

AGPhil 7: Quantum Gravity 4

Time: Wednesday 9:30–11:00

Location: PTB SR AvHB

Invited Talk AGPhil 7.1 Wed 9:30 PTB SR AvHB
Consistency as a guide to quantum gravity — •KAREN CROWTHER — University of Oslo, Norway

In the absence of novel empirical data, the search for a theory of quantum gravity is primarily motivated, guided, and constrained by theoretical and philosophical concerns. I argue that consistency is the most basic principle functioning in these roles. Consistency is seen as essential, and is widely taken as a constraint in physical theorising, yet scientists do not, and should not, reject inconsistent theories. There are different forms of consistency in science: empirical inconsistency, external inconsistency, and internal inconsistency. I explore how these play a role in motivating and constraining the search for quantum gravity, with an eye to pinpointing and evaluating the status of the different forms in each of these functions. I find that the “inconsistencies” usually appealed to, are not of the form expected, and may not in fact be inconsistencies at all, while some actual inconsistencies that could be relevant are dismissed as uninteresting. I also consider the heuristic

value of inconsistency, and the relationship between consistency and unification in the search for quantum gravity.

Invited Talk AGPhil 7.2 Wed 10:15 PTB SR AvHB
Transplanckian QED: The Discovery of the Landau Pole — •ALEXANDER BLUM — Max Planck Institute for the History of Science, Berlin, and Albert Einstein Institute, Potsdam

One of the main hopes for a quantum theory of gravity is that it will resolve the ultraviolet behavior of quantum field theory. In my talk, I will discuss the origins of this hope in the mid-1950s, when physicists started exploring the high-energy behavior of quantum electrodynamics and gradually came to realize that the theory would inevitably break down at scales far beyond the Planck scale. I will then reflect on the symbiotic relationship this engendered between quantum field theory (QFT) and quantum gravity (QG): QFT could rest assured that its foundational difficulties would be taken care of by QG, while QG received a robust motivation from the high-energy breakdown of QFT.