Adlam, Emily


Summary: I assess various proposals for the source of the intuition that there is something problematic about contextuality, ultimately concluding that contextuality is best thought of in terms of fine-tuning. I then argue that as with other fine-tuning problems in quantum mechanics, this behaviour can be understood as a manifestation of teleological features of physics. Finally I discuss several formal mathematical frameworks that have been used to analyse contextuality and consider how their results should be interpreted by scientific realists. In the course of this discussion I obtain several new mathematical results – I demonstrate that preparation contextuality is a form of fine-tuning, I show that measurement contextuality can be explained by appeal to a global constraint forbidding closed causal loops, and I demonstrate how negative probabilities can arise from a classical ontological model together with an epistemic restriction.

MSC:

81P05 General and philosophical questions in quantum theory
81P15 Quantum measurement theory, state operations, state preparations
81P13 Contextuality in quantum theory
83F05 Relativistic cosmology

Keywords:
quantum mechanics; contextuality; fine-tuning

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