

# Counterfactuals and non-locality of quantum mechanics

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## Abstract

In the paper the proof of the non-locality of quantum mechanics, given recently by H. Stapp and D. Bedford, and appealing to the GHZ example, is analyzed. The proof does not contain any explicit assumption of realism, but instead it uses formal methods and techniques of the Lewis calculus of counterfactuals. To ascertain the validity of the proof, a formal semantic model for counterfactuals is constructed. With the help of this model it can be shown that the proof is faulty, because it appeals to the unwarranted principle of “Elimination of Eliminated Conditions” (EEC). As an additional way of showing unreasonableness of the assumption (EEC), it is argued that yet another alleged and highly controversial proof of non-locality of QM, using the Hardy example, can be made almost trivial with the help of (EEC). Next the question is considered whether the validity of the proof in the GHZ case can be restored by adopting the assumption of “partial realism”. It is argued that although this assumption makes the crucial step of the original reasoning valid, it nevertheless renders another important transition unjustified, therefore the entire reasoning collapses.

**Keywords:** quantum mechanics, non-locality, realism, counterfactuals

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