HPS/Pl 125: Problem 6

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HPS/Pl 125, WI '25

February, 2025

Belot presents four different ideas about the nature of the wave function in Bohmian mechanics — multi-field, field, law, or property. Which of these four options do you think Bohmians should adopt and why?

I find myself generally disturbed by any ontology which requires that there be a phyiscal manifestation of what the author refers to as a "zillion-dimensional" space for the wave function. I find the idea that the configuration space exists outside of physical space to be a bleak prospect — how could we gain any epistemic access to such a space, or learn anything about it? I am afraid we could do no more than simply postulate it, without the ability to gain or learn anything through doing so. On the other hand, if the configuration space is the physical space, I find it very difficult to understand why our experience of the world would be so limited to 3. I see no justification for claiming our world to be many-dimensional. As a result, I do not favor the field interpretation.

I similarly find the far-other end of the spectrum to be unpalatable. The idea that the wave function is purely nomological and does not in any way represent a material structure does not seem realistic to me. We see true patterns of interaction that manifest in physical space out of quantum mechanics in the double slit experiment, and I feel that if the wave function is removed from physicality, reduced to nomological status, we lose the ability to explain these patterns. I am further concerned that the law interpretation introduces laws of nature that change over time, which seems to me to represent a severe departure from the way we understand the world to work.

I am left with the multi-field and property interpretations. I have some concerns about the property interpretation, as I feel that we should either gain or maintain the full informatic content of the wave function when we posulate an ontology. It doesn't seem right that we should lose information about the wave function when we posit an ontology, but the property interpretation seems to require this. The example given by Belot demonstrates this for the particle in the box, where any solution corresponding to energy eigenstates of the particle in the box yields the same history of dispositions, giving equal danger and equal probability of being found in any region of the box between all of the solutions. In contrast, standard quantum mechanics would give us more information with different dangers and different probabilities for different solutions. I find it very difficult to commit to an ontology in which it seems we lose some information in the process.

So, all that remains standing is the multi-field interpretation. While this approach certainly

has its challenges, I found it the most promising of those enumerated. The fields postulated here are a bit lacking by comparison to the fields of classical physics, and the have different motivations, but I find these challenges pale in comparison to the issues with the other options discussed above. In the multi-field version, we don't get a strange interaction across configuration space, and we don't have to tie a large ensemble of particles together across space. We get to connect a field to each particle, and work with the particle species and degrees of freedom of the particles in physical space. This seems to me to be the most promising of the options discussed by Belot.