QUESTIONS AND PHYSICAL REALITY
- SIMPLE PHILOSOPHICAL CONSIDERATIONS-

MICHELE CAPONIGRO AND HELEN LYNN

Abstract. We argue, through some philosophical considerations, on (i) dependent or (ii) an independent existence of physical reality underlying quantum states. According these simple considerations, we conclude that is impossible to have a clear independent existence of physical reality, we need to search the reasons in the relationship between our questions (the observer) and the consequent answers (always estimated by the same observer). Finally, we infer that every theory is affected by our "questions", so we cannot speak about an unconditional and independent theory underlying physical reality. Plan of the paper, the existence of physical reality underlying quantum states: (i) it before bit, (ii) it without bit, (iii) it from bit.

1. Assumptions

We assume that:
(1) $|\Psi\rangle$ provide a complete description of physical properties.
(2) The observer is not an experimental device.
(3) The observer is the only ontic element of physical reality.
(4) Only the ontic observers compare different quantum states.
(5) The theories elaborated by observers could be (i) ontic (supported by experimental data) or (ii) epistemic.

We will show that under these conditions we have serious difficult to proof an independent existence of physical reality, only we could to proof his "dependent" existence, an existence after the observer.

2. It before bit

We know about the complex relationship between questions and answers, for instance, when does a statement constitute an answer to question? How can it be known that the statement is a correct answer to a question? The answer to these questions depends on the degree of certainty required, a formal definition of the problem domain, language, and theory is required to produce reliable results. In this paper we shall try to argue on the possible "a priori" or "a posteriori" existence of quantum states, from philosophical point of view, our objective is to find a criterium to proof a possible choice utilizing three possibility: first, it before bit. With this statement we mean the emergence of physical reality independent from any observers, in this case we assume that the observer do not exist. Can we find, in this case, the "independent" existence of quantum states? Realistic approach to quantum mechanics seem to belong to this case, we disagree, we argue that is not possible to establish any criterium for their existence, we cannot say...
anything. Every good realistic position do not leave from the presence of the observer.

3. It without bit

This second approach seem ideal, the observer exist but is silent, a Kantian system that include an embarrassing silent observer, is not considered in our philosophy. Eastern philosophy, instead, have a long tradition on this subject. In this paper we do not venture in this field. It without bit, seem to belong to platonist system, most researches thinks to be silent and Fapp. We agree with Fapp but they are not silent. They ask many things as observers, but in their theories the same observer has not any relevance. In any case, like previous analysis, we cannot proof any clear "a priori" existence of the physical reality, also this approach seem inadequate.

Observation: Some analysis by Zeilinger [1] seem quite close this approach, he does not need any observer, a device is sufficient to deduce the underlying physical reality of quantum states.

4. It from bit

Third case, seem we have find the right approach, in this case we have an active observer, the observer decide the fundamental questions in order to find the fundamental answers. Seem a clear kantian position, but our position is different. The emergent physical reality seem linked with the "questions" of the observers, this conclusion is not so appreciated from scientific community, it show a negative impression: a subjective method, but as we seen, from philosophical point of view, is the only possible. We remember the assumption of ontic observer. Now, as observer we try to proof the only possible "independent" subjective existence of quantum states.

5. It from bit: Examples of Subjective "A Priori" Existence of Quantum States

Premise:
(1) Quantum states provide a complete description of physical properties.
(2) 2.1 Fist assumption: We need to postulate the existence of the observer for his description.
(2) 2.2 Second assumption: every observer is a physical property.

Quantum states provide a complete description of physical reality (observer included).

Observation: For instance, Rovelli’s program [2] follow this approach to quantum mechanics. We argue that this approach will be considered the same "subjective" for the inevitable presence of the observer. According Rovelli instead the approach is not subjective. The denied observers compare the different quantum states not the physical systems. We agree about the postulate of possible completeness. The independent quantum states is "subjective".

Premise:
(1) Quantum states provide a complete description of physical properties.
2.1 We need to postulate the existence of the observer.
2.2 Every observer is not an element of physical property.

Quantum states is not a complete description of physical reality.

Observation: For instance, Fuchs’ program follow this approach, we think with an important discrepancy between the observer and the completeness. Qm is a complete description of physical reality but the observer is not an element of physical properties. The observer has not the same "substance". According our assumptions the approach is the same subjective but quantum states do not provide a "complete" description of physical reality (observer to remain not explained by QM) According Fuchs instead we have a complete description of the physical reality and the approach is not subjective, he affirm to be a realist, probably he admit the onticity of the observer. It is possible to analyze in future others possibilities (next paper).

6. Conclusion

The conclusions are quite simple, according our philosophical assumptions is not possible an independent description of quantum states, with all their implications, except third case, where the "a priori" seem possible but subjective. We conclude that is not possible give an ontological proof of their existence, while is always possible give a subjective dependent existence, utilizing the word subjective in right way (observer presence) as defined in this paper, consequently the subject always affect possible answers researched. Many different works affirm to have found an ontic or an epistemic | >, here we affirm, under our philosophical conditions, that both are subjective.

References

[1] A.Zeilinger: The Message of the Quantum?, Nature 438, 743 (2005).
[2] C Rovelli: Relational Quantum Mechanics, International Journal of Theoretical Physics, 35, 1637 (1996)
[3] C.Fuchs Quantum Mechanics as Quantum Information(and only a little more)-

Physics Department, University of Camerino, I-62032 Camerino, Italy
E-mail address: michele.caponigro@unicam.it

Quantum Philosophy Theories, www.qpt.org.uk
E-mail address: helen.lynn@qpt.org.uk