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Statement

and

Readings

The Future

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Abstract

Quantum mechanics and Quantum field theory have been the most successful theoretical framework in the history of physics, leading to experimental results of unprecedented accuracy, theories of mind-boggling depth, and a framework with an ability to encompass new settings of unparalleled power. Claims that we do not understand quantum mechanics or quantum field theories are belied by the above successes.

However, one thorn has stubbornly remained in hide of this success, and that is gravity, and in particular the realisation by Einstein that gravity could be described by a coordinate invariant theory of the distance structure of space and time. In particular for at least 80 years it has been recognized that this thorn exists, and for 80 years attempts to remove it have failed.

Most of the problem seems to come about because of the very different behaviour of time in the two theories—being crucial to the interpretive structure of quantum theory, and being an inconsequential epiphenomenon of the gravity.

In this talk I will go over some of these issues which is probably the biggest challenge facing quantum field theory today.