Review of: "The new partitional approach to (literally) interpreting quantum mechanics"

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Potential competing interests: No potential competing interests to declare.

I must confess that, in general, I am very wary of approaches that tend to account for "quantum oddities" through purely mathematical considerations. So I began reading this article with a considerable amount of skepticism. However, as I progressed in my study, skepticism gradually gave way to appreciation and, finally, the intellectual pleasure of having discovered something new.

I have no comments on the content, given that I find the article very well written and understandable even to an average physicist like me, which is not particularly versed in mathematical aspects. Personally, I examined the same questions considered by the author but from a more physics perspective and came to the same conclusions. It is therefore pleasant to see a convergence despite the diversity of starting points.

I think that two problems should be distinguished: that of the interpretation of quantum formalism and that of understanding the ontology of quantum entities. This is because the quantum formalism, or at least many of its ingredients (description of measurements through non-commuting operators, wave functions in Hilbert spaces, etc.), are also applicable outside the original context of quantum physics. For example, there are extensive applications to quantum cognition, textual analysis or the description of test procedures even in the classical context (interfering tests). It is therefore a probability calculation scheme that was discovered only by a historical accident in relation to the topic of quantum physics. It seems to me that the article deals specifically with this aspect, rightly underlining the role of indefiniteness and distinctions as fundamental in the construction of this calculation scheme.

The still open question of the definition of an ontology of quantum entities is instead strictly connected to the physical interpretation of quantum theory, and is specific to this theory. The question can be posed in different ways; from my point of view, the crux is that of the definition of the relationship between quantum entities (seen as Heisenberghian possibilities or potentialities in the terms also taken up by the author) and spacetime. The "historical" attempts to define this relationship in classical terms, and to reconstruct the quantum formalism from there, have led to non-credible results or have entirely failed (think, for example, of the experimental elimination of De Broglie's pilot wave theory by Zou, Wang and Mandel). So the problem is to define an ontology that is compatible with quantum principles from the beginning.

For this purpose, the mathematical considerations masterfully exposed by the author must be specialized to the concrete case of quantum mechanics. It is necessary to answer questions such as: why is the wave function defined on the complex field? What relationship does this fact have with time? What is the physical mechanism - clearly mediated by

ordinary interactions - underlying the "distinction" or "quantum jump"? What selects the quantities subject to distinction? Is spacetime a structure of relation between distinctions or does it exist in a latent form from the beginning? I believe that these, and many other questions, go beyond the field of mathematics and require answers based on physical investigations, even of an experimental nature.

For this reason I would be cautious in calling the author's proposal an "interpretation of quantum theory" and would rather tend to see it as an interpretation of quantum formalism. However, specifying its usefulness in indicating a path to the study of ontology not burdened by unfortunately common prejudices (the exorcising of the quantum jump, the need for "many-worlds", and so on).