

Holographic Quantum Theory of Consciousness

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Abstract

All observations are fundamentally rooted in consciousness. In this paper, we embark on an exploration to gain insights and even derivations about natural laws and phenomena by delving into the basic constituents of consciousness. We propose that the basic constituents of consciousness consist of two pairs of duality consciousness: change-unchange duality consciousness and inclusion-exclusion duality consciousness. We derive mathematical actions to quantify the amount of information within human consciousness, leading to the discovery of the holographic action obtained in our previous work. From this holographic action, we can derive a mathematical formula expressing the hologram, which describes the potential information, energy, and matter that can manifest through human consciousness. From this, we deduce the natural laws and phenomena observable and experienceable through human consciousness. Six major predictions come about from this derivation:

1. The existence of a grand unification theory
2. Universality of space and time scale invariance across all observed phenomena
3. The emergence of observed phenomena from a hologram
4. The one-way direction of conscious time and its relationship to the total information of the observed system.
5. The potential to transcend currently observed natural laws by surpassing duality consciousness and reaching emptiness.
6. The ability to mathematically describe observed natural laws, phenomena, and experiences

This work provides a mathematical demonstration of how observed natural laws and phenomena manifest from human consciousness activities. It unveils the profound connection between observed natural laws and human consciousness, indicating greater human potential and abilities. Furthermore, it offers a new physical foundation and mathematical tool for studying DNA, the brain, life, cosmology, grand unified theory, and all scientific and spiritual disciplines.

Keywords: Holographic Quantum Theory of Consciousness, basic constituents of consciousness, holographic action, space and time scaling invariance, direction of time, grand unification theory, duality consciousness, mind and body problem

1. Introduction

Consciousness, the awareness of both internal and external phenomena, underpins our perception of reality and shapes our understanding of the universe and ourselves [1, 2]. All scientific observations, studies, and experiences are fundamentally rooted in consciousness.

Currently, significant efforts are being made to understand consciousness using natural physical laws [3]. In this paper, we embark on an exploration to gain insights, deductions, and derivations about natural laws and phenomena by delving into the basic constituents and structure of consciousness.

In our previous work on the quantum theory of consciousness (QTOC) [4], we introduced a novel interpretation of quantum physics. We proposed that at a fundamental level, everything consists of a quantum vibrational field that carries information, energy, and matter. Quantum measurement, in this context, involves the process by which observers receive and process these vibrations, along with the information, energy, and matter they convey. This process gives rise to observed quantum phenomena and conscious experiences. We demonstrated that this reinterpretation of quantum physics enables us to utilize quantum mechanics to scientifically investigate how the physical body can give rise to conscious experiences, thereby addressing the hard problem of consciousness.

This paper aims to elucidate how consciousness influences the physical reality one experiences. In quantum physics, emptiness, often referred to as vacuum, is not truly empty. According to the Feynman path integral formulation of quantum physics [5], in order to calculate a wave function that describes the quantum vibrational field, one must sum up all possible trajectories. Since emptiness encompasses the largest number of potential trajectories, its vibrational field contains the highest amount of potential information, energy, and matter.

A vibrational field contains various possible vibrations and states. A quantum measurement determines which states are being observed, thus the observed quantum phenomena. Since human consciousness is involved in all measurement, it is natural to presume that consciousness is critical in manifesting and determining the observed natural laws and phenomena. Studying the basic constituents of consciousness can help us gain deeper insight not only about consciousness but also about natural laws and phenomena.

Our exploration of how consciousness affects the observed phenomena follows a four-step process:

1. Identification of Basic Constituents: We identify the basic constituents of human consciousness as two pairs of elementary duality consciousness: change-unchange and inclusion-exclusion.
2. Mathematical Formulation: We derive the simplest mathematical action resulting from these duality pairs, revealing the holographic action describing the information involved in consciousness.

3. **Mathematical Derivation:** We deduce a mathematical formula encompassing all possible information, energy, and matter manifested by human consciousness, known as the holographic function.
4. **Phenomena and Predictions:** We predict and derive phenomena emerging from the hologram described by the holographic action and function. We will present six major predictions from the holographic quantum theory of consciousness (HQTOC).

