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AN “OBJECTIVE” INTERPRETATION OF QUANTUM MECHANICS AS
A PREMISE TO THE CONSTRUCTION OF A QUANTUM ONTOLOGY

Abstract

The standard interpretation of quantum mechanics (QM) adopts a verificationist conception of truth and meaning that implies, together with the Heisenberg principle, the *nonobjectivity* of the properties of any physical system. This means that properties cannot be thought of, in general, as possessed or not possessed by a system before a measurement, which however specifies only some of them, necessarily leaving the others indeterminate. In semantic terms, statements attributing physical properties to a given sample of a physical system (or *physical object*) have not truth values, in general, before a measurement, which however can never provide a complete assignment of truth values.

Nonobjectivity constitutes a major difficulty if one wants to build up a quantum ontology, for it prohibits thinking in terms of some kind of physical reality which is independent of the observer. Yet, it is commonly maintained to be an intrinsic (hence unavoidable) feature of QM and not only a consequence of the standard interpretation, since it is also based on a number of arguments which seemingly do not depend on epistemological choices introduced a priori, as verificationism (in particular, the double slit argument and the Bell-Kochen-Specker theorem, which proves the *contextuality* of QM). It is therefore important to observe that these arguments can be criticized from a physical viewpoint. Indeed, they stand on mathematical assumptions that seem physically reasonable at first sight, but subtend a classical way of looking at physical laws that is contradictory with the operational philosophy of QM. If this criticism is accepted, a way is open to non-standard interpretations of QM that are *objective* in a semantic sense and yet preserve the formal apparatus of the theory. An interpretation of this kind has been provided by the author in a number of papers, some of which together with other authors, in the framework of a general epistemological position called *Semantic Realism*, which is characterized by the adoption of a correspondence theory of truth and meaning for the observative language of physics (hence Semantic Realism opposes the identification of *truth* and *knowledge of truth* that is typical of the verificationist position underlying the standard interpretation of QM). The main features of the new interpretation (briefly called *SR interpretation*) can be summarized as follows.

(i) The *objectification problem*, that is, the problem of how definite measurement outcomes can be obtained, disappears, since a measurement simply reveals a preexisting value of a physical observable (or property).

(ii) QM is a *local* and *noncontextual* theory.

(iii) Quantum Logic is a mathematical structure expressing the for-