Can both the Many Worlds and the Copenhagen Interpretation be true?

Dmitri Martila

*Tartu University, 4 Tähe Street, 51010 Tartu, Estonia**

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Abstract

The Many Worlds Interpretation (MWI) was proposed by H. Everett. It has sounded like most senseless stuff to the scientists of his time, but today it is one of the leading interpretations of Quantum Mechanics (QM). I argue that this interpretation does not conflict with the conventional interpretation. Namely, the observer whose mind does not depart from Our Universe must use the Copenhagen Interpretation (CI).

*Electronic address: eestidima@gmail.com

I. FALL DOWN OF THE COPENHAGEN INTERPRETATION

Throughout much of the 20th century, the Copenhagen Interpretation had overwhelming acceptance among physicists. Although astrophysicist and science writer John Gribbin described it as having fallen from primacy after the 1980s [1], according to a very informal poll (some people voted for multiple interpretations) conducted at a quantum mechanics conference in 1997 [2] the Copenhagen interpretation remained the most widely accepted a specific interpretation of quantum mechanics among physicists.

In a 2017 article, physicist and Nobel laureate Steven Weinberg states: "According to Bohr, in measurement, the state of a system such as a spin collapses to one result or another in a way that can not itself be described by quantum mechanics, and is truly unpredictable. This answer is now widely felt to be unacceptable. There seems no way to locate the boundary between the realms in which, according to Bohr, quantum mechanics does or does not apply." [3]

In my understanding, Dr. Weinberg's statement that the collapses "can not itself be described by quantum mechanics" is not true, because the collapse of the wave function is simply the choice of the initial conditions for the QM equations. Thus, the collapse of the wave function does not violate the QM equations.

A 2011 poll of 33 participants at an Austrian conference found only 14 CI's supporters. [4]

MWI's initial reception was overwhelmingly negative, with the notable exception of DeWitt. Wheeler made considerable efforts to formulate the theory in a way that would be palatable to Bohr, visited Copenhagen in 1956 to discuss it with him, and convinced Everett to visit Copenhagen as well, which happened in 1959. Nevertheless, Bohr and his collaborators completely rejected the theory. Everett left academia in 1956 to never return, and Wheeler eventually disavowed the theory. Everett recounted his meeting with Bohr as "that was a hell... doomed from the beginning." Léon Rosenfeld, a close collaborator of Bohr, said: "With regard to Everett neither I nor even Niels Bohr could have any patience with him, when he visited us in Copenhagen more than 12 years ago in order to sell the hopelessly wrong ideas he had been encouraged, most unwisely, by Wheeler to develop. He was undescribably stupid and could not understand the simplest things in quantum mechanics." [5]

II. MY CONTRIBUTION

Thesis: *The Many Worlds Interpretation of Quantum Mechanics does not conflict with the Copenhagen Interpretation.*

Proof: Let us suppose that the Many Worlds idea is true, and so Our Universe is just one from a nearly infinite set of different universes. Each one corresponds to each possible outcome of the collapse of the wave functions in Our Universe. But, having the goal to find out the laws of nature which govern Our Universe only, a researcher needs to have to apply the Copenhagen Interpretation (even if the Many Worlds interpretation is true as well). This ends the proof.

The time and place of the collapses of the wave functions, which happen in Our Universe even if there is the Multiverse out there, can be described as the initial conditions of the equations, but these events cannot be predicted in advance. The Multi Words Interpretation consists of the Copenhagen Interpretations inside each universe. Therefore, the Multi Words Interpretation cannot solve the issue of indeterminism.

Having the indeterminism, I wonder how they made a problem and paradox from such a natural process as the "Information Loss in Black Holes". Namely, if there is the conservation of information, instead of its loss, then the future is determined by the past, e.g. we can read the poems of Shakespeare long before his birth.

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[1] J. Gribbin, "Q for Quantum"

[2] Max Tegmark (1998). "The Interpretation of Quantum Mechanics: Many Worlds or Many Words?" Fortsch. Phys. 46: 855–862. arXiv:quant-ph/9709032

[3] Steven Weinberg (19 January 2017), "The Trouble with Quantum Mechanics". New York Review of Books.

[4] Maximilian Schlosshauer, Johannes Kofler, Anton Zeilinger (2013), "A Snapshot of Foundational Attitudes Toward Quantum Mechanics". Studies in History and Philosophy of Science Part B: Studies in History and Philosophy of Modern Physics. 44 (3): 222–230. arXiv:1301.1069.

[5] Stefano Osnaghi, Fabio Freitas, Freire Olival Jr (2009), "The Origin of the Everettian Heresy". Studies in History and Philosophy of Modern Physics. 40 (2): 97–123. doi:10.1016/j.shpsb.2008.10.002.