Graz Advanced School of Science
PHYSICS COLLOQUIUM OF THE UNIVERSITY OF GRAZ AND
THE GRAZ UNIVERSITY OF TECHNOLOGY

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Complex Behaviour in Classical and Quantum Chaos

Abstract:

I shall first explain how chaotic behaviour can emerge in deterministic systems of classical dynamics. It is due to a sensitive dependence on initial conditions, meaning that two nearby initial states of a system develop in time such that their positions (states) separate very fast. After a finite time (the Lyapunov time) the accuracy of an orbit characterizing the state of the system is entirely lost, and the system can be in any allowed state. The system can be also ergodic, meaning that one single chaotic orbit describing the evolution of the system visits any neighbourhood of all other states of the system.

In the same sense, chaotic behaviour in time evolution does not exist in quantum mechanics. However, if we look at the structural and statistical properties of certain quantum systems, we do find clear analogies and relationships with the structures of the corresponding classical systems. This is manifested in the eigenstates and energy spectra of various quantum systems (mesoscopic solid-state systems, molecules, atoms, nuclei, elementary particles) and other wave systems (electromagnetic, acoustic, elastic, seismic, water surface waves etc.), which are observed in nature and in experiments.

After the general presentation I shall discuss research results we have recently obtained for quantum chaos.

Date:	Tuesday, October 1st, 2024 Institute of Physics, University of Graz, Universitaetsplatz 5
Meet the speaker:	3:45 p.m. Library Experimental Physics, 1st floor
Lecture:	4:15 p.m. Lecture Hall 05.01, ground floor
Host:	Prof. Willibald Plessas

For a regularly updated colloquium program see: Physics Colloquium (tugraz.at)