

AGPhil 5: Quantum-Classical Divide III

Time: Thursday 16:15–19:00

Location: SPA SR22

Invited Talk AGPhil 5.1 Thu 16:15 SPA SR22**Entropy, entanglement and utility** — ●JOS UFFINK — Department of Philosophy, University of Minnesota, Minneapolis, MN, USA

This talk explores a formal analogy between the study of entanglement in quantum theory, entropy in classical thermodynamics, and utility in decision theory. Roughly speaking, I will argue that in all three cases, the mathematical problem arises of finding and characterizing those functions that respect a given pre-ordering relation, subject to certain auxiliary conditions. Moreover, theorems have been obtained in these three separate areas that might be applied to them in common. It is my main purpose to draw attention to these analogies, and argue how they might be useful in thermodynamics and quantum theory.

Invited Talk AGPhil 5.2 Thu 17:00 SPA SR22**Collapsing to classicality: on the ontology of dynamical collapse theories** — ●WAYNE C. MYRVOLD — Department of Philosophy, University of Western Ontario, London, ON, Canada

Dynamical collapse theories are intended to yield, at the macroscopic level, a world of objects that act appropriately like classical objects. There has been extensive discussion of late about the ontology appropriate to collapse theories, much of it focused on the question of whether the wave function needs to be supplemented by primitive ontology that goes above and beyond the wave function. This paper will examine the question: "What does it take to be an object?" and will argue for the claim that collapse theories can yield a world of classical objects, with nothing other than wave functions, properly construed.

15 min. break

AGPhil 5.3 Thu 18:00 SPA SR22

Physical Reality, Explanation and the Nomological Interpretation of the Wave Function — ●FEDERICO LAUDISA — Department of Human Sciences, University of Milan-Bicocca, Piazza Ateneo Nuovo 1, 20126 Milan, Italy

One of the most controversial issues in the area of the foundations of quantum mechanics is the status of the wave function. According to

a recent result, denying the wave function a certain degree of reality leads to contradictions with quantum predictions (Pusey, Barrett, Rudolph 2012); the PBR result, however, gives no hint as to what a wave function is supposed to mean as 'part of reality'. In the present talk, I will turn to the nomological interpretation of the wave function according to the Bohmian mechanics (Goldstein, Zanghì 2013). In order to investigate its status and to see whether it can make justice to the role of the wave function in quantum mechanics, I will rely on two points: 1) the reading of the 'nomological' according to the primitivist approach to laws (Maudlin 2007); 2) the defense of the claim according to which a nomological entity can be part of the natural world even if it is not a concrete and causally efficacious entity (Psillos 2011). Finally, on the basis of the above reading of the nomological role of the wave function, we will see whether this claim can also bring to bear on its explanatory virtue (Lange 2013).

AGPhil 5.4 Thu 18:30 SPA SR22

The Role of the Wave Function in the GRW Matter Density Theory — ●MATTHIAS EGG — University of Lausanne, Switzerland

Every approach to quantum mechanics postulating some kind of *primitive ontology* (e.g., Bohmian particles, a mass density field or flash-like collapse events) faces the challenge of clarifying the ontological status of the wave function. More precisely, one needs to spell out in what sense the wave function "governs" the behaviour of the primitive ontology, such that the empirical predictions of standard quantum mechanics are recovered. For Bohmian mechanics, this challenge has been addressed in recent papers by Belot (Eur. J. Phil. Sci. 2 (2012), 67-83) and Esfeld et al. (Brit. J. Phil. Sci. forthcoming, doi:10.1093/bjps/axt019). In my talk, I attempt to do the same for the matter density version of the Ghirardi-Rimini-Weber theory (GRWm). Doing so will highlight relevant similarities and differences between Bohmian mechanics and GRWm. The differences are a crucial element in the evaluation of the relative strengths and weaknesses of the two approaches, while the similarities can shed light on general characteristics of the primitive ontology approach, as opposed to other interpretative approaches to quantum mechanics.