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(I) Markovian dynamics in open quantum systems

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The state of a quantum system evolves according to the Schrödinger equation. Often, one is interested in the behaviour of parts of a whole system only. Such parts are called open quantum systems, as they exchange energy, matter, information with their surroundings. The dynamics of open systems is very complicated. They are a central topic of research in many theoretical and applied fields of modern quantum theory, such as quantum optics and quantum information, having applications to other sciences (chemistry, biology). One of the main tools for the analysis is the Markovian approximation, in which the open system dynamics is approximated by the so-called master equation. In some aspects, the latter is akin to the Schrödinger equation, in others it is crucially different due to the open nature of the system. Despite the ubiquitous use of the Markovian approximation, its rigorous justification turns out to be a difficult task.
In this talk we explain recent ideas and results of a mathematical approach proving the validity of the Markovian approximation, i.e., of the master equation. The talk does not require the listeners to have a deep background in quantum theory and should be accessible to a rather general audience.

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