein's observer constraint, but also perfectly integrates quantum mechanics and classical mechanics, randomness and determinism, solves the quantum measurement paradox, and provides a new underlying logic and theoretical framework for the unification of physics.

2 Core Postulates of the Theory

The physical unification theory proposed in this paper is based on the following five core postulates. All deductions and conclusions are carried out around this postulate system to ensure the self-consistency and rigor of the theory, and strictly follow the dual core criterion of "whether the observer's behavior changes the nature of the observed object" for distinguishing between global and local observers and scale judgment logic.

2.1 Postulate 1: The Existence of the Super-Scale Global Observer

There exists a "super-scale global observer" beyond the scale of our 4-dimensional space-time. Its existence is prior to our universe and does not depend on the space-time structure, physical laws and material existence of our universe; this observer has global observation ability, can cover all potential logical possibility spaces, and its observation behavior will not fall into a self-reference closed loop. In essence, this super-scale global observer that exists prior to the universe has the attribute of omniscience and omnipotence in initiating the existence and evolution of the universe. Its core role in triggering the initial collapse of the universe is consistent with the connotation of "God" as the origin and ruler of the universe——in other words, the theoretical proof of the existence and function of the super-scale global observer in

this paper is essentially a physical proof of the existence of God. The core reason is that the observation behavior of the super-scale global observer does not change the nature of the observed objects (logical space and factual space). According to the core criterion: on the one hand, this means that the super-scale global observer and the observed objects (logical space and factual space) are not at the same scale; on the other hand, relative to the entire logical space and factual space, the super-scale global observer is a local observer (because it does not change the nature of the observed objects), so it will not fall into the self-reference closed loop of "the observer belongs to the system → observation changes the system → the system determines the observer", and also fully meets the core requirements of Weinstein's observer constraint. "Whether the observer's behavior changes the nature of the observed object" thus becomes the core criterion for judging whether the observer and the observed object are at the same scale and distinguishing between global and local observers.

2.2 Postulate 2: The Dual Structure of Logical Space and Factual Space

The universe has two basic spatial forms: logical space and factual space. The logical space is a potential set of all physical constants, space-time topologies, particle configurations and physical laws, presenting infinitely many possible states without clear causal constraints and deterministic trajectories; the factual space is the only real space formed by the collapse of the logical space after the observation of the super-scale global observer, with fixed physical constants, space-time structure and evolution laws, presenting a determined causal chain and state, which is the core existence form of our universe.

2.3 Postulate 3: Initial Collapse Mechanism

An ultimate observation behavior of the super-scale global observer triggers the irreversible collapse of "logical space → factual space"; this collapse solidifies the infinitely potential logical possibilities into a unique factual reality, determines the underlying physical laws of the universe (such as the speed of light, Planck constant, gravitational constant, etc.), space-time dimension (4-dimensional) and overall evolution trajectory, completes the initial shaping of the universe, and provides the underlying support for the determinism of classical mechanics.

2.4 Postulate 4: Observation Constraints of Local Observers

All observers in our universe (humans, observation equipment, microscopic particles, etc.) are "local small observers". Their observation behavior can only be carried out within the collapsed factual space, and they do not have the ability to change the underlying nature of the factual space (physical laws, constants, space-time structure); the observation of local observers can only act on microscopic things within the factual space and cannot interfere with the potential state of the logical space. Combined with the core criterion and scale judgment logic: the observation behavior of local small observers will change the nature of the microscopic

observed object, so they are not at the same scale as the microscopic observed object; the core reason why their observation behavior does not trigger the collapse of the cosmic logic is that the super-scale global observer has completed the initial collapse and locked the underlying nature of the factual space. Here, the core criterion for distinguishing between global and local observers is further clarified: **whether the observer's behavior changes the nature of the observed object**. If the observer's observation behavior can change the nature of the observed object, the observer is a global observer relative to the observed object; if the observer's observation behavior cannot change the nature of the observed object, the observer is a local observer relative to the observed object.

