Review of: "On Bell Experiments and Quantum Entanglement"

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The article in its current form sounds for me very naive and overstated, and demonstrates the luck of careful formulations, which in this very deep subject lead quickly to problems. I disagree with literally all points expressed in the article, let here consider just a few points out of many:

1) The author say: "In Bell experiments, the validity of the quantum-mechanical description of the physical world and the legitimacy of the standard interpretation of quantum randomness are taken for granted, which is a fatal logical flaw."

OK, let's look from the view of logic: what the Bell experiments (or better to say, our interpretation of the experiment) are trying to defend is the following logical claim: IF A THEN B, in short, A=>B. Here A and B are logical variables defined as A="quantum mechanics is correct" and B="Bell inequalities are violated". That is, "If quantum mechanics is correct, Bell inequalities violated". Important, A=>B, not "A=true" or B=>A, or something else. If you look to the corresponding truth table of A=>B, it can be true even if A is false! To prove A=>B it is completely legitimate to say "let us assume that A is correct and then look if we obtain (or not obtain) B". An that, in turn, means that, for the sake of this proof, one can indeed assume all the tools of quantum mechanics, including interpretation of quantum randomness, to be valid. Formulating once more, shorter: to assume A and prove, based on this assumption, that A=>B, is completely OK from logical point of view, independently if A is valid in reality or not. So, there is no logical flaw in this.

Of course, in the literature, especially popular, one can meet another claim: "breaking the Bell inequalities proves quantum mechanics", that is, in our denotations, B=>A. The Bell experiment does not prove this. The author's argument in the present article can be considered as a completely legitimate argument, why it is so! But, once more, the authors argument does not apply to A=>B.

And, finally one more remark to our point, now beyond the pure logic. In the experiment, the Bell inequalities are not "just violated". They are violated exactly at the configuration where quantum mechanics predict them to be violated. This does not "prove quantum mechanics", but it naturally increase our degree of belief in it.

3) The author says "In Bell inequalities, a physical constraint imposed on measuring individual quantum objects, i.e., the same single quantum object can at most be measured only once, is violated."

In quantum mechanics there is no rule that a quantum object can be measured only once. Many measurements of the same object are perfectly legitimate in quantum mechanics. This is a peculiarity of optics, that, since the photons are destroyed by the measurement, one can typically measure a photon only once. But in other platforms the qubits are NOT destroyed by measurements. There are several experiments, which show violation of Bell inequalities in the cases where qubits are not destroyed. This is, for instance, B. P. Lanyon et al, Phys Rev Lett 112, 100403 (2014) for trapped ions, or Roman Schmied et al, Science 352, 441 (2016) for cold atoms.

Furthermore, does the fact that not the same object is measured, breaks the Bell inequalities? In the Bell inequalities we must not necessarily assume, that we measure one and the same object. In contrast, we assume that the object (or objects) we measure belong to one and the same statistical ensemble, that is, have the same statistical properties. This is because the Bell inequalities and their derivations operate with probabilities and statistical distributions rather than with individual outcomes. The property of having the same statistical distribution is ensured by the identical procedure of creation of the photons in the optical Bell experiments.

In conclusion, I believe that the article in its present form has no great scientific value. However, it has an important pedagogical value as an illustration, how careful one should think when discussing such a deep and complicated subject.