Article

The Source of Consciousness as an Empty Space of Potentiality

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Abstract

A purely mathematical-physical argument is made proving the source of consciousness is an empty space of potentiality that is the "ultimate power underlying the universe; the ultimate impersonal reality underlying everything in the universe, from which everything comes and to which it returns".

Key Words: empty space, potentiality, source, consciousness.

Relativity theory is based on the idea of space-time geometry, while quantum theory is based on the idea of a Hilbert space. In terms of the role of an observer, a space-time geometry defines the space within which the observer moves, which we understand in the sense of a worldline or frame of reference, while the Hilbert space defines the observable values of everything the observer can possibly observe within its world. The big problem with the unification of quantum theory with relativity theory is the problem of how to reconcile this space-time geometry with the Hilbert space. In a strange way, it is precisely this reconciliation that proves the source of consciousness is an empty space of potentiality that is the "ultimate power underlying the universe; the ultimate impersonal reality underlying everything in the universe, from which everything comes and to which it returns" [1].

All the laws of physics are based on an action principle. The nature of action always reduces down to some kind of a measure of geometrical length in some configuration space, like the concept of proper time in a space-time geometry. The Hilbert space is constructed by summing over all possible paths in that configuration space and weighting each path with a probability factor we call the wave function $\psi=\exp(iS/\hbar)$, where S is the action (the geometrical length) of some possible path that connects two points in the configuration space. The path of least action is the most likely path in the sense of quantum probability, but the nature of the Hilbert space implies that every observation of something by an observer requires a choice from this space of observable values.

The big problem with the unification of quantum theory with relativity theory is how the Hilbert space is constructed. Everything in modern physics points to the conclusion that by some mechanism, a holographic screen is constructed for the observer [2]. Different theories suggest different mechanisms, but they all point to some kind of holographic screen construction process. The simplest idea suggests non-commutative geometry as the mechanism [3]. As an observer enters into an accelerated frame of reference, say due to the effects of dark energy and the exponential expansion of space, an event horizon, such as a cosmic horizon, arises and surrounds the observer at the central point of view.

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In non-commutative geometry position coordinates on a bounding surface are represented by non-commuting Dirac operators, which gives rise to a fibre bundle space. We normally think of space-time as the base space and the bundle space as a vector or spinor space that sits on top of the base space of space-time, but non-commutative geometry reverses this relationship. The bundle space is a Hilbert space that sits on the bounding surface, and space-time geometry is a holographic projection from the bounding surface to the central point of view of the observer. In non-commutative geometry a bounding surface is a holographic screen encoding all the bits of information that holographically define the space-time geometry. Bits of information are encoded on the screen due to the bundle connection of non-commuting Dirac operators that represent position coordinates on the screen. In this holographic screen construction mechanism, the bounding surface is the base space, the Hilbert space is the bundle space, and space-time geometry is a holographic projection.

In a holographic world information is always encoded on a bounding surface of space that acts as a holographic screen. The way bits of information are encoded on the screen defines how a Hilbert space is constructed for the observer. Everything in the observer's world is defined in this Hilbert space constructed on the screen. The holographic screen always surrounds the observer at the central point of view. The holographic screen only arises as a bounding surface of space if the observer is in an accelerated frame of reference, but the screen even holographically defines the space-time geometry of the observer's world. This turns the normal relationship of the bundle space to space-time geometry upside-down, since the holographic screen defines a Hilbert space.

Since position coordinates on this bounding surface are represented by non-commuting variables, they have inherent uncertainty. The product in uncertainty of any two position coordinates on the screen is at least as large as the Planck length squared. If we call those position coordinates x and y, like latitude and longitude on the surface of a sphere, we have an uncertainty relation of the form $\Delta x \Delta y \geq \ell^2$, where ℓ is the Planck length. The net effect is the bounding surface encodes n bits of information in a pixelated way. The pixel size is about a Planck area, and the number of bits of information encoded on the surface is given in terms of the surface area A divided by the Planck area as $n=A/4\ell^2$. Due to the nature of the Dirac operator, the n bits of information encoded on the screen are defined in terms of the n eigenvalues of an SU(n) matrix. The SU(n) matrix is the nature of the Hilbert space defined on the holographic screen. This gives a simple, elegant and natural explanation for how a holographic screen encodes bits of information.

Like a spin network, these n bits of information are entangled with each other, and so there is a tendency for these bits of information to align together over the course of time. The course of time arises as a sequence of screen outputs from the observer's holographic screen to the central point of view of the observer. This gives a natural explanation for why bits of information align together over the course of time. In the sense of relativity theory, the course of time (the sequence of screen outputs) corresponds to a sequence of events that arise as the observer follows an accelerated worldline through the space-time geometry that is holographically projected from its holographic screen.

If we are to speak about the course of time, we also have to speak about the flow of energy. What gives rise to the flow of energy through the observer's world? The simple answer is the second law of thermodynamics. The normal flow of energy through the observer's world arises as heat

tends to flow from hotter to colder objects, and this also directs the flow of time. As far as holography goes, there is no difference between a temperature gradient and a temporal gradient.

How is a temperature (temporal) gradient established? The nature of dark energy and a cosmic horizon gives the answer. The holographic principle [4] gives the temperature of the horizon in terms of its radius R as $kT=\hbar c/2\pi R$, and relativity theory gives the radius of the cosmic horizon in terms of the cosmological constant Λ as $R^2=3/\Lambda$.

