

Speaker: Jonathan Brugger, University of Freiburg
Title: Exact Dynamics of One-Dimensional Few-Particle Quantum Systems
Date: Thursday, April 11th, 11 o'clock (s.t.)
Place: Seminar room 915

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Abstract:

While the tunneling of a single particle is nearly perfectly understood, we still lack a comprehensive understanding of the tunneling processes of two or more interacting particles: Under which conditions do they tunnel individually or in a correlated way? What is the role and influence of the particles' interaction? And is there an underlying spectral structure?

Here we answer these questions for the tunneling dynamics of two interacting bosons via exact numerical diagonalization. We find that correlated two-particle tunneling is the primary process, while uncorrelated single-particle tunneling is due to resonances between the two-particle system's eigenfunctions. We determine the necessary prerequisites for the latter and provide an intuitive picture of the underlying spectral structure. Along the way, we discuss the exact numerical diagonalization of the two-particle Hamiltonian with a specifically adapted finite element method, the consequences of a long-ranged Coulomb, as well as short-ranged contact interaction for the tunneling dynamics, the state space structure of open many-body quantum systems, and its application to many-body quantum non-Markovianity.