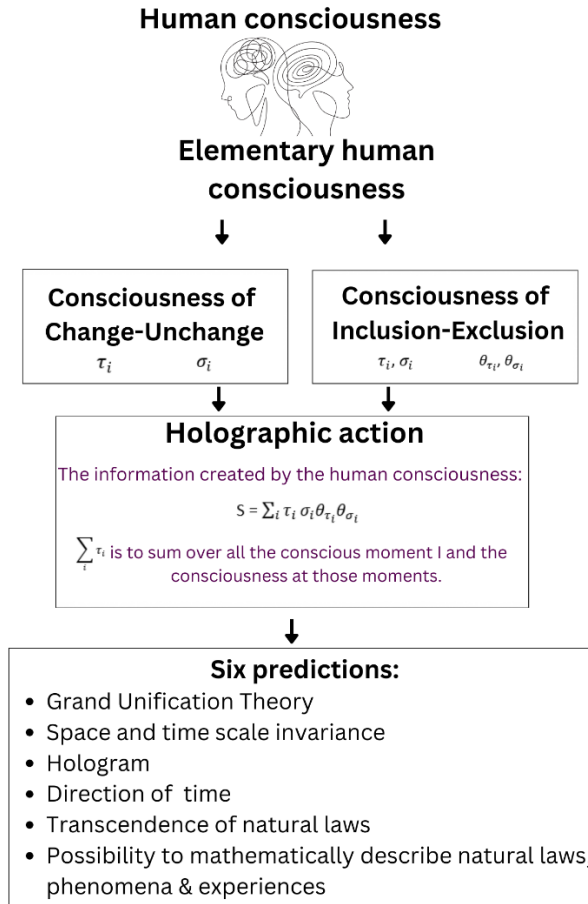


Fig 1. Illustration of the derivation and prediction of HQTOC

2. Basic Constituents of Consciousness and its Manifestation

We will begin by exploring the fundamental components and structure of human consciousness. Drawing inspiration from ancient Chinese philosophy, particularly the concept of yin and yang, we propose that human consciousness is inherently dualistic in nature. This duality, often represented by the interplay of opposites, is akin to the yin and yang paradigm in Chinese tradition [6].

According to the ancient wisdom encapsulated in the concept of yin and yang, everything in the universe consists of two opposing yet complementary elements: yin and yang. These elements manifest in various dichotomies, such as front and back, man and woman, slow and fast, or positive and negative electric charge. Importantly, yin and yang are not absolute entities but are

instead relative and interdependent. What constitutes yin for one person may be yang for another, illustrating the contextual nature of this duality.

Furthermore, yin and yang are inseparable and mutually dependent—neither can exist in isolation. Just as in the realm of physics where positive and negative electric charges are intrinsically linked, the concepts of yin and yang are interwoven and co-created. It is impossible to conceive of one without the presence of the other. This principle, known as the law of yin yang, permeates Chinese culture, philosophy, and religion, shaping perspectives on the interconnectedness of all phenomena.

By embracing the insights of the law of yin yang, we gain a deeper understanding of the foundational structure of consciousness. It highlights the inherent duality or pairing of elements within human consciousness, reflecting the dynamic interplay of opposing elements that underpin our perception and experience of the world.

2.1 Basic Constituents of Human Consciousness - Elementary Consciousness

In physics, the discovery that all matter is comprised of fundamental particles, indivisible and not composed of other particles, prompts us to inquire: can we identify the elementary constituents of consciousness, the fundamental building blocks from which all consciousness emerges?

We propose that the basic constituents of consciousness are two pairs of duality consciousness: change-unchange duality consciousness and inclusion-exclusion duality consciousness [7, 8]. These pairs represent the foundational elements of human cognition, forming the basis of all conscious experiences.

