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【20】Out of nowhere: The emergence of spacetime in quantum gravity

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Quantum gravity attempts to fuse insights from quantum physics, which has so successfully contributed to our understanding of the constitution of matter, and from general relativity, our best theory of gravitation. This is necessary in order to describe the physics of black holes and the very early universe. Such a theory is of great interest to the philosopher of nature: the conceptions of space and time arising from our manifest image of the world have already been challenged by general relativity, and adding quantum effects to the mix promises to add significant complications. As it turns out, most approaches to quantum gravity suggest that our world is ultimately neither spatial nor temporal. How can one conceptualize such a non-spatiotemporal world? May necessary conditions for empirical research in a such world even be violated? How can space and time not be fundamental, but instead emerge from a non-spatiotemporal structure just as the liquidity of water emerges from molecules which are themselves not liquid? Using a concrete example of a theory of quantum gravity, I will explain - and answer - these questions.

Theoretical Work

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