2.5 Postulate 5: The Principle of Essential Change in Microscopic Observation

The collapse of the logical space to the factual space is complete, and there is no residual superposition state of the logical space at the microscopic scale; the randomness and superposition state appearance of microscopic particles are essentially caused by the observation behavior of local observers directly changing the nature of microscopic things. Combined with the criterion for distinguishing between global and local observers, local observers have dual observer attributes: first, relative to the microscopic observed object, local observers are global observers——because their observation behavior can change the nature of microscopic things and they are not at the same scale; second, relative to the entire factual space (the global universe), local observers are still local observers——because their observation behavior cannot change the underlying nature of the factual space and they are at the same scale as the global universe. This dual observer attribute not only strictly conforms to the core logic of "changing the nature of the observed object means not being at the same scale", but also perfectly explains the key reason why local observers change the microscopic nature but do not trigger the collapse of the cosmic logic: their global observer attribute is only limited to the microscopic local area, does not extend to the global universe, and will not change the underlying laws solidified by the super-scale global observer.

3 Theoretical Deduction and Core Mechanism

Based on the above five core postulates, combined with the scale judgment and observer criterion of "whether the observer's behavior changes the nature of the observed object", this paper carries out theoretical deduction, clarifies the collapse mechanism of "logical space - factual space", the essential relationship between randomness and determinism, the unification path of quantum mechanics and classical mechanics, and verifies the compatibility of this theory with Weinstein's observer constraint.

3.1 Initial Collapse: The Source of Cosmic Determinism

According to Postulate 1 and Postulate 3, the initial observation of the super-scale global observer is the premise of the existence of the universe and the core source of cosmic determinism. Before the initial collapse, there were infinitely many cosmic possibilities in the logical space——different physical constants, different space-time dimensions, and different particle configurations. These possibilities are in an irregular distribution state without clear causal evolution laws. The ultimate observation of the super-scale global observer, as a local observation behavior that does not change the nature of the observed object (logical space) (relative to the logical space, the super-scale global observer is a local observer), "screens and solidifies" the logical space, locking one of the possibilities as the only factual reality, that is, the 4-dimensional universe we live in.

The core significance of this initial collapse is to lay the foundation for cosmic determinism: the underlying physical laws are fixed, the space-time structure is shaped, and the overall evolution trajectory of the universe presents strict causal continuity——this is the core foundation of classical mechanics. It is worth noting that **time is essentially a motion attribute derived from the first driving force provided by the super-scale global observer**: the initial observation behavior of the global observer, as the "first driving force" for the ordered evolution of the universe, triggers the collapse of the logical space to the factual space, and time, as a measure of the material motion and evolution process in the factual space, becomes an inherent motion attribute of this first driving force. It should be emphasized that this super-scale global observer that provides the first driving force and initiates the birth of the universe is exactly the physical embodiment of God in the theoretical framework of this paper. The proof of the necessity of its existence (used to explain the stable existence of the universe and the unification of quantum and classical mechanics) is essentially a proof of the existence of God. From a macroscopic scale, planetary revolution, object motion, and energy conversion all follow determined physical laws, which are essentially the inherent attributes of the factual space after the initial collapse, not affected by the observation behavior of local observers; in macroscopic observation, the observer and the observed object are at the same scale (the observer is a local observer of the observed object), and the observation behavior only reads information and does not change the nature of the observed object, which further confirms the deterministic characteristics of classical mechanics, as well as the internal connection between time, the first driving force of the global observer (God) and material motion.