The consciousness of change and unchanged is intricately linked to human perception of time and space. When measuring physical space, such as determining the length of an object, our focus is on its unchanging attributes—the stable dimensions of length, height, and width. Conversely, our awareness of change and motion aligns with our perception of time, evident in observations like the shifting sands in a container or the gradual burn of incense. The cyclical movements of celestial bodies further underscore our temporal awareness, highlighting the dynamic relationship between consciousness and the passage of time.

Similarly, consciousness of inclusion or exclusion—attachment or detachment, belonging or not belonging—represents another elementary consciousness that cannot be further decomposed. On the other hand, our consciousness of good and bad may compose of consciousness of belonging or not belonging, slow or fast, tall or short. Therefore, the consciousness of good and bad is not elementary consciousness. It is composed of a set of the elementary consciousness of space-time/change-unchange and the elementary consciousness of inclusion and exclusion.

Therefore, we posit that all human consciousness is grounded in these two fundamental duality pairs: space-time consciousness and inclusive-exclusive consciousness. By recognizing these foundational elements, we gain insight into the essential structure of human cognition and the dynamic interplay between temporal progression, spatial stability, and concepts of inclusion and exclusion in shaping our conscious experiences.

2.2 The Mathematic Formula Describing All Human Consciousness

Since all human consciousness is composed of two elementary duality consciousness, namely two basic duality pairs: space-time consciousness and inclusive-exclusive consciousness, all consciousness can be expressed in terms of four components. Let's use τ , σ , θ_τ , θ_σ to represent each of the four components. Here τ denotes the consciousness of change related to time, σ represents the consciousness of unchange related to space, θ_τ denotes the exclusive component of τ , and θ_σ denotes the exclusive component of σ . As the symbols to denote the exclusive component, θ_τ and θ_σ should represent the quality that it cannot occupy the same place or state simultaneously. Therefore, for the two identical θ components, $\theta * \theta = 0$. This means that θ_τ and θ_σ should have a fermionic character, while τ and σ should have a bosonic character. It is discovered that in nature there exist two types of particles, fermions and bosons. Fermions are particles that are unable to stay in the same state together with another same kind of particle, whereas bosons are particles that are able to stay in the same state together with another same kind of particle.

As τ , σ , θ_τ , θ_σ are intended to be co-created, any consciousness can be expressed in the form of a summation of products of these four elements:

$$A_1 = \sum_{\text{summation}} \tau \sigma \theta_\tau \theta_\sigma \quad (1)$$

In physics, action serves as a fundamental attribute of a system's dynamics, enabling the derivation of both the wave function and the equations governing the system's motion. Interestingly, it is noteworthy that the mathematical expression for consciousness (1) bears resemblance to the super-holographic action derived within the framework of the grand unification theory, which is rooted in the holographic principle [9]:

$$A_2 = \alpha \int d\tau d\sigma d\theta_\tau d\theta_\sigma \quad (2)$$

The symbol \int is used to represent the summation over space σ and time τ , including θ_τ and θ_σ . The super-holographic action encompasses both bosonic spacetime and fermionic spacetime, exhibiting supersymmetry, which represents a symmetry between bosonic and fermionic elements. In our work [9], we demonstrate that the actions (2) mathematically encode a hologram containing comprehensive information about a system. This holographic action, an extended and generalized form of the action in string theory, general relativity, and thermodynamics, contributing to the development of a grand unified theory in physics.

In our paper [9], to elucidate how physical phenomena emerge from the holographic action (2), we express the action in terms of physical space and time X^μ . For simplicity, we focus solely on space σ and time τ , temporarily disregarding the fermionic components (θ_τ , θ_σ). In this context, the physical spacetime X^μ is a projection from the conscious spacetime (τ , σ),

$$X^\mu: (\tau, \sigma) \rightarrow X^\mu (\tau, \sigma).$$

In this projection, the action remains unchanged:

$$A_3 = \alpha \int d\tau d\sigma = \alpha \int dX^\mu dX_\mu \quad (3)$$

In the presence of a background field $G^{\mu\nu}$ in physical space and time, the action (3) becomes:

$$A_4 = i\alpha \int_0^T d\tau \int_0^L d\sigma G^{\mu\nu} \partial_\tau X_\mu \partial_\sigma X_\nu \quad (4)$$

