Speaker: **Lydia Dopfer, University of Freiburg**

Title: **Non-Markovian Dynamics and Critical Behaviour of a Spin-Star Model**

Date: **Tuesday, October 28th, 11:00 am (s.t.).**

Place: **Seminar room 915**

Title: **Non-Markovian Dynamics and Critical Behaviour of a Spin-Star Model**

In this thesis, the dynamics of a central spin star model are studied. An exactly solvable system of Ising spins is considered, which experiences decoherence effects. The system is examined for an initially uncorrelated state. To investigate a wide range of parameters, the Central Limit Theorem is applied to the probability distribution of the magnetisation. With this, an approximation is explicitly derived, which is highly accurate for all parameter ranges considered in this thesis. The influence of number N of spins in the bath, coupling strength g and temperature T on the time evolution of the magnetisation of the central spin is examined. Furthermore, the critical number N* of bath spins is identified, at which the system experiences the least decoherence due to frequency bunching. The behaviour at this critical value is analysed and theoretically explained. For this purpose, the influence of different initial states on the time evolution of the magnetisation is investigated, which proved to depend on the orientation of these states in the Bloch sphere. Additionally, different evaluations of the critical value are compared, and the accuracy of the calculations for different parameters is assessed. Finally, the plateau setting in before the information backflow, which characterizes non-Markovian dynamics, is investigated in terms of the influence of the number of environmental spins and coupling strength g. It is shown that the magnetisation exhibits a zero crossing for N* and approaches zero for a high number of bath particles.
In its entirety, this thesis provides a highly accurate approximation for the cental spin star model, which has been employed to perform a thorough analysis of the influence of different parameters and threshold values on the dynamics of the magnetisation.