Quantum probability theory and the arrow of time

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The nature of (macroscopic) events and decoherence in quantum probability theory is believed to be closely related to the arrow of time and incomplete information about the past [1]. Contrary to this quantum arrow of time in quantum probability theory a quantum and classical arrow of time arises from coarse graining time evolution operators while also restricting them to a subset of states of vanishing measure [2]. The resulting coarse grained time evolution operators are convolution operators forming a semigroup. The infinitesimal generator of the resulting semigroup has applications to experiment [3].

[1] Ph. Blanchard and J. Froehlich (eds.), "The Message of Quantum Science", Springer, Berlin 2015.

[2] Acta Physica Polonica B, 49, 859 (2018).

[3] Analysis, 36, 49 (2016).