

Speaker: Hans-Peter Weber, University of Freiburg

Title: A Microscopic Model of Equilibration

Date: Thursday, July 17th, 14:00 pm

Place: Seminar room 915

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We investigate the emergence of equilibration in a minimal, fully closed quantum systems consisting of two coupled subsystems, each comprising two interacting particles. The system is solved using a finite element discretisation of the Hamiltonian, followed by a spectral analysis and unitary time evolution. Under suitable interaction strengths, we observe signatures of energy redistribution and equilibration: certain initial states relax into quasi-stationary states with reduced energy differences between subsystems. However, thermalisation is not universal — many initial states exhibit only partial or prethermalising behaviour. The system's spectrum displays avoided crossings and moderate level repulsion, indicating an intermediate regime between regularity and chaos. While spectral unfolding procedures and chaos diagnostics remain future tasks, the current results already demonstrate that thermal features can emerge in isolated few-body quantum systems — especially when integrability is broken. Overall, this work offers a controlled and numerically robust platform for exploring quantum thermalisation in small systems and may serve as a stepping stone toward a quantum-mechanical foundation of thermodynamic laws.