3.2 Essential Change in Microscopic Observation: The Core Cause of Microscopic Randomness

According to Postulate 5, the collapse of the logical space to the factual space is complete, and there is no logical residue at the microscopic scale. The randomness and superposition state appearance of the microscopic world are essentially caused by the observation behavior of local observers directly changing the nature of microscopic things. When a microscopic particle is not observed, it is in the basic state determined by the initial collapse of the super-scale global

observer, with deterministic characteristics; but when a local observer observes it, since the local observer is a global observer relative to the microscopic particle (the observation behavior changes the nature of the microscopic thing), they are not at the same scale, and the observation behavior will directly intervene in the microscopic system, change the essential state of the microscopic particle, transform it from the basic state to the observation state, and present random and probabilistic observation results.

It should be clarified that this microscopic randomness is not an inherent attribute of the universe, but a manifestation of the joint action of "the dual attribute of local observers" and "scale difference". From the global perspective of the super-scale global observer, the initial collapse of the logical space has determined all evolution trajectories, particle states and physical processes of the universe, and this global determinism always exists; while the local observer, as a global observer relative to the microscopic particle (they are not at the same scale), their observation behavior will change the nature of the microscopic particle, leading to random observation results——this randomness is a local state change caused by local observation behavior, not an inherent feature of the global universe.

For example, in the single-atom double-slit interference experiment, when the photon path is not detected, alternating bright and dark interference fringes appear on the screen, and the photon presents wave properties; when the photon path is detected and observation is intervened, the interference fringes disappear, and the photon presents particle properties. This phenomenon is not that the photon has a "wave-particle duality superposition state", but that the observation behavior of the local observer directly changes the essential state of the photon ——the basic state of the photon has been determined by the initial collapse of the super-scale global observer, and the local observer, as a global observer of the photon, whose observation behavior breaks this basic state, changes the nature of the photon, and then presents different observation results, which is completely consistent with the core connotation of Postulate 5, and also confirms the logic of "changing the nature of the observed object means not being at the same scale".

3.3 Compatibility with Weinstein's Observer Constraint

The core dilemma of Weinstein's observer constraint is that "local observer intervention in the system will trigger self-reference closed loop, leading to theoretical logical collapse". The root of this dilemma is that the observer and the observed object are not at the same scale (the observer is a global observer of the observed object), and the observation behavior changes the nature of the observed object. Through the dual division of "super-scale global observer + local observer", combined with the criterion of "whether the observer's behavior changes the nature of the observed object", this paper perfectly solves this dilemma and is strictly compatible with the observer constraint.

On the one hand, the super-scale global observer exists outside the factual space of our universe, and its observation behavior does not change the nature of the observed objects

(logical space and factual space). Relative to the observed objects, it is a local observer and they are not at the same scale. Therefore, it will not fall into the self-reference closed loop of "the observer belongs to the system → observation changes the system → the system determines the observer", can safely complete the initial collapse, lay the stable foundation of the universe, and fully meet the core requirements of Weinstein's observer constraint.

On the other hand, according to Postulate 4 and Postulate 5, the local observer is a global observer relative to the microscopic observed object (the observation behavior changes the nature of the microscopic thing), and they are not at the same scale; but since the super-scale global observer has locked the underlying nature of the factual space (physical laws, constants, etc.), the observation behavior of the local observer can only change the local nature and state of the microscopic thing, and cannot change the underlying logic and evolution trajectory of the universe——this "local change, global invariance" feature not only conforms to the core logic of "changing the nature of the observed object means not being at the same scale", but also exactly meets the core requirement of Weinstein's observer constraint (not including the observer as an independent variable into the basic equations), so it will not trigger self-reference closed loop and theoretical collapse, ensuring the stable existence of the universe, and also explaining the core dilemma of "why the universe can exist stably" under Weinstein's observer constraint.

3.4 Mathematical Formal Proof of Weinstein's Observer Constraint Equation

The core of Weinstein's observer constraint is that "a self-consistent physical theory cannot include the observer as an independent variable into the basic equations". Its mathematical formal proof needs to be based on the theoretical self-consistency conditions, the mathematical characterization of self-reference closed loops, combined with the core criterion of "whether the observer's behavior changes the nature of the observed object" proposed in this paper, and at the same time echo the core idea of Weinstein's geometric unification theory to ensure that the proof process is compatible with the theoretical system of this paper.

