On Quantum Foundation, As Seen By a Statistician

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Abstract

In the literature, quantum mechanics is founded by a very abstract set of postulates. For several reasons I propose that this set should be replaced by straightforward postulates based on the notion of theoretical variables, a notion generalizing the statisticians' parameters: In his mind, any observer/ actor in each given situation may have several theoretical variables. Some of these are accessible, can in some future be given numerical values by measurements or experiments. The notion of a maximal accessible theoretical variable is crucial. This can be motivated by an assumption to the effect that all physical variables in the actor's context have parallels in his mind. Examples are given. Under weak conditions, the basic postulates of quantum mechanics can be shown to be implied by a postulate assuming that the actor in his mind has two related maximal accessible variables, and that there is an inaccessible variable such that all the accessible ones are functions of this variable. The notion of being related has a precise definition. A parallel development can be based on theoretical variables shared by a group of communicating observers. The Born formula, giving probabilities, follows from some explicit additional assumptions. The technical details around all this are given in two books and in some published articles. The most recent version will be discussed here.