Using the action in (4), we can obtain holographic function Ψ_h :

$$\Psi_h = \exp(i A_4) = \sum_{\text{sum over possible } X^\mu} \exp(iA'_h). \quad (5)$$

Holographic function Ψ_h is obtained by summing over all possible trajectories X^μ for $\exp(iA'_h)$. Feynman's path integral formulation of quantum physics indicates that this summation is a way to calculate the wave function, which describes the possible vibrations, energy, information, and matter in a system. In this case, holographic function Ψ_h describes the potential vibrational fields, information, energy, and matter that can be manifested by human consciousness.

3. Predictions of HQTOC

There are six major predictions stemming from the holographic quantum theory of consciousness, as represented by actions (1), (2), (3), (4), and (5).

3.1 Prediction of a Grand Unified Theory

If everything we observe is determined by consciousness, and our consciousness can be mathematically expressed by the holographic action, then all observed natural laws and phenomena should emerge from this singular formula. This leads to the first prediction of this theory:

HQTOC Prediction I: A grand unification theory, employing a single mathematical formula to encompass observed natural laws and phenomena, exists.

In our prior research [9], we elucidate that natural phenomena and the laws of physics manifest from the holograms described in (2), (3), (4), and (5). Specifically, we observe that elementary particles emerge from holographic action due to Poincaré symmetry. Additionally, gravity and gauge interactions, encompassing electromagnetic forces, weak and strong forces, emerge due to diffeomorphic symmetry, while the classical equation of motion arises due to Weyl symmetry. Dark matter and dark energy emerge from vibrations on the horizon scale of the universe, whereas Higgs bosons and the Higgs mechanism emerge from boson and fermion condensation. Consequently, the holographic action describes a grand unification theory, capable of employing a single mathematical formula to explain the various laws and phenomena observed in physics.

3.2 Predictions of the hologram described by the four components

Everything one observes and experiences is rooted in one's consciousness. Because the basic components of human consciousness are four elements and two duality pairs, all the observed

phenomena are projections from the hologram formed by these four elements and two duality pairs. This leads to the second prediction of HQTOC.

HQTOC Prediction II: All observed phenomena emerge from a hologram encoded with two duality pairs and four components, described by holographic action.

Our findings that physical laws and phenomena, from elementary particles, fundamental forces, Higgs bosons and mechanisms, dark matter, dark energy, and black holes, to the large structure of the universe, emerge from the hologram, validate this prediction. Another demonstration of this prediction is the life system, which also utilizes four elements and two duality pairs to encode the information of the life system. The carrier of genetic information, DNA, is a polymer composed of two polynucleotide chains made of four elements (cytosine [C], guanine [G], adenine [A], or thymine [T]) that coil around each other to form a double helix. This double helix structure of DNA is a typical holographic structure, mathematically described by the holographic action.

One can observe this through the action that mathematically expresses this structure, denoted as A_D :

$$A_D = \sum_{n=1}^N h_{nn} \sigma^n \tau^n \quad (6)$$

Here σ^n represents the components on one of the double helix, τ^n represents the components on the other, and h_{nn} represents the interaction between these two components. The symbol $\sum_{n=1}^N$ represents summation over all the components on the DNA helix, ranging from 1 to N. Here, N represents the total number of components on the double helix. One can see that A_D in (6) is a special case of the holographic action described in (1) and (2).

The physical form, phenomena, and experience of the life system emerge from the information encoded in DNA, which can be mathematically expressed by the holographic action. One can apply the holographic action to mathematically study the vibrational field created from the information of DNA and how the field of the environment can affect the structure and expression of DNA. The holographic action gives us with a new mathematical tool to study DNA, brain structure, and life in general. Further exploration and discussion of this concept will be conducted in future work.

3.3 Prediction of Space and Time Scaling Invariance

The holographic action demonstrates conformal invariance [9], indicating that the holographic action, function, and observed phenomena remain unchanged when scaling space or time.

