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Peer Review

Review of: "Measurement Problem from the Perspective of Wittgenstein's Philosophy"

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Feynman says that we don`t have two worlds which are a classical and a quantum one. We have only one world, that in which we live, and it is a quantum one. In the same manner, the author strives to eliminate the classical description of measurement devices, exchanging it for a complex system which is impossible to describe in a proper manner by mathematics or anything like that. But the inference raises a few problems.

The first one concerns what mathematics is. Identification of mathematics with logic might be pleasing to logicians, but there are not many mathematicians who would agree. If the author asserts that a measurement is not possible to represent by mathematics in any sense, the question arises: what is? Geometry is the elder discipline in mathematics, which came into being more than two thousand years ago, and mathematical logic less than two hundred years ago. Mathematics, therefore, does not reduce to logic at all, and if it has cognized anything about something, it`s about measurement. There is no measurement beyond mathematics, nor mathematics beyond measurement.

The second one concerns probability theory. In fact, there are two of them. Classical was postulated by Kolmogorov and quantum by von Neumann, but both consider the measurement process. Description of a measurement should depend on what conception one has supposed regarding the process. If the Kolmogorov theory were supposed, it is clear that one gets a classical description since the space of events should satisfy classical logic. Von Neumann presents an alternative view which is a magnificent part of the Mathematical Foundations. He referred to Bohr, who had mentioned that the dual description of nature by quantum theory concerns the principle of psychophysical parallelism by Gustav Theodor Fechner. It is about the fact that the Hilbert space is self-dual, which implies the representing of both states and devices concurrently.

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The third problem is about the exclusivity of mathematical languages that occur in classical and quantum theories. The claim is not true at all, which is not difficult to be convinced of. There is a formulation of classical mechanics in terms of operators and functional spaces. It is the Koopman-von Neumann mechanics, famous far and wide. So if anyone is going to unify classical and quantum theory and solve the measurement problem, he should be a mathematician. It actually concerns mathematical physics in order to present a measurement by a stochastic process. In that manner, the foundations of mathematics and physics coincide to the root of geometry, wherein measurement is the basic conception.

I recommend the book

Andrei Krennikov, Probability and Randomness: Quantum versus Classical

and the article

Miloš Milovanović, The Measurement Problem in Statistical Signal Processing, Mathematics, 2023

for further reading.

Declarations

Potential competing interests: No potential competing interests to declare.

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