Review of: "[Commentary] The Zeroth Law of Science"

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I am finding this paper inspiring and possibly important for the further advance of physics, or its eventual generalization. We have come to the point where consciousness should not be excluded from investigations in physics and other natural sciences. It was rightly excluded since the Renaissance because that enabled the rapid, unprecedented development of physics and technology. But with quantum mechanics, the circle is closed: we can no longer proceed without bringing consciousness into the game. All the difficulties in understanding and interpreting quantum mechanics stem from the lack of properly involving consciousness.

The paper provides a fresh view on the debate about the role of the observer in quantum mechanics, which depends on its interpretation. In the conventional view, observers collapse the wave function. In alternative interpretations, e.g., "decoherence," there is seemingly no need for an observer (but some authors argue that this is not the case). It is asserted that "The Many Worlds Interpretation may be the most extreme expedient used to deny a role of the observer in fundamental physics." This is one of the common misconceptions about the Everett interpretation. To obtain a more balanced view on the role of the observer, I suggest that the author looks at the following works: M. Pavšič, "The Landscape of Theoretical Physics" (Kluwer Academic, 2001); M. Pavšič, Foundations of Physics, 14 (1994) 1495 ; Robert Lanza and Matej Pavšič, "The Grand Biocentric Design" (BenBella, 2020).

The goal of the author is to challenge the so-called Zeroth Law, according to which the laws of nature are fixed. He proposes experiments to test this law within classical and quantum arrangements. After discussing the difficulties of reproducing the experiments in biology, he addresses reproducibility in quantum mechanics, where reproducibility does not hold on the level of individual particles, but on ensembles of particles.

Next, the author asks whether quantum randomness is really random. He discusses the experiments performed from the 1970s to the 2000s in the Princeton laboratory by Robert Jahn. The experiments show a slight deviation from randomness. We then read:

> *Jahn was Dean of Engineering at Princeton and a prominent researcher in aerospace engineering until his credibility was attacked for daring to ask questions that are considered out-of-bounds by conventional science. The take-down of Robert Jahn represented a shameful triumph of Scientism over the true spirit and methodology of science.*

There are numerous examples of such shamed behavior in the scientific community. For instance, scientists dismissed the observations by fishermen about the connection between tides and the moon. They ridiculed Alfred Wegener, who proposed the idea of continental drift. They strongly opposed Dan Shechtman, who discovered quasicrystals. As they did not wish to look in Shechtman's electronic microscope, they had refused to look through Galileo's telescope. They pushed Robert Goddard to commit suicide because he developed the concept of rocket drive---saying that Professor Goddard did not understand Newton's laws of action and reaction; a consequence was that he lost his university position. In the introduction to my book "Stumbling Blocks against Unification: On Some Persistent Misconceptions in Physics" (World Scientific, 2020), I describe those cases and then discuss several concepts in physics that are generally considered wrong and not viable physically, and yet, at second thought, they make sense.

Concerning consciousness, the author writes:

> *One school holds a place for consciousness in the fundamental workings of quantum physics. This is not currently the dominant interpretation, but it is the one advocated by Erwin Schrödinger himself, and it was attractive to several prominent physicists who followed him, especially de Broglie, Bohm, and Wigner. The idea was expanded into three book-length treatments by Berkeley professor Henry Stapp. (Stapp and Stapp 2004, Stapp 2007, Stapp 2017) [Mindful Universe: Quantum Mechanics and the Participating Observer (2011), Mind, Matter, and Quantum Mechanics (2013), Quantum Theory and Free Will (2017)] More accessible is my favorite book on the subject, Elemental Mind, by Nick Herbert (Herbert 1993).*

The relation between consciousness and quantum mechanics is discussed in the works, "The Landscape of Theoretical Physics" (Kluwer Academic, 2001), Foundations of Physics, and "The Grand Biocentric," mentioned above. Here one can find useful insights not found elsewhere; therefore, I recommend the author to consider those works as well.

The author, among other points, points to the evidence that quantum biology "has firmly established a special role for quantum mechanics in some biological processes, including photosynthesis." The following citation from the article is an important observation that provides a rebuttal of the usual view that the brain is a hot macroscopic object functioning along classical physics and cannot support quantum superposition:

> *Neurotransmitters are molecules that flip between two conformations, two very different shapes, dependent on their chemical and electrical environments. Kauffman has shown (Kauffman 2019) that most such molecules are “designed” (meaning “evolved”) to be unreliable, in the sense that they jump with maximal ease between the two conformations, and they exist in the brain in a “superposition state.”*

Then there is a discussion about the design of a computer that is intended to function reliably, in contrast to how nature seems "to have gone out of her way to make our brains out of components that are as unreliable as possible." Such (quantum) uncertainty thus "allows our consciousness to shape our thoughts and (through neurons) control our muscular movements."<\/p>

I have some doubt about the conclusion that physical laws governing the world work with good precision and reliability "most of the time." This is a strong assertion because if we found that a known physical law does not work reliably, we would search for a better law. Namely, even if we found "miracles," which by definition are exceptions to physical laws, we would investigate thoroughly until explaining such miracles by a new, reliable law. In my paper "A Novel View on Successive Quantizations, Leading to Increasingly More “Miraculous” States," Modern Physics Letters A 34 (2019) 1950186, arXiv 1901.01762 [hep-th], I consider the quantization of the wave function such that it becomes uncertain, analogously to the uncertainty of a particle's position. As a consequence, there could occur deviations from the usual behavior of the objects described by quantum mechanics. This could be a "miracle," but such an unpredictable wave function is described by a wave functional obeying a definite law, analogous to the usual Schroedinger equation.

In summary, I think that the paper provides additional value to the efforts in understanding quantum mechanics and consciousness; therefore, I recommend its publication.