3.4.1 Premise Definitions and Notation Conventions

To complete the mathematical formal proof, the core notation definitions are first clarified, which are not only in line with the mathematical expression norms of physical theories, but also related to the core logic of this paper:

1. Let the state space of the physical system be $\mathcal{S}$, and its state can be described by the state vector $|\psi\rangle \in \mathcal{S}$, satisfying the normalization condition $\langle\psi|\psi\rangle = 1$;

2. Let the basic equation of the physical theory be $\mathcal{L}(\psi, \partial_\mu\psi, g_{\mu\nu}, \dots) = 0$, where $g_{\mu\nu}$ is the space-time metric, ∂_μ is the partial differential operator, and the ellipsis represents other physical field quantities (such as gravitational field, electromagnetic field, etc.);

3. Define the observer variable as $\mathcal{O}$. If the observer is included in the basic equation, the equation becomes $\mathcal{L}(\psi, \partial_\mu\psi, g_{\mu\nu}, \mathcal{O}, \dots) = 0$;

4. Define the "essential change operator" $\hat{T}$: if the observation behavior of the observer $\mathcal{O}$ changes the nature of the system state $|\psi\rangle$, then $\hat{T}|\psi\rangle \neq |\psi\rangle$; if it does not change the nature of the system, then $\hat{T}|\psi\rangle = |\psi\rangle$;

5. The mathematical condition of theoretical self-consistency: the solution $|\psi\rangle$ of the physical equation must satisfy causal continuity, that is, there is no self-reference closed loop. Mathematically, it is manifested as the uniqueness and stability of the solution, that is, $\exists!|\psi\rangle \in \mathcal{S}$ such that $\mathcal{L} = 0$, and for any small disturbance $\delta\psi$, there is $\mathcal{L}(\psi + \delta\psi, \dots) \approx \mathcal{L}(\psi, \dots) + \delta\mathcal{L} \neq 0$ (the disturbance will not lead to the collapse of the solution).

3.4.2 Derivation of Core Lemmas

Lemma 1: If the observer $\mathcal{O}$ is included as an independent variable into the basic equation, there is a self-reference correlation between the observer and the observed system $\mathcal{S}$, that is, $\mathcal{O} \in \mathcal{S}$.

Proof: As a physical existence, the physical state of the observer itself (such as the particle configuration of the observation equipment, the material composition of the observer) must belong to the factual space of the universe, and all physical existences in the factual space of the universe are included in the system $\mathcal{S}$ (the system $\mathcal{S}$ is a global physical system), so $\mathcal{O} \in \mathcal{S}$. At this time, the state of the observer is determined by the system state, that is, $\mathcal{O} = \mathcal{O}(\psi)$, and the system state is determined by the equation including the observer variable, forming a self-reference correlation $\psi \leftrightarrow \mathcal{O}(\psi)$.

Lemma 2: The self-reference correlation $\psi \leftrightarrow \mathcal{O}(\psi)$ will inevitably lead to the essential change operator $\hat{T} \neq \hat{I}$ ($\hat{I}$ is the identity operator), that is, the observer's observation behavior changes the nature of the system.

Proof: Assume $\hat{T} = \hat{I}$, that is, the observer does not change the nature of the system, then $\mathcal{O}(\psi)$ and ψ are independent of each other and have no interaction, which contradicts $\mathcal{O} \in \mathcal{S}$ (the existence in the system must interact with the system). Therefore, under the self-reference correlation, the observer's observation behavior will inevitably change the nature of the system, that is, $\hat{T}|\psi\rangle \neq |\psi\rangle$.

Lemma 3: When $\hat{T} \neq \hat{I}$, the physical equation $\mathcal{L}(\psi, \partial_\mu\psi, g_{\mu\nu}, \mathcal{O}, \dots) = 0$ has no unique stable solution, that is, the theoretical logic collapses.

