

Physical Meaning of Quantum Mechanics

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Abstract

In recent years the wisdom of experiments has reached such high level, that some interpretations of Quantum Mechanics are getting falsified [M. Ringbauer, B. Duffus, C. Branciard, E. G. Cavalcanti, A.G. White, A. Fedrizzi, Measurements on the reality of the wavefunction, Nature Physics **11**, 249–254 (2015)]. Therefore, I suggest a new interpretation of Nature to compensate the loss of these interpretations.

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Reality works on proper Definitions

Nature is defined as what the Standard Instruments measure, and the Instruments is what measure the Nature. This is a cyclic definition. When Einstein was asked “what is Time?”, he replied “this is what the clock shows.” But the definition of Nature by “all that we see” is wrong because we can see a ghost which is not natural. The clock measures time. Talking about instruments, we must understand, that they do in fact measure. Therefore, one can not say: the clock at night measures nothing, because I am sleeping. Why? You said word “clock”. It is instrument, so you can not talk about it without keeping in mind, that it measures. In such a way, we restore the observer-independence, which is being killed in Ref. [1].

By measuring, the Instruments change Nature. It is like when you measure the blood pressure. The cuff squeezes the arm hard, you worry and the pressure and pulse rise. The measurement must be unchangeable under the definition of a measurement, but the Nature changes. Therefore, Quantum Mechanics is needed as an relation between the Instruments and Nature. After all, Instruments are recorded in the definition of Nature.

The size matters

Indeed, the smaller the object of Nature, the stronger it is modified by measurements. Thus, the bigger the object, the less it is “quantum”. Indeed, bullets in the double-slit target are not producing wave-like interference pattern, even if their flights are not observed.

How about the semi-dead cat?

Schrödinger’s cat is placed in a box, an Uranium atom decays and triggers a Geiger counter. The latter breaks an ampoule with poison and the cat dies. Scientists say that if we do not open the box, the cat is in a limbo state between life and death, called “quantum superposition”.

But why such a tornament? Do not put the poison into the box! Do not take a box! Forget about any poison! Do not use the poison at all! Take only Uranium and a Geiger counter and a human to watch the detector. Let a human watch the detector until it would react, giving a sound to the radiation detection. The question arises: why the superposition

(decayed – not decayed) is not destroyed inside the Uranium, during all the time until the detector reacts? If the radioactive material decays, the Geiger counter will work with a probability of less than 100 percent [2]. Due to the fact that the counter is not determined to react, the superposition (decayed – not decayed) inside the radioactive substance is not disturbed by the observations of the person. Only in case of a reaction of the Geiger counter, the superposition inside the radioactive substance would be broken.

Can a particle be in two places simultaneously?

In overall situations, superposition is not measured by instruments, therefore superposition is not a part of Nature (look my definition of Nature above). And if so, the logic of Aristotle (White is not Black and Black is not White) is not violated.

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- [1] Massimiliano Proietti, Alexander Pickston, Francesco Graffitti, Peter Barrow, Dmytro Kundys, Cyril Branciard, Martin Ringbauer, Alessandro Fedrizzi, Experimental rejection of observer-independence in the quantum world, arXiv:1902.05080 (2019)
- [2] Alain Aspect, Jean Dalibard, Gérard Roger, Experimental Test of Bell's Inequalities Using Time-Varying Analyzers, Phys. Rev. Lett. 49, 1804–1807 (1982).