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Title: Counterfactuals and partial quantum measurements

Abstract: The standard textbook presentation of quantum measurements, based on the postulates of von Neumann, implies that a measurement cannot be reversed: once it's done and the result is "engrained" in the classical reality, the state is projected onto an eigenvalue of the measurement operator, and all the information about the quantum state of the system before the measurement is lost. As a result, it does not make sense to think about what result could have been obtained if another choice for measurement had been made, an observation which is often mentioned in the analysis of the EPR - style gedankenexperiments. I will introduce a class of POVM measurements called "partial measurements", for which, somewhat surprisingly, it does make sense to talk about reversing them. I will then discuss the relevance of this class of measurements for our understanding of the complementarity principle, Bell inequalities, quantum teleportation, and entanglement swapping.