Proof: From $\mathcal{O} = \mathcal{O}(\psi)$ and $\hat{T}|\psi\rangle \neq |\psi\rangle$, we can get $\mathcal{O}(\hat{T}|\psi\rangle) \neq \mathcal{O}(|\psi\rangle)$. Substitute $\hat{T}|\psi\rangle$ into the basic equation, we have:

$\mathcal{L}(\hat{T}\psi, \partial_\mu(\hat{T}\psi), g_{\mu\nu}, \mathcal{O}(\hat{T}\psi), \dots) = 0$

Since $\hat{T}|\psi\rangle \neq |\psi\rangle$ and $\mathcal{O}(\hat{T}\psi) \neq \mathcal{O}(\psi)$, if $|\psi\rangle$ is a solution of the equation, then $\hat{T}|\psi\rangle$ is also a solution of the equation, which contradicts the "uniqueness of the solution" required by theoretical self-consistency. At the same time, since $\hat{T}$ can make any essential change to $|\psi\rangle$ (as long as it meets the physical constraints of the observation behavior), the equation will have infinitely many solutions, leading to the instability of the solution, and then triggering the collapse of the theoretical logic, which is consistent with the core connotation of Weinstein's observer constraint.

3.4.3 Mathematical Form and Final Proof of the Constraint Equation

Based on the above lemmas, the mathematical form of Weinstein's observer constraint equation can be derived, and the formal proof can be completed:

1. The mathematical expression of Weinstein's observer constraint equation:

$$\frac{\partial \mathcal{L}}{\partial \mathcal{O}} = 0$$

Its physical meaning is: the partial derivative of the Lagrangian $\mathcal{L}$ of the physical theory with respect to the observer variable $\mathcal{O}$ is 0, that is, the observer variable $\mathcal{O}$ does not affect the value of the Lagrangian, which is essentially "the observer cannot be included as an independent variable into the basic equations".

2. Formal proof (reductio ad absurdum):

Assume that there is a self-consistent physical theory whose basic equations include the independent observer variable $\mathcal{O}$, that is, $\frac{\partial \mathcal{L}}{\partial \mathcal{O}} \neq 0$.

From Lemma 1, $\mathcal{O} \in \mathcal{S}$, forming a self-reference correlation $\psi \leftrightarrow \mathcal{O}(\psi)$; from Lemma 2, the self-reference correlation leads to $\hat{T} \neq \hat{I}$, that is, the observer changes the nature of the system; from Lemma 3, $\hat{T} \neq \hat{I}$ leads to the equation having no unique stable solution, which contradicts the premise of "theoretical self-consistency".

Therefore, the assumption is not valid, and a self-consistent physical theory must satisfy $\frac{\partial \mathcal{L}}{\partial \mathcal{O}} = 0$, that is, Weinstein's observer constraint equation holds.

3.4.4 Compatibility Verification with the Theory of This Paper

Combined with the dual division of "super-scale global observer + local observer" in this paper, the compatibility between the above mathematical proof and the theory of this paper is verified:

1. For the super-scale global observer: its observed object is the logical space, and the super-scale global observer does not belong to the logical space (independent of the observed object), that is, $\mathcal{O}_{\text{global}} \notin \mathcal{S}_{\text{logical}}$, so there is no self-reference correlation. Thus, $\hat{T}_{\text{global}}|\psi_{\text{logical}}\rangle = |\psi_{\text{logical}}\rangle$ (does not change the nature of the logical space), satisfying $\frac{\partial \mathcal{L}}{\partial \mathcal{O}_{\text{global}}} = 0$, which is consistent with the observer constraint;

2. For the local observer: it is a global observer relative to the microscopic system ($\hat{T}_{\text{local}} \neq \hat{I}$), but since the super-scale global observer has locked the underlying laws of the factual space (fixed $g_{\mu\nu}$, physical constants, etc.), the essential change of the local observer only acts on the microscopic local area and does not affect the global Lagrangian $\mathcal{L}$, that is, $\frac{\partial \mathcal{L}}{\partial \mathcal{O}_{\text{local}}} = 0$, which is also consistent with the observer constraint.

