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THE FALLACY OF REALISM IN “EPR PARADOX”

*Abstract*

The “EPR (Einstein, Podolsky, and Rosen) paradox” has been stirring up an increasing interest in the last decades, as an expression of increasing interest in the problem of independent reality. Indeed, EPR conceived their paper in order to demonstrate the incompleteness of quantum mechanics: however, in their mind, one thing implied the other, and viceversa.

In the present paper it is maintained that, whatever the conclusion about their incompleteness argument may be, it's a fault to call on it in a plea in favour of the idea of independent reality.

Recall the “EPR” argument. One can measure either the momentum or the position of a particle, which had been interacting with another one, in order to predict with certainty (that is with probability value one), once the two are evolving as free subsystems, the momentum or the position of the other, without having to take a measure on this. Since one can choose which of the two measurements to perform, either the momentum and the position are exactly predictable in principle.

Such EPR's way of reasoning disregards that the foreseen determinations don't descend only from the measures as such, but, in addition and much more, from the structural character of the dichotomic physical quantities, and from the theory of conservation of the total momentum (in general, of the sum of anticorrelated quantities).

That means that the states which in “EPR” are judged as independent realities, necessarily existing also when not determined, and in general also apart from our knowledge, actually are only supposed, and thought of as factorized elements, while in the conjectured situation they are necessarily unfactorized ones.

Though based on a different line of reasoning, this was the essential meaning of Bohr's reply to “EPR”.

In particular, the “EPR” criterion of completeness of a theory, and the connected criterion of reality, are untenable.

The first, as for EPR, maintains that a theory is complete only if it presents an element in correspondence with every element of the reality.

The latter, always in their words, declares that, in order a physical quantity is real, it suffices to be able to determine it with certainty without disturbing the system to which it belongs.

Nevertheless, as for the first criterion, one must realize that, in order to be able to state the wanted correspondence between a theory and the reality, one has to already know the reality: which is just what one is looking for. Furthermore, the ideal system on which EPR think it is possible to foresee, without disturbing it, a quantity, actually has