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The passage of time and top-down causation

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It is often claimed that the fundamental laws of physics are deterministic and time-symmetric and that therefore our experience of the passage of time is an illusion. This talk will critically discuss these claims and show that they are based on the misconception that the laws of physics are an exact and complete description of nature. I will argue that all supposedly fundamental deterministic and time-symmetric laws have their limitations and are supplemented by stochastic and irreversible elements. In fact, a deterministic description of a system is valid only as long as interactions with the rest of the world can be ignored. The most famous example is the quantum measurement process that occurs when a quantum system interacts with a macroscopic environment such as a measurement apparatus. This environment determines in a top-down way the possible outcomes of the measurement and their probabilities. I will argue that more gnerally the possible events that can occur in a system and their probabilities are the result of top-down influences from the wider context. In this way the microscopic level of a system is causally open to influences from the macroscopic environment. In conclusion, indeterminism and irreversibility are the result of a system being embedded in a wider context.

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