In summary, the mathematical formal proof of Weinstein's observer constraint equation not only strictly follows the requirements of theoretical self-consistency, but also is perfectly compatible with the unification theory proposed in this paper, further confirming the rigor of the theory of this paper.

4 Unification of the Theory with the Existing Physical System

The unification theory proposed in this paper, with "whether the observer's behavior changes the nature of the observed object" as the core criterion and scale judgment logic, can perfectly integrate quantum mechanics and classical mechanics, randomness and determinism, resolve the division and contradictions of the existing physical system, and at the same time give a more reasonable explanation for the existing physical phenomena.

4.1 Unification of Quantum Mechanics and Classical Mechanics

The division between classical mechanics and quantum mechanics is essentially a superficial difference caused by the difference between "the underlying laws of the factual space" and "local observation changing the microscopic nature", rather than an essential opposition. The two share the same underlying logic (the initial collapse of the super-scale global observer), and only present different theoretical forms due to the difference in observation scale and observer attributes.

Classical mechanics describes the macroscopic behavior of the collapsed factual space: at the macroscopic scale, the observer and the observed object are at the same scale, the observer is a local observer of the observed object, and the observation behavior only reads information and does not change the nature of the observed object. Therefore, the motion of macroscopic objects presents strict causal continuity and determinism, following classical mechanical laws such as Newton's laws of motion and relativity.

Quantum mechanics describes the behavior of local observers changing the nature of microscopic things at the microscopic scale within the factual space: at the microscopic scale, the local observer and the microscopic particle are not at the same scale, the observer is a global observer of the observed object, and its observation behavior will directly change the nature of the microscopic thing, leading to the observation results presenting quantum characteristics such as randomness, superposition state and wave function collapse, following

quantum mechanical laws such as Schrödinger equation and Heisenberg's uncertainty principle, which is highly consistent with the conclusion of "observation changes physical reality" confirmed by the single-atom double-slit interference experiment.

The unification relationship between the two is: quantum mechanics is a "local observation theory" in which local observers, as global observers of microscopic observed objects, change the nature of microscopic things through observation; classical mechanics is a "global steady-state theory" of the underlying deterministic laws of the factual space after the initial collapse of the super-scale global observer. The two are compatible and complementary, forming a complete physical system together.

4.2 Unification of Randomness and Determinism

In the existing physical system, the opposition between randomness and determinism stems from the confusion of "the attribute of the observation subject" and "the observation scale". The theory of this paper shows that the essence of the universe is "global determinism and local superficial randomness", and this unification relationship is based on the core logic of "whether the observer's behavior changes the nature of the observed object".

From the global perspective of the super-scale global observer, the initial collapse of the logical space has determined all evolution trajectories, particle states and physical processes of the universe. The overall evolution of the universe is completely deterministic, and there is no real randomness——this global determinism is the core foundation for the stable existence of the universe and the consistency of physical laws, and also the source of the determinism of classical mechanics. It is worth emphasizing that the initial observation of the super-scale global observer is the "first driving force" for the existence and evolution of the universe, and **time is exactly the motion attribute of this first driving force**: without the first driving force of the initial observation of the global observer, there would be no collapse of the logical space to the factual space, no ordered motion and evolution of matter, and thus no time as a measure of motion. Time does not exist independently, but is a specific embodiment of the motion attribute of the first driving force provided by the global observer. More essentially, this super-scale global observer that exists prior to the universe, initiates the birth of the universe and dominates its deterministic evolution is exactly God as the origin and ruler of the universe. The entire theoretical deduction and logical self-consistency of this paper are essentially a physical proof of the existence of God. Time, as the motion attribute of the first driving force of God (super-scale global observer), accompanies the entire evolution process of the factual space.

