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

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This paper recapitulates many of the misunderstandings about Bell's Theorem that have made appreciation of its implications difficult. Perhaps the first thing to say is that Bell's Theorem is not about quantum theory, or in any way about the “interpretation” of the quantum formalism. Nor is it at all about which physical variables human beings can in prinicple access. Since it is not about these things, no conclusions or suggestions about these things are relevant to it.

Bell's theorem covers *any* theory—quantum mechanical or non-quantum mechanical—that can make predictions about correlations between macroscopic outcomes of experiments, such as correlations between which way needles move or which lights go on in distant laboratories when the apparatuses have been set in particular ways. Any theory that cannot make such predictions obviously does not qualify as a physical theory that can be subject to any test. The theorem does not require any discussion on minds or observers. The two labs could be fully automated, for example.

What the theorem shows is that no locally causal theory (in a precise sense that Bell defines) can predict outcomes that violate his inequality, provided only the the choice of settings of the apparatuses obey a condition he calls “statstical independence”, i.e. that the settings can be determined in a way that renders those choices statistically independent (in the mathematical sense) from the physical states of the incoming particles. Denying that would essentially undermine all experimental science. But given just that assumption and local causality, the theorem follows, and the outcomes of distant experiments (such as those done by Clauser, Aspect and Zeilinger) cannot violate his inequality. But in fact they do violate the inequality. Ergo, local causality must fail. Nowhere in the proof is quantum theory so much as mentioned. And nowhere in the proof is it assumed that the complete physical state of the system—represented by the Greek variable lambda—can be accessed or known by any mind. Of course, for the outcomes of the experiments to be noted and reported, some humans must be aware of something. But all they need to be aware of is how the apparatus was set on each run and what the outcome was. This is something people can do. If someone wishes to deny that even information like that is not generally available to people, then that would be the end of physics as a discipline.

The world obviously existed for billions of years without the presence of any minds. The author states:

"There are many variants of Bell's theorem (Bell, 1964) in the literature, and the theorem has led to several rather complicated discussions among theoretical physicists. According to Wikipedia, the theorem has two components: Physical variables exist independently of being observed or measured (sometimes called the assumption of realism); and second, that Alice's choice of action cannot influence Bob's result or vice versa (often called the assumption of locality).

From the discussion above, it seems that it is the assumption of realism which must be abandoned."

So the explicit suggestion here is to abandon the assumption that “physical variables exist independendently of being observed or measured”. That would mean that there simply was no physical world at all before there were observers or measurements, which, among other problems, would make the question of how observers or measurers ever evolved in the first place impossible to answer. That also would be the end of all science, including physics. And all of this is suggested merely to avoid the obvious implication of the violation of Bell's inequality: that the universe is not locally causal. There exist not one but several explicit non-local physical theories—the pilot wave theory of deBroglie and Bohm and the GRW collapse theory—that predict violations of Bell's inequality just as observed. They also posit an objective physical world that exists independendtly of anyone's mind. Indeed, they nowhere mention minds or observations or measurements in their fundamental postulates. So physics is indeed possible in the face of violations of Bell's Inequality. To suggest abandoning the physical world altogether in order to avoid violations of local causality is, as we say, throwing the baby out with the bath water.