

# Review of: "On the Bell Experiment and Quantum Foundation"

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The author proposes a personal analysis of the consequences of the Bell experiments, in the light of the Convivial Solipsism interpretation of quantum theory. As a conclusion, it is argued that "the mind of any observer must be limited in some way", that the observer "is not able to keep enough variables in his mind when making decisions."

The paper proposition is inspired, but lacks precision.

"Every description of a physical phenomenon must be from the point of view of an observer or from the point of view of communicating observers." In this (neo)Copenhagen stand, what is an "observer"? For example, in QBism, an observer is an agent, making bets and updating her beliefs based on her use of quantum theory. Any object able to do so is an "observer". In Relational Quantum Mechanics, an observer is simply an object of reference out of the quantum description, which interacted with another object treated quantumly. It can be any physical system. Here, the notion of observer seems to imply the notion of "mind". But, as mentioned by many partisans of the (neo-)Copenhagen approach, the "observer" does not need to refer to consciousness or mind. E.g. "These fictitious physicists may as well be inanimate automata that can perform all the required tasks, if suitably programmed." [A. Peres, *Quantum Theory: Concepts and Methods*, 1993].

A precise definition of what "the mind of an observer" is/refers to is thus lacking. Physical variables are said to be "in the mind of the observer". What does it mean? This makes the main arguments of the paper rather vague. For example, the concept of "(in)accessible conceptual variables", which seems to be defined relative to the primitive notion of "mind of the observer". Where does this "inaccessibility" come from? From a more realistic point of view, this sounds very similar with "hidden variables", i.e. inaccessible physical properties. "Bell's inequality has to do with a hypothetical reality behind these measurements, and this, in my opinion, is a reality that we do not seem to be able to cover completely with any human-made model." I struggle to see a distinction with the hidden variable program here. Note moreover that the Bell result does not assume or starts from quantum theory at all. It is way more general, and allows to discriminate classical from non-classical correlations.

"We can assume that the variables *also* exist in the mind of A." Does this mean that conceptual variables exists twice? physically and in the mind? does the inaccessibility apply to the physical ones (in which case, this seems to come down to hidden variables)? or the ones in the mind? In this case, one might argue that this would violate basic principles of parsimony: why would we need to introduce variables in the mind if the argument can be applied to physical variables? As

such, it seems that Theorem 1 can be reformulated without referring to “variables in the mind of an observer”.

Finally, the “limitation of the mind of the observer” may be put in perspective with the notion of epistemic horizon from J. Szangolies (arXiv2007.14909[quant-ph]), i.e. “the fundamental limit to the knowledge available about a system to any conceivable observer.” Szangolies shows that Bell inequalities precisely delineate the set of theories for which there exists a function that yields the values for all possible measurements. “Contrariwise, Bell inequality violations certify that no such  $f(n, k)$  for all values can exist—or at least, be probed by experiment. [...] The epistemic horizon puts a limit to the information accessible about any given system, and each attempt to access more courts inconsistency.”