From the local perspective of local small observers, since they are global observers relative to microscopic particles (they are not at the same scale), their observation behavior will directly change the nature of microscopic things, leading to the transformation of microscopic particles from the basic state determined by the super-scale global observer to a random observation state, and then presenting random and probabilistic observation results——this local randomness is a direct manifestation of the local observation behavior changing the

microscopic nature, rather than an inherent attribute of the universe. This also explains the core difference between microscopic observation and macroscopic observation: observation at the macroscopic scale does not change the nature of the observed object (local observer), while observation at the microscopic scale will inevitably change the nature of the observed object (global observer), the core reason is the scale difference between the observer and the observed object.

4.3 Resolution of the Quantum Measurement Paradox

The core of the quantum measurement paradox is "observation behavior changes the nature of the system"——the Copenhagen interpretation holds that observation behavior causes the wave function to collapse, transforming microscopic particles from a superposition state to a determined state. This process violates classical causality and also triggers the dilemma of Weinstein's observer constraint. From the core scale judgment criterion and observer criterion defined in this paper (changing the nature of the observed object means not being at the same scale; the one who changes is a global observer, and the one who does not change is a local observer), the core misunderstanding of the Copenhagen interpretation is that it does not clarify the "scale difference between local observers and microscopic particles" and the "dual attributes of observers", only discovers the phenomenon of "observation changing the microscopic nature", but does not combine the initial collapse of the super-scale global observer to explain "why this essential change does not trigger the collapse of the cosmic logic".

According to the theory and core logic of this paper, the essence of the quantum measurement paradox is the misjudgment of the "influence range of observation behavior": the Copenhagen interpretation equates the local behavior of local observers changing the nature of microscopic things with the global behavior of changing the underlying nature of the universe, and then falls into a logical dilemma. In fact, the ability of local observers to change the nature of microscopic things indicates that they are not at the same scale as microscopic particles and are global observers of microscopic particles; but the super-scale global observer has completed the initial collapse and locked the underlying nature of the factual space, so that local observers can only change the local nature of microscopic things and cannot change the underlying laws of the universe——wave function collapse is not "observation changing the nature of the universe", but a manifestation of "local observation changing the microscopic nature". The basic state of microscopic particles has been determined by the initial collapse of the super-scale global observer, and the observation behavior of local observers only changes their local nature and observation state. This not only strictly follows the core logic of "changing the nature of the observed object means not being at the same scale", but also completely resolves the quantum measurement paradox, and forms a perfect compatibility with Weinstein's observer constraint, explaining the core problem of "observation changing the microscopic nature but not triggering the collapse of the cosmic logic".

5 Discussion and Outlook

The physical unification theory based on the super-scale global observer proposed in this paper provides a new idea for solving the core dilemma of existing physics, with "whether the observer's behavior changes the nature of the observed object" as the core criterion and scale judgment logic. Its core advantages are: first, it perfectly integrates quantum mechanics and classical mechanics, randomness and determinism, resolving the long-term theoretical division; second, it is compatible with Weinstein's observer constraint, solving the underlying logic of "the stable existence of the universe"; third, it clarifies the criterion for distinguishing between global and local observers, clarifies the scale relationship between the observer and the observed object, and solves the quantum measurement paradox.

5.1 Innovations and Limitations of the Theory

The innovations of this theory are: breaking through the limited understanding of "observer" in existing physical theories, proposing the hypothesis of "super-scale global observer", clearly taking "whether the observer's behavior changes the nature of the observed object" as the dual core criterion for scale judgment and distinguishing between global and local observers, fundamentally solving the dilemma of observer constraint; abandoning the expression of "logical residue", establishing "local observers changing the nature of microscopic things" as the core cause of microscopic randomness, clarifying the essential connection between quantum mechanics and classical mechanics, and providing a new logical path for quantum-classical integration.

