

## AGPhil 4: Philosophy of Cosmology IV

Zeit: Dienstag 14:00–15:45

Raum: HS 10

**Hauptvortrag**

AGPhil 4.1 Di 14:00 HS 10

**Anthropic reasoning and finality** — •RICHARD DAWID — Stockholm University, Stockholm, Sweden

The talk points at a general conceptual shift in scientific reasoning that is required for endorsing anthropic arguments in cosmology. In the 20th century, empirically successful physical theories were taken to have stable explanatory value despite the fact that those theories were expected to be superseded by successor theories later on. This understanding was based on the expectation that the known theory would survive as an effective theory of its more fundamental successor. The effective theory's explanation of a phenomenon remained valid as an effective representation of the corresponding explanation at the level of the fundamental successor theory. The described argument would not be available to anthropic reasoning, however, if the multiverse theory on which it is based were at some stage superseded by a successor theory that lacked the multiverse structure. In that case, the explanatory value of anthropic reasoning would collapse entirely. Therefore, unlike other scientific explanations, anthropic explanations depend on implicit finality assumptions to establish their relevance. The talk will discuss implications of this shift.

AGPhil 4.2 Di 14:45 HS 10

**The naturalness principle and its justification** — •MIGUEL ÁNGEL CARRETERO SAHUQUILLO — Bergische Universität Wuppertal

The naturalness principle has had a major role in particle physics during the last decades, in particular in model building. Nowadays, one can find a wide range of different definitions. Some of them seem mutually exclusive, but traditionally its notion has been linked to the fine-tuning problem. In order to palliate it as appears in the Higgs sector of the standard model, new physics should have appeared in the last LHC run. Thus, the persistence of fine-tuning has originated

numerous works exploring both, the limits and the different conceptual definitions of naturalness. However, little work has been done re-examining precisely one of the main pillars naturalness advocates: its historical successes.

In this talk I will delineate the two kind of examples used in literature for justifying naturalness based on past instances, namely reconstructions and successes. As the sole success example, the charm quark episode will be reviewed. Exploring the motivations given for its prediction and the later computed mass will allow us to determine whether the charm quark is indeed a good example of a naturalness success, able to trigger further model building based on naturalness. The main conclusion will be a negative answer, which will driven us to claim that the charm quark case should count as a naturalness reconstruction, whose justificatory power is reduced with respect to an actual success.

AGPhil 4.3 Di 15:15 HS 10

**Universe - Multiverse. The fine tuning of the constants of Nature** — •THOMAS NAUMANN — Deutsches Elektronen-Synchrotron DESY, 15738 Zeuthen, Germany

Einstein once said: "What really interests me is whether God could have created the world any differently." Our existence depends on a variety of constants which appear to be extremely fine-tuned to allow for the existence of Life. These include the number of spatial dimensions, the strengths of the forces, the masses of the particles, the composition of the Universe and others.

Starting from Leibniz' question whether we live in the "Best of all Worlds" we ask which parts of the laws of physics are fine-tuned and whether the hypothesis of a multiverse can explain the fine-tuning of so many fundamental quantities.

We discuss the role of hypotheses and Popper's criterion of falsification in physics as well as critique of the anthropic principle.