

Separability and Non-Individuality : Is it possible to conciliate (at least a form of) Einstein's realism with quantum mechanics?

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Abstract

In this paper we argue that physical theories, including the most recent ones, even if only implicitly, talk of 'objects' (or 'things') of some sort (really, of several sorts), and question the logico-mathematical apparatus we still use to formulate them, taking into account what such theories presuppose about these entities. I shall point out that despite the discourse (or at least some discourses) goes in the direction of assuming that these quantum objects would be 'new entities' of some kind, distinct from the traditional physical objects of classical physics, the logico-mathematical framework we use is still the old one, grounded on classical logic and set theory, which are committed to atavistic concepts based on individuals and distinguishable things, in complete disagreement with our present day conception of quanta. So, the use of such apparatus would impede us to be in complete agreement with the ontological commitment the theories of \textit{quanta} seem to propose. Thus, I move in the direction of joining those who try to question the 'logic of quantum mechanics' from a different point of view, looking for a formal rationale for a new ontology.

As a consequence of this move, we can revisit Einstein's ideas on physical reality and see that, from the perspective of considering a new kind of object, here termed 'non-individuals', it is possible to sustain that they still obey some of Einstein's conditions for 'physical realities', so that it will be possible to talk of a 'principle of separability' in a sense which is not in complete disagreement with quantum mechanics. So, Einstein's departure from quantum mechanics might be softened at least concerning a form of his realism (locality still remains a challenge of course), for we guess that the incompatibility between quantum mechanics (field theories included) and some form of 'separability' makes sense only

if the objects of discourse are thought as `classical' objects,
typical of classical ontology.

Keywords: quantum objects,
Non-individuality, separability, quasi-sets, extensional ontology

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