Summary: The problem of measurement is often considered an inconsistency inside the quantum formalism. Many attempts to solve (or to dissolve) it have been made since the inception of quantum mechanics. The form of these attempts depends on the philosophical position that their authors endorse. I will review some of them and analyze their relevance. The phenomenon of decoherence is often presented as a solution lying inside the pure quantum formalism and not demanding any particular philosophical assumption. Nevertheless, a widely debated question is to decide between two different interpretations. The first one is to consider that the decoherence process has the effect to actually project a superposed state into one of its classically interpretable component, hence doing the same job as the reduction postulate. For the second one, decoherence is only a way to show why no macroscopic superposed state can be observed, so explaining the classical appearance of the macroscopic world, while the quantum entanglement between the system, the apparatus and the environment never disappears. In this case, explaining why only one single definite outcome is observed remains to do. In this paper, I examine the arguments that have been given for and against both interpretations and defend a new position, the “Convivial Solipsism”, according to which the outcome that is observed is relative to the observer, different but in close parallel to the Everett’s interpretation and sharing also some similarities with Rovelli’s relational interpretation and Quantum Bayesianism. I also show how “Convivial Solipsism” can help getting a new standpoint about the EPR paradox providing a way out of the seemingly unavoidable non-locality of quantum mechanics.

MSC:

81P15 Quantum measurement theory, state operations, state preparations
81S22 Open systems, reduced dynamics, master equations, decoherence
81P40 Quantum coherence, entanglement, quantum correlations
00A79 Physics
81P05 General and philosophical questions in quantum theory

Keywords:
measurement problem; consciousness; decoherence; realism; entanglement; non-locality

Full Text: DOI arXiv

References:
