AGPhil 3: Quantum Theory 2

Time: Tuesday 14:00–16:00 Location: H5

AGPhil 3.1 Tue 14:00 H5

Kurt Gödels Notizen zur Quantenmechanik — •Oliver Passon — Bergische Universität Wuppertal

Kurt Gödel hat unter anderem ein umfangreiches Erbe aus Notizen und Arbeitsbüchern in Gabelsberger Kurzschrift hinterlassen. Dieser Vortrag stellt die bisher unveröffentlichten Arbeitsbücher zur Quantenmechanik aus den Jahren 1935/36 vor. Ein Schwerpunkt liegt auf der Frage, welche Stellung Gödel zu den Grundlagenproblem und Interpretationsfragen der Quantentheorie eingenommen hat.

AGPhil 3.2 Tue 14:30 H5

Persistence and Nonpersistence as Complementary Models of Identical Quantum Particles — •Philip Goyal — University at Albany (SUNY), Albany, NY

In our ordinary conception of the physical world, it is tacitly assumed that the appearances perceived in the present moment are underpinned by objects that persist through time, and that are reidentifiable on the basis of their stable characteristic properties.

It is widely accepted that the quantum treatment of assemblies of identical particles brings this assumption into question, but no consensus on a modification of this assumption has thus far emerged.

In this talk, we propose a new understanding of identical particles based on a recent derivation of the symmetrization postulate [1].

We adopt an operational approach in which the raw data consists of identical localized events. We construct two distinct models of the event data, namely a persistence model and a nonpersistence model. These differ in whether or not it is assumed that successive events are generated by individual persistent entities ('particles'). We then show that these models can each be described within the Feynman formulation of quantum theory and be synthesized to derive Feynman's form of the symmetrization postulate.

On this basis, we propose that the quantal behaviour of identical particles reflects a complementarity of persistence and nonpersistence, analogous to the way in which the behavior of an individual electron reflects a complementarity of particle and wave.

[1] P. Goyal, New J. Phys. 17, 013043 (2015)

AGPhil 3.3 Tue 15:00 H5

Quantum modal realism and Everettian actualism: a methodological appraisal on scientific realism — Jonas Rafael Becker Arenhart[1] and •Raoni Wohnrath Arroyo[2] — [1]Federal University of Santa Catarina, Department of Philosophy, Florianópolis, Brazil. — [2]Federal University of Santa Catarina, Graduate Program in Philosophy, Florianópolis, Brazil.

A recent tension splits scientific realism into two types, 'shallow' and 'deep', depending on how they relate to metaphysics. The division is better appreciated by employing a distinction between 'ontology' and 'metaphysics' by their subject matter, the former dealing with existence-questions and the latter with nature-questions. Deep scientific realists argue that one should 'go deep' into metaphysical questions, otherwise one's scientific realism is not sufficiently informative about its realist content; hence, not genuinely realist. Shallow realism stops at the level of providing an ontology. With this methodological background, we consider two realist approaches to Everettian quantum mechanics: quantum modal realism and Everettian actualism; the former being a defense of the existence of a many-world ontology and the latter being a defense of a single-world ontology. This, in turn, produces a tension regarding the 'realism' of such approaches: the current debate revolves around existence questions concerning the multiplicity of worlds (leaving unanswered questions regarding their nature), so either the mentioned realist approaches are not realist enough by deep realists' standards or their very standard of dealing with metaphysical questions is not a reasonable one.

AGPhil 3.4 Tue 15:30 H5

Derivative metaphysical indeterminacy and quantum physics — •Alessandro Torza — Instituto de Investigaciones Filosóficas, UNAM

A growing literature regards quantum mechanics as a hotbed of metaphysical indeterminacy (MI), which is to say, indeterminacy with a nonrepresentational source. However, Glick (2017) has argued that quantum mechanics provides evidence of MI only if MI can be merely derivative (i.e., arising only at the nonfundamental level); and Barnes (2014) has argued that MI cannot be merely derivative. I will respond to both Glick and Barnes by providing two ways of understanding quantum mechanics as giving rise to merely derivative MI. My overarching argument is as follows:

1. MI is characterized relative to a logical space: MI arises in logical space L just in case there is a fact (state of affairs) in L which neither obtains nor fails to obtain.
2. A quantum system S defines both a classical logical space C_S (i.e., a logical space which is a model of classical logic) and a quantum logical space Q_S (i.e., a logical space which is a model of quantum logic). Crucially, MI arises in Q_S but not in C_S (Torza 2021).
3. Given a system S, there are two ways of understanding C_S as fundamental and Q_S as derivative: if a metaphysically privileged description of reality involves classical logic (Sider); and if reality is fundamentally isomorphic to a Hilbert space (Carroll & Singh ms).
4. Therefore, there are two ways of understanding quantum MI as arising derivatively (in Q_S) but not fundamentally (in C_S).