THE UNCERTAIN FUTURE AND THE AMBIGUOUS PAST IN CLASSICAL, QUANTUM AND GENERAL NON-SIGNALING SETTINGS

Marek Kuś

Both classical and quantum physics conform to a general non-signaling (causality) principle: results of an experiment in a well localized laboratory cannot instantaneously influence physical states of distant systems. Despite the fact that quantum correlations can be stronger than classical ones, which is reflected in violation of Bell-like inequalities, no information infringing non-signaling principle can be transmitted between distant parties. Interestingly, causality property does not distinguishes quantum correlations as the strongest possible – there exist non-signaling theories exhibiting "stronger than quantum correlations" violating the so called Tsirelson bound imposed by quantum mechanics. It is thus tempting to ask why quantum mechanics is distinguished by being chosen to govern our world. Classical and quantum mechanics offer different mechanisms for making the past undetermined and the future uncertain – how these ambiguities can appear in possible generalized non-signaling theories?