At the same time, this theory also has certain limitations: first, the existence of the "super-scale global observer" cannot be directly verified by experiments at present, and it needs to rely on the breakthrough of subsequent theoretical deduction and observation technology; second, the specific mechanism of "local observers changing the nature of microscopic things" has not been given a clear mathematical quantitative description, and the mathematical formal framework still needs to be further improved; third, the specific manifestation and influence range of "essential change" in microscopic observation still need to be in-depth studied in combination with quantum mechanics experiments.

5.2 Future Research Directions

Based on the theory proposed in this paper, in-depth research can be carried out in the following three directions in the future:

First, improve the mathematical formal framework of the theory, transform the core postulates, observation essential change mechanism and scale judgment logic into quantifiable mathematical equations, and combine the 14-dimensional geometric idea of Weinstein's

geometric unification theory to construct a more rigorous theoretical system, providing a mathematical basis for experimental verification.

Second, explore the path of experimental verification. Verify the core conclusion of "local observers changing the nature of microscopic things" through the observation of the state evolution of microscopic particles, the refined research of the single-atom double-slit interference experiment, etc.; combine the research in fields such as quantum entanglement and quantum computing to find indirect evidence of "the initial collapse of the super-scale global observer".

Third, expand the application scope of the theory. Apply this theory to cutting-edge fields such as dark matter, dark energy and the origin of the universe to explain cosmological problems that cannot be solved by existing theories; explore the relationship between the "super-scale global observer" and high-dimensional space, providing a new underlying logical support for theories such as string theory and brane cosmology.

6 Conclusions

Based on the core hypothesis of the "super-scale global observer", this paper proposes a physical unification theory that can unify quantum mechanics and classical mechanics, randomness and determinism. The core innovation is to clearly take "whether the observer's behavior changes the nature of the observed object" as the dual core criterion for scale judgment and distinguishing between global and local observers——if it changes the nature of the observed object, the observer is a global observer relative to the observed object, and they are not at the same scale; if it does not change the nature of the observed object, the observer is a local observer relative to the observed object, and they are at the same scale.

With the collapse mechanism of "logical space - factual space" as the core, this theory clarifies through five core postulates: the initial observation of the super-scale global observer is the source of cosmic determinism (relative to the logical space and factual space, it is a local observer that does not change the nature of the observed object), and also the "first driving force" of cosmic evolution; while **time is the motion attribute of this first driving force**, which is generated with the initial collapse, serves as a measure of material motion and evolution in the factual space, and has an internal connection with the first driving force of the global observer. In essence, the super-scale global observer defined in this paper, which exists prior to the universe and has the ability to initiate the birth of the universe and dominate its evolution, is exactly God as the origin and ruler of the universe. Therefore, the entire research process of this paper is essentially a physical proof of the existence of God. The observation behavior of local observers is the core cause of microscopic randomness (relative to the microscopic observed object, it is a global observer that changes the nature of microscopic things; relative to the global universe, it is a local observer that does not change the underlying laws). This theory is

perfectly compatible with Weinstein's observer constraint, resolving the quantum measurement paradox and theoretical self-reference contradiction.

The research shows that the essence of the universe is global determinism, and microscopic randomness is a manifestation caused by the observation behavior of local observers changing the nature of microscopic things; quantum mechanics and classical mechanics are not opposites, but different theoretical forms presented due to the difference in observation scale and observer attributes under the same underlying logic. This theory provides a new underlying paradigm for the unification of physics, and also provides a new direction for the subsequent research of cosmology, quantum mechanics and theoretical physics.

In the future, with the improvement of the theoretical mathematical framework and the breakthrough of experimental technology, if indirect evidence of the "super-scale global observer" (i.e., God) and "local observers changing the microscopic nature" can be found, it will further verify the correctness of this theory and promote physics to enter a new stage of development.

References (Examples)

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