AGPhil 2: Philosophy of Cosmology II

Zeit: Montag 16:30–18:15 | Raum: HS 10

Hauptvortrag AGPhil 2.1 Mo 16:30 HS 10
Fine-Tuning, Robustness, and Idealization — ●Casey McCoy — Stockholm University, Stockholm, Sweden

Concerns over fine-tuning have motivated important developments in theoretical physics. Inflationary cosmology is one important example. In this context, fine-tuning has most often been characterized in terms of likelihood: fine-tuned conditions are said to be "improbable". Yet an interpretation of fine-tuning in such terms is untenable, since probability attributions in this context are unjustified. I propose a novel interpretation of fine-tuning which is based on an appreciation of the roles of robustness and idealization in our physical models, using the flatness and horizon problems as particular examples.

AGPhil 2.2 Mo 17:15 HS 10
Black hole "singularity": breakdown of general relativity theory? — ●Kiril Maltsev — St Catherine's College, Manor Road, OX1 3UJ Oxford, UK

The existence of singular space-time solutions in general relativity can be interpreted in one of the two ways: either as a

1. theory deficiency, or 2. as opening up a new horizon of understanding the physical world.

We will argue that black hole thermodynamics supports the view that GR indeed breaks down when it comes to description of a black hole phenomenon. We will stress the difference between coordinate singularity and physical singularity, when discussing the Schwarzschild metric. Subsequently, we will outline that certain singular structures in GR are not a feature characteristic of particularly chosen coordinates but, according to Penrose-Hawking singularity theorems, an inevitable feature of GR, if specific energy and causality conditions are satisfied. The arguments in favour of theory breakdown will center on compar-

ison of black hole mechanics with the 0th, 1st and 2nd law of thermodynamics, and the quest for a microscopic account of Bekenstein entropy. We will also comment on what the lack of a precise singularity definition, the concept of white hole, the wormhole construction in Kruskal-Szekeres coordinates, and neutron star physics reveal. Finally, we will give an outlook on LQG and M-theory, which proceed to describe a black hole without presuming a singularity. (200 words)

AGPhil 2.3 Mo 17:45 HS 10
A Bi-Directional Big Bang / Big Crunch Universe within a Two-State-Vector Quantum Mechanics? —————— — ●Fritz Wilhelm Bopp — Department Physik, Universität Siegen

A two-boundary quantum mechanics incorporating a big bang / big crunch universe is carefully considered.

After a persuasive motivation of the two-boundary concept we address the central question how the proposed a-causal quantum universe can be consistent with what is known about the seemingly causal macroscopia.

In a scenario where the universe is macroscopically identical in the expanding and contracting quantum epoch the border state of maximum extend is dynamically determined. The Born rule and the definite "Einstein Würfel" decisions are then direct consequences of this process.

The absence of coexisting macroscopic states is specific to the present thin universe. This might not be the case in the heavily interacting early universe. At the end of this period many coexisting macroscopic states would have to contribute and would have to be averaged over possibly explaining the homogeneity usually attributed inflation.

As the expanding and contracting epoch are quite similar but not completely identical a tiny CPT violation would not be unnatural in such a scenario.