AGPhil 13: Philosophy of Physics 2

Time: Thursday 9:30–11:00 Location: PTB SR AvHB

AGPhil 13.1 Thu 9:30 PTB SR AvHB

Does quantum cosmology predict the age of the universe? — •Álvaro Mozota Frauca — Autonomous University of Barcelona

The problem of time of canonical approaches to quantum gravity has been argued to make them unsatisfactory. In this article I study how it affects quantum cosmology and reach the same conclusion. The advantage of studying the cosmological case is that its simplicity makes the discussion much clearer and less technically charged. The classical models I will be concerned with describe how two degrees of freedom, the scale factor and a scalar field, evolve with respect to a time variable. After quantizing the model, this time variable just disappears, and I argue that this is problematic. Indeed, this variable in the classical model allowed us to make claims like 'the universe is 13.8 billion years old' and I will argue that this is a physically meaningful prediction that is lost in quantum cosmology. I will analyze some of the relational positions in the quantum gravity and quantum cosmology literature that tend to deny the physical meaning of time variables and I will argue against them for the case of classical cosmology. In this sense, I will conclude that the age of the universe is a physical prediction of classical cosmological models, that it is missing from quantum cosmology, and that this should make us suspect that there is something wrong with this sort of approach.

AGPhil 13.2 Thu 10:00 PTB SR AvHB

Godel, Penrose and Paraconsistency: What Goes? What Stays? — •Kartik Tiwari — University of Bonn, Bonn, Germany

Penrose in "Emperor's New Mind" and "Shadows of the Mind" uses Godel's Incompleteness Theorem to argue for the non-computability of human intelligence and advocate for the necessity of novel physics to understand consciousness. Objections to Lucas-Penrose argument have received mostly dis-satisfactory responses, leading to a diminished interest in the subject amongst philosophers of mind. Conversely, the study of para-consistent formal systems have gained much traction over the past few decades. Naturally, one wonders about the status of Lucas-Penrose Argument and its objections in light of paraconsistency. In our paper, we briefly introduce Godel's (First) Incompleteness Theorem, Lucas-Penrose Argument and Paraconsistent Formal Systems. Then, we summarize - what is widely considered - an authoritative defeater of the Lucas-Penrose argument by David Chalmers. Following this, we systematically investigate the status of Lucas-Penrose Argument and its possible objections with the machinery of paraconsistent logic. We then conclude with some broader speculations about paraconsistency in the context of human intelligence and the soundness of Penrose's demand for novel physics to understand consciousness.

AGPhil 13.3 Thu 10:30 PTB SR AvHB

Energieerhaltung und Irreversibilität — •Grit Kalies[1] und Duong D. Do[2] — [1]HTW University of Applied Sciences, Dresden, Germany — [2]The University of Queensland, Brisbane, Australia

Die Energieerhaltung (der 1. Hauptsatz der Thermodynamik) gilt in vielen modernen physikalischen Theorien nur bedingt. Beispiele sind: 1. Quantenfeldtheorien, in denen Teilchen kurzfristig aus dem Nichts entstehen, um wieder darin zu vergehen (Quantenfluktuationen des Vakuums), 2. die kinetische Gastheorie, in der Gasteilchen im Moment des Stoßes gegen eine Wand keinerlei Energie besitzen, 3. die Allgemeine Relativitätstheorie, in der die potentielle Energie (Gravitationsenergie) in einem Feld außerhalb des Körpers liegt, womit die Energieerhaltung des Körpers beim freien Fall verletzt wird, 4. die Urknalltheorie, wonach Zeit, Raum und Materie aus einer Singularität entstanden sind, was die vorherige Existenz von Energie in Frage stellt. Die Irreversibilität von Prozessen wieder (der 2. Hauptsatz der Thermodynamik) spielt in der Mechanik, Quantenmechanik und den Relativitätstheorien keinerlei Rolle, was man das Paradox der Zeit [1] nennt, welches Physiker und Philosophen gleichermaßen beschäftigt. Gibt man die Idee einer Kraftwechselwirkung auf und geht dazu über, jegliche Wechselwirkung zwischen Objekten, wie z.B. Teilchen, über Prozesse zu beschreiben [2], ändert sich der Zugang zur Energieerhaltung und Irreversibilität grundlegend, sowohl in der Mechanik als auch der Quantentheorie. [1] I. Prigogine, I. Stengers: Das Paradox der Zeit, Piper, München, Zürich, 1993; [2] G. Kalies, D.D. Do, AIP Adv. 13 (2023), 065121, 055317, 095322, 095126.