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The freedom of choice assumption and its implications

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The assumption that the parameters of an experiment (e.g., those determining the basis of a quantum measurement) can be chosen freely is implicit to most considerations in physics. One may therefore ask whether it is possible to give a precise meaning to the notion of "free choice" and, if yes, study its implications. One natural approach towards defining free choice, considered already by Bell, is to specify a causal structure on the set of all physically relevant parameters and observables. A parameter may then be considered "free" if it is statistically independent of all other parameters and observations that do not lie in its causal future. Recently, it has been realized that the assumption of free choice, as defined above, has various interesting consequences. In particular, if defined relative to a causal structure compatible with relativity theory, free choice immediately implies completeness of quantum theory. This means that there cannot exist any additional (hidden) parameters that would improve the statistical predictions that quantum theory makes about the outcomes of future measurements. In this talk, I motivate and explain this definition of free choice and give an overview of the most important implications of the free choice assumption.