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News and Views

2024: A Year of Quantum Progress

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Abstract - 2024 has proven to be a significant year for a number of scientific and technological advancements. In this *News and Views* article we review briefly some of the relevant developments in the field of information, quantum computation, AI, biology and evolutionary sciences.

Keywords - Willow; Quantum Computing; Information Universe.

1 Breakthroughs in Understanding our Place in the Universe

2024 has proven to be a significant year for advancements in the fields of quantum physics, artificial intelligence and quantum computing (perhaps that's the understatement of the year!). With Google's new quantum computing model, *Willow* [1], and incredible developments in neuroscience, the mutual progression in research within these disciplines is changing our perception of reality. In the middle of this is the Simulation Hypothesis that suggests that the universe is quite real but it is, in fact, a highly sophisticated simulation. In my 2024 book, *The Simularity Proposition* [2], I discussed how the Singularity, a hypothetical (yet manifesting before our eyes!) future state of affairs where artificial intelligence crosses and integrates with human intelligence, and the Simulation Hypothesis, are proving to be codependent and provide a robust explanation for these concepts.

2 Quantum Breakthroughs – Computational and Biological

Google's Willow is an unparalleled breakthrough in the quantum computing field. Classical systems are different from quantum systems in that the former do not incorporate quantum entanglement as a way of computing. This new quantum computer accomplished a mind-bending complicated computational task back in late 2024 and took only 6.5 seconds to do so. This is staggering. The classical world's fastest supercomputer would have needed over 47 million years to solve the same problem that Willow was able to solve in a matter of seconds demonstrating the latter's unparalleled computational strength. This breakthrough is a major step towards the realization of quantum supremacy through the use quantum entanglement that cannot be handled by classical computers within reasonable time frames. (Willow – this is achieving true 'scary action at a distance,' well done!). This advancement reminds me of a recent article that was published by *The Brighter Side News* [3] which explains how quantum teleportation – the almost instantaneous transport of information

between two locations that are far apart – is now becoming very real. What is almost eerie is the parallel discoveries in biological systems such as microtubules in the human brain. An article written by Eva Fjällström [4] explains how advancements in neuroscience are strong suggesting that consciousness is inseparably connected with quantum mechanics and the fundamental nature of the universe. What is interesting is that this indicates that the two main domains of knowledge – neuroinformatics and quantum computation – are actually moving towards some kind of meeting where they would explain each other in terms usually reserved for either one or the other domain.

3 Melvin Vopson and the Information Universe

While searching for some more information about this field I came across a physicist who is doing some fascinating work at the fulcrum of these symmetries, Melvin Vopson, who is advancing the theory that information is not just an aspect of the universe but that it is it's foundational constituent. This has been captured in an article by *Indy100* [5] where Dr. Vopson's is setting out to prove the Simulation Hypothesis, providing a scientific model as to how such a simulated reality could be the most current and logical explanation for our existence. If the universe, at its most reducible level, is information then the quantum behavior of particles, such as entanglement, may be seen as computational processes in a type of supercomputer. The author of *Reality Reloaded: The Scientific Case for a Simulated Universe* [6], Dr. Vopson develops ideas that go further and extend the studies of such pioneers as Rizwan Virk, who has written a convincing series of books and articles exploring how advancements in computing and AI are inching us closer to creating simulated realities of our own – a process that could mirror the creation of our own universe

4 The Conjunction of Neuroscience and Quantum Physics

Current research on the quantum nature of micro-tubules, which are parts of neurons, has led certain scientists to hypothesize that consciousness is in some way quantum. This concept now resurfaces as a key theme in consideration of the accomplishments of Willow; quantum computing is capable of replicating some aspects of unique biological consciousness. It means that the distinction between machine intelligence and human intelligence is growing to the extent that it will soon be difficult to distinguish one from the other. It's my opinion that the Turing test was surpassed years ago and we are, in fact, closer to *Ray Kurzweil's predictions* [7] of the Singularity and much sooner than expected. These recent transformational breakthroughs provide important corroboration for the hypothesis that the universe is, in essence, computational in its nature. It is not a coincidence that biological processes reflect the actions of quantum systems; in fact, we are learning that it might point to a whole new understanding of our universe.

I theorized about this in the The Simularity Proposition – and suggested, quite accurately now, that by the time I published it, new discoveries would make some of the content of that essay obsolete. The main theme of that publication was that the Singularity and Simulation Hypothesis are two ideas that are interconnected and dependent on each other. Advancements in the fields of artificial intelligence – where we are now clearly on the brink of reaching AGI – and quantum computing, leave little doubt that we are becoming closer to a moment when we can create our own simulation-type multiverses. This leads to many essential questions about our prevailing perceptions of our world: Are we actually living in a type of program built by some advanced civilization or identity? And if so, what implication does that have for our concepts of existence?

Dr. Vopson's findings on the fundamental nature of the informational universe propose a scientific basis to these questions. His discoveries, along with breakthroughs like Willow and studies on quantum consciousness, points to a future in which physics, biology and computation become one. It seem that there are numerous examples of where this type of

convergence of thinking has been happening. For example, Cubism is an evolving perspective of Quantum Information Theory. It is centered on an agent that is able to communicate with the environment, for example, perform an experiment. Information gained in such a process is then used to refine or update what the agent knew or believed. This is why it is also known as Quantum Bayesianism (or QBism). In other words, it focuses on how the new information from the world transforms the perception, connecting quantum mechanics with the Bayesian framework. As we consider these points of alignment between quantum breakthroughs and experimental research in both the technology and biology realms, these lead to a rethinking of how we grasp consciousness and our universe.

5 Vision of the New Paradigm for Understanding Reality

The discoveries of the year 2024 underscore how quantum computing, neuroscience and simulation theory are now branches of scientific inquiry that are intertwining with each other. Moving forward, it is crucial to keep on expanding these intersections not only to enhance our technical potential, but to enrich our philosophical concept of existence. It is evident that the cross connection of these concepts indicates that there is a a strong probability of impending paradigm shifts in our understanding of the universe. Here's to 2025 – what will we be able to achieve by this time next year?

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