Given that the general form of the hologram is consistent across different systems, albeit with variations in their conscious/holographic time and space scales, it follows that time and space scaling invariance should be present within and among different objects and phenomena. This generalized scaling invariance constitutes the third prediction of HQTOC.

HQTOC Prediction III: There are space and time scaling symmetries/invariance within and among different phenomena and objects.

Observations of scale invariance span various natural systems, encompassing large-scale objects in astrophysics [10, 11, 12, 13, 14], geology [15], natural disasters [16], electric breakdown phenomena [17], plant structures [18, 19], properties of proteins in specific organisms [20], and noncoding areas of DNA [21]. Scale-free properties are even observed in the behavior of humans and animals [22, 23, 24, 25]. Man-made objects and phenomena also exhibit scale-free properties, such as in software programming. Comprehensive overviews and additional examples are provided by Gisiger [26].

Extensive research over the past 40 years has focused on fractal structures and scale-free dynamics in the brain [27 - 41]. In [42], F. Vazza and A. Feletti illustrate structural and morphological similarities between the network of neuronal cells in the human brain and the cosmic network of galaxies, as well as similarities in network properties and memory capacity. The study suggests, "The tantalizing degree of similarity that our analysis exposes seems to suggest that the self-organization of both complex systems is likely being shaped by similar principles of network dynamics, despite the radically different scales and processes at play."

HQTOC provides a physics principle explaining why such space and time scaling invariance should exist universally. It also offers mathematical formulations to describe, study, and utilize this symmetry for making predictions. Further exploration of this concept will be undertaken in future work.

3.4 Prediction of Arrow of Time

The arrow of time concept posits the "one-way direction" of time, developed by the British astrophysicist Arthur Eddington in 1927, remains an unsolved general physics question. This direction, according to Eddington, might be determined by studying the organization of atoms, molecules, and bodies, possibly depicted on a four-dimensional relativistic map of the world ("a solid block of paper") [43].

This direction of time is perceptible through consciousness and reasoning, yet it does not explicitly appear in physics apart from entropy, a statistical mechanics and macroscopic phenomenon arising from a system. At the microscopic level, physical laws and processes are mostly time-symmetric (except for a small violation in the case of weak interaction), meaning they are the same whether time moves forward or backward. However, at the macroscopic level, an evident direction of time exists, likely linked with the growth of entropy.

In HQTOC, two kinds of space and time are proposed [44]. One is the consciousness spacetime (τ, σ) , and the other is physical spacetime X^μ . Conscious space and time, also called holographic space and time [9], or information space and time [48], form the hologram from which physical space, time, and phenomena emerge. The physical spacetime X^μ is a projection from consciousness spacetime (τ, σ) , $X^\mu: (\tau, \sigma) \rightarrow X^\mu(\tau, \sigma)$. Physical time X^0 is the measurable time, which can be measured by a clock. As one can turn the hands of a clock both backward and forward, physical time is capable of being positive and negative, without necessarily having a

direction.

Conscious time and space are associated with the information in a system. Actions (1) and (2) delineate the relationship between conscious time, space, and system information. This confirms and mathematically expresses the notion that the direction of time correlates with the total information of the system, which increases with conscious time. This constitutes the fourth prediction of HQTOC:

HQTOC Prediction IV Conscious time and space together are proportional to the total information of a system. As conscious time progresses, the system accumulates more information, suggesting a directionality to conscious time.

Interestingly, according to HQTOC, the total maximum amount of information in a system is proportional to both conscious time and conscious space. Our expanding universe exemplifies this, as with time, both the age and horizon of the universe expand. In this scenario, both conscious space and time exhibit directionality. The directional aspect of conscious space implies that as conscious time advances, the maximum amount of space one can be conscious of also increases, leading to a growth in system information with both conscious space and time.

3.5 Prediction of the Possibility to Transcend Natural Laws through Going Beyond Duality

In HQTOC, observed natural laws and phenomena stem from human duality consciousness. If one can shift their consciousness and surpass duality consciousness, it may be possible to transcend currently observed natural laws, including gravity, electromagnetic fields, and more. This constitutes the fifth prediction of HQTOC.

