Quantum Information Research Supports Consciousness as Information

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Statement of Problem

The "energy" dominance in physics has made it difficult to develop widely accepted theories of mind that explains consciousness and intention. Recent research in the unification of quantum gravity theories for black holes has proven that information is primary to the structure of quantum mechanics and therefore introduces an "It from Bit" perspective for the universe that has relevance for consciousness.

This understanding of quantum information being more fundamental than energy/matter or even space/time, requires the adoption of an energy/information duality for anything with inaccessible states, such as quantum states and consciousness. The seemingly paradoxical aspects of consciousness will become more understandable adopting this energy/information duality just as early in this century the particle/wave duality was insightful in understanding physics.

Research Methods

This paper describes the quantum gravity research that is applicable to the idea that consciousness is primarily an informational system. By understanding quantum states as an information system, the energy/information duality is exposed. The corresponding nature of quantum spacetime supports non-local behaviors. Quantum information laws form a consistency network that creates all fields, particles and even spacetime itself. Even Einstein was wrong about the thinking of quantum mechanics as mere energy mechanics. Correctly labeling phenomena as information vs. energy will lead to clarity about paradoxical aspects of consciousness. This clarity of understanding is essential to support theoretical discussion as well as experimental design and prediction. No new experimental results are reported in this paper.

It from Bit

John Wheeler coined the term "It from Bit" [1] to describe the essence of the role of information theory in the unification effort of quantum (theory of very small) and gravity (theory of very large) as applied to black holes.

In non-technical terms, the work can be described as follows. The second law of thermodynamics requires that any information encoding of bits (such as phase space or even quantum spin state) must not be neglected when tossed into a black hole. Schiffer [2] first showed that when a bit, encoded as a quantum spin state, is thrown into a black hole, the result is a minimum discrete increase in surface area of the black hole, of approximately Planck's area. This bit corresponds to the known fact that the black hole surface area is it's entropy and can be thought of as a very large number of bits. A black hole is really a bit bucket and all matter and energy represents an equivalent number of information bits.

These black hole bits define and exist inside event horizon of the black hole. Here normal time is slowed down due to general relativity time dilation, such that time stands still. Likewise length contraction creates the effect that everything is at a single point. Every black hole is therefore a large-scale macroscopic quantum system that has size and an equivalent mass in our physical universe, but from its own reference frame acts as a single point/instant in space/time. This is exactly like how a photon experiences spacetime due to relativity.

Similar large-scale macroscopically visible quantum states are also attainable without a black hole, in superconductivity and superfluidity experiments. These highly specialized quantum states follow the very unusual properties of quantum "non-mechanics", only if the coherent state is maintained by isolating them from environmental noise such as other quantum interactions and high temperatures.

Quantum Computation

In 1994 Peter Shor [3] showed that large-scale coherent quantum states could be useful to obtain quantum computation. A traditional bit can represent one of two answers, and chaining **n** bits together allows the storage of one out of 2**__n__ possibilities. Quantum computation uses quantum superposition of **n qubits** to solve 2**__n__ possible solutions simultaneously. A qubit is a specially prepared coherent quantum state, and Shor showed qubits that can be programmed to include the "algorithm" of the tough factoring problems used in

decryption. This result proves that theoretically one can solve certain classes of computational problems using a quantum computer, which are not solvable by classical computers. Practical quantum computers that maintain the coherent state of a large number of qubits (20-30) are not still in development.

The fact that useful computing can be accomplished with quantum states means that both information state and computation are part of the quantum world of "It from Bit". This useful information technology occurs because of the non-ordinary quantum spacetime, even though the quantum states themselves are not directly measurable.

Consciousness as Quantum Information

"It from Bit" [1] and "Information is Protophysical" [4] both describe how information can exist without energy or matter encoding. This can be thought of as high dimensional topological structures, which is the basis for information theory as well as all unified field theories [5]. High dimensional mathematics is the basis for content addressable memories [6] (such as holographic memories) and all communications encoding [7]. The higher the number of dimensions that one exists within, the more intelligent a computation system one can build. Quantum mechanics is formally described using the mathematics of Hilbert spaces, which is a space of an arbitrary number of spaces. The time frame experienced is also related to the number of dimensions and velocity of the observer.

The non-normal spacetime of these high dimensional domains allows the natural cosmological evolution of the laws of physics, including biological evolution supporting morphogenic resonance [8]. Jung's collective unconscious [9] and shared dreams [10] also require a non-local information repository or exchange, using resonance. Medical intuition [11] and remote viewing [12] both require a theoretical basis for non-local information exchange so that the possibility of biological quantum computing as a model for consciousness would account for such phenomena. Since quantum fields can create and orchestrate all other fields using the David Bohm's quantum theory of "active information" [13], even consciousness related anomalies such as "Copper Wall" experiments [14], "Group Field REG" [15], and future electronics [16] have a theoretical basis using a quantum informational model. None of this phenomena is explicable within a classical energy paradigm [17] but can be derived using quantum theory with informational basis [18].

The Next Information Age

The theme of this paper is that quantum information represents the "Next Information Age" and consciousness may be best explained within that paradigm, including the pervasive energy/information duality. The current information age consists of primarily classical information in bits encoded as energy (magnetic, charge, optics) and matter (ink, barcodes, etc) structures. This next information age represents quantum encoded information using qubits and also ebits (for EPR bits) which do not have classical energy nor classical spacetime properties. Quantum computation falls in that domain and would include biological forms of quantum computation.

When consciousness is mapped into a non-classical non-energy domain of quantum information, many of the paradoxical problems of energy dominated solutions dissolve. These quantum states are synonymous with quantum states of brain, so no duality is involved. Intention can be thought of as an acausal reorganization of these information states [19] with free will corresponding to fuzzy logic choices dependent on vast amounts of "subjective memory" parameters contained in our experiences.

Conclusion

Most consciousness concepts imply a rich information system for maintaining experience and making decisions based on that experience. Even with astounding advances in computer sciences and engineering, critics of Artificial Intelligence (AI)[20] have computationally argued that humans are very powerful and won't be replaced soon. The role of information in black hole theory and quantum computation directly addresses many of the requirements for a good theory of consciousness including energy/information duality, decision making in computation, and non-locality.

The research was reported in this paper because any discussion regarding consciousness and intentionality would be incomplete without including these known facts regarding the information structure of our universe. The resulting energy/information duality is mandated in physics, and it sheds considerable light on the consciousness debate. The evidence for a quantum related theory of consciousness is mounting daily and should be expected for the following reason. If an informational basis of quantum theory can account for matter, energy, conservation laws, and even empty spacetime, perhaps a theory of everything and everywhere can naturally include consciousness.

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