

PHYSICS COLLOQUIUM

Speaker: **Prof. Peter Schlagheck**
Physics Department,
University of Liege



Topic: **Quantum simulation of chaos**

Time and place: Tuesday, April 16, 2024, **2:50 pm** – hybrid event
The colloquium will be held in REC/C213.

Online participation possible:

Zoom-Meeting: Meeting-ID: 631 3817 8900 / passcode: PC-SoSe24

<https://tu-dresden.zoom-x.de/j/63138178900?pwd=am9nSzYyeUJh3SWxMdnNBWkpUaXI5UT09>

Host: Prof. Frank Grossmann

Abstract: The second quantum revolution has given birth to a number of novel tools and techniques that are about to have some effect on our everyday life in the near future. Among those new tools figures quantum simulation, i.e., the possibility to better understand the quantum dynamics in a complicated system (e.g. in a biochemical context) by emulating the essential ingredients of that system within a different quantum system that is under very good experimental control. State-of-the-art platforms for quantum simulations, using photons, trapped ions, ultracold atoms, or superconducting qubits, share the common feature that they are very complex and involve many degrees of freedom. Quite unsurprisingly, pioneering studies with such quantum simulation platforms were therefore focused on obtaining a better understanding of the generic properties of complex quantum many-body systems and their relation with the notions of integrability or chaos. In my talk, I will address these quantum signatures of chaos in the specific context of ultracold bosonic atoms confined within optical lattices, theoretically described by Bose-Hubbard systems which feature a well-defined classical counterpart. I will specifically focus on deviations from the quantum-classical correspondence in this context, owing to many-body quantum interference effects. Those deviations can be rather subtle, if induced by the presence of discrete symmetries or time-reversal invariance, or rather important, as exemplified by scars, i.e., eigenstates that are strongly localized in phase space and thereby defy thermalisation despite global chaos. Being aware of these generic phenomena will be of key importance for the conception and handling of efficient quantum simulators.

Bio: 1996-1999: PhD in physics at TU München / 1999-2001: Postdoc at Université Paris Sud / 2001-2008: Assistant position (including habilitation) at Universität Regensburg / 2008-2009: Guest professor at University of Lund (Sweden) / since 2009: Faculty member at Université de Liège.

Get-Together:

The colloquium will be followed directly by a Get-Together with Prof. Peter Schlagheck in REC/B101 (around 4:00 p.m.). All students and staff are invited to talk to the speaker and discuss perspectives on the academic career, work-life balance and the professional life as a scientist.