Quantum physics reveals that the vacuum contains infinite potential matter, energy, and information. The vacuum represents a physical state of emptiness. Additionally, there exists the conscious state of emptiness, characterized by a state of consciousness free of duality consciousness. If one embarks on self-cultivation and attains the conscious state of emptiness, according to HQTOC, the manifestation of consciousness and observed laws and phenomena may differ. This serves as the fifth prediction of HQTOC.

HQTOC Prediction V

If one transcends duality consciousness and attains emptiness, it may be possible to transcend currently observed natural laws and phenomena.

Throughout Chinese history and in many cultures, there are accounts of highly cultivated masters exhibiting extraordinary abilities such as levitation, flight, disappearance, and matter transformation by accessing a higher consciousness state beyond duality. These folklore stories suggest the occurrence of phenomena aligned with the fifth prediction. However, to scientifically validate this prediction, rigorous studies are required. Conducting such research may pose challenges, as it necessitates years of dedicated practice to achieve a deep state of emptiness before individuals can demonstrate such abilities. Furthermore, individuals possessing these abilities may be reluctant to participate in experiments, as they must be in the state of emptiness

to perform such feats. Therefore, the design of experiments to test this and other predictions will be deferred to future work.

3.6 Prediction of the Possibility to Use Mathematics to Describe Observed Natural Laws, Phenomena, and Experiences

In his influential article "The Unreasonable Effectiveness of Mathematics in the Natural Sciences," E.P. Wigner argued that biology and cognition could be the origin of physical concepts as perceived by humans [44]. He suggested that the remarkable alignment between mathematics and physics, deemed "unreasonable" and difficult to explain, may originate from this connection.

If we view mathematics as the abstract language of human consciousness and acknowledge that our consciousness manifests observed natural laws, phenomena, and experiences, it logically follows that these can be described mathematically. The intriguing alignment between mathematics and the physical world, as emphasized by E.P. Wigner, finds an explanation within HQTOC. This alignment constitutes the sixth prediction of HQTOC.

HQTOC Prediction VI All observed natural laws, phenomena, and experiences can be described mathematically.

4. Discussion and Conclusion

In this paper, by identifying the basic constituents of human consciousness as two fundamental pairs of duality consciousness—change-unchange and inclusion-exclusion—we derive the holographic action and function, which describe the hologram created by human consciousness and the potential information, energy, and matter that can be manifested by it. HQTOC encompasses six major predictions:

1. The existence of a grand unified theory (GUT), described by a single mathematical formula—the holographic action—to encompass all observed laws and phenomena.
2. The emergence of observed laws and phenomena from a hologram created by four components and two duality pairs.
3. Universal time and space scaling invariance as a symmetry present in all observed phenomena.
4. Proportional relationship between conscious space and time and the maximum amount of information in a system. Conscious time may exhibit directionality.
5. The potential for transcending currently observed natural laws and phenomena by surpassing duality consciousness and entering an emptiness state.
6. The ability to describe natural laws, phenomena, and experiences mathematically.

The pursuit of a grand unification theory (GUT) is crucial in physics, and this research suggests that understanding consciousness is a pivotal element in achieving this goal. Additionally, it provides a mathematical framework to explore the relationship between information encoded in DNA or brain structure and the fields they generate.

This work illustrates mathematically how observed natural laws and phenomena are manifested from human consciousness activities, revealing a profound connection between observed natural laws and human consciousness. This insight has implications for exploring human potential and abilities and offers a new foundation and mathematical tool to study DNA, the brain, life, cosmology, grand unified theory, and various scientific and spiritual disciplines.

Acknowledgment

We extend our gratitude to Jonathan Schooler for his invaluable advice and suggestions, Nikki Johnson for her assistance with references, Edward Wuenschel for his editorial support, and Daniela Rambaldini and Corina Sarb for their contributions to the illustration and figures in the paper.

This research was made possible in part by the National Science Foundation under Grant No. NSF PHY-1748958. We are grateful for their support.

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