The basic idea is the cosmological constant is not really a constant, but a value that decreases over the course of time. The other way to say this is dark energy burns away over the course of time, and as it burns away, heat is radiated away. We understand "burning" in the sense of "undoing" a process of symmetry breaking. A non-zero cosmological constant breaks the symmetry of empty space since its constructs a cosmic horizon from the central point of view of the observer. As the cosmological constant "burns" away to zero, the cosmic horizon is deconstructed and the symmetry of empty space is restored.

As dark energy burns away and the cosmological constant decreases in value, the cosmic horizon inflates in size and cools in temperature. The normal flow of energy through the observer's world (and the course of time) is established as dark energy burns away and the cosmic horizon inflates in size and cools in temperature. In effect, the course of time is a derivative concept that corresponds to the burning away of dark energy.

In thermodynamic terms, this normal flow of energy through the observer's world is established as the observer's cosmic horizon inflates in size and cools in temperature, and as heat tends to flow from hotter states of the observer's world to colder states of the observer's world. The action principle tells us that the most likely way for energy to flow is for all things to follow the path of least action.

The holographic screen is a bounding surface of space that arises because the observer is in an accelerated frame of reference, and surrounds the observer at the central point of view. This screen constructs the Hilbert space that defines everything the observer can possibly observe in its world. All perceivable things are composed of bits of information, and are like images projected from the screen to the central point of view of the observer.

The only way to make sense of this situation is to discuss the nature of a consensual reality shared by many observers when their holographic screens "overlap" and share information. Each observer makes choices in its own world about how information is encoded in its own world and how energy flows through its own world, but since the different worlds of different observers overlap with each other and share information, one observer's choices affect what the other observers perceive in their own worlds.

Each observer to a limited degree chooses what it perceives in its own world with its own focus of attention on that world, but the choices of other observers also affect what is perceived in that world. The consensual reality shared by many observers is the reality that all the different observers have constructed and chosen together.

The nature of an observer and its world is a constructed reality. The holographic principle tells us this reality is only constructed when a boundary is constructed. This boundary is a bounding surface of space that acts as a holographic screen. Every bit of information that defines every aspect of this constructed reality is encoded on the screen. Every scientific theory and every scientific concept that can be constructed about this constructed reality must be constructed within this constructed reality, and therefore must reduce down to the way bits of information are encoded on the boundary.

The big questions are: who constructs what, and who knows about this construction? Can a part of this constructed reality construct concepts that explain the whole of the reality? Can a part of this constructed reality understand and know about these concepts that explain the whole? Even if that was possible, what constructs this constructed reality in the first place? Within what space does the bounding surface of space that constructs this constructed reality arise? What energizes the construction of the boundary?

Once we fully understand that the constructed reality is constructed with some kind of a holographic screen construction mechanism, there is no way to avoid the conclusion that the constructed reality must have an underlying reality. There must be some notion of a space of potentiality within which the bounding surface of space arises. This potentiality space must have the potential to expend energy in order to construct the boundary. Since all perceivable things in the constructed reality are defined in terms of how information is encoded on the boundary, the potentiality space in and of itself, without the construction of a boundary, cannot be characterized in terms of information or any perceivable thing composed of bits of information. This potentiality space must be empty. Since this potentiality space in and of itself is unbounded, it must be infinite. Since there is nothing in this empty potentiality space, in and of itself it must be undifferentiated.

How can such an infinite, unbounded, undifferentiated, empty potentiality space expend the energy required to construct a boundary within itself? The answer is dark energy and the exponential expansion of space, which gives rise to the construction of a cosmic horizon. Relativity theory tells us the negative potential energy of gravitational attraction exactly cancels out the dark energy, and so the total energy of this construction process adds up to zero. The construction process is possible because the total energy of the observer's world adds up to zero, and so it is possible to create "something from nothing".

Since everything in the observer's world is composed of energy and all of that energy ultimately adds up to zero, this construction process tells us that everything is ultimately nothing. This kind of construction process also tells us the observer of this constructed reality is always present at the central point of view of the constructed boundary.

There is one last property of this empty potentiality space that is deducible from pure logic. Whatever the nature of the constructed reality that arises when the boundary is constructed, this constructed reality is characterized by some set of logically consistent computational rules. That is the nature of all mathematical theories.

The Gödel incompleteness theorems prove that the consciousness of the observer that knows about the consistency of the rules cannot itself emerge from the rules. If that was possible, then a paradox of self-reference arises within the rules that makes the rules logically inconsistent. Logical consistency requires that the consciousness that knows about the consistency of the computational rules is outside the rules. These rules only apply to the constructed reality. This proves that the consciousness that knows about the consistency of the rules cannot itself arise within the constructed reality, but must come from outside the constructed reality. Since this constructed reality is constructed on a boundary, this proves that the source of the observer's consciousness is the empty potentiality space that constructs this constructed reality by constructing a boundary within itself.

In Hinduism this infinite, unbounded, undifferentiated, empty potentiality space that is the source of consciousness is called Brahman. This unlimited, underlying reality is not constructed, and can never be conceptualized by any limited scientific concepts that we can construct in our limited constructed reality.

This argument proves the source of consciousness is an empty potentiality space that is the "ultimate power underlying the universe; the ultimate impersonal reality underlying everything in the universe, from which everything comes and to which it returns" [1]. Ultimately, that is what everything is. The irony is that in its primordial unbounded state it is "nothing".

References

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