PHYSIKALISCHES KOLLOQUIUM

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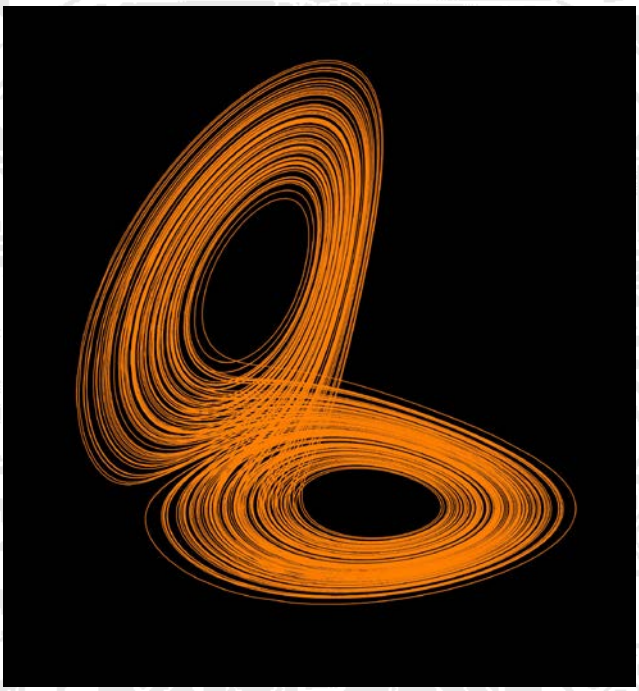
IM GROßEN HÖRSAAL



FRACTALITY AND SELF-SIMILARITY IN CLASSICAL AND QUANTUM PHYSICS

PD DR. ALBERTO RODRÍGUEZ GONZÁLEZ

PHYSIKALISCHES INSTITUT, UNIVERSITÄT FREIBURG

Very often, shapes found in nature deviate from the ideal forms treated by classical geometry. In some cases natural forms even exhibit some type of self-similarity, by which a reduced portion of an object resembles the whole, either exactly, approximately or in a statistical sense. These irregular and intricate patterns challenge the intuition that we inherit from our standard geometry lectures and their study requires of a different approach. Such complex structures receive the name of fractals and can be characterised by a 'fractal dimension' which usually exceeds its topological dimension.

In this lecture, we will present a basic introduction to fractality, and show how the use of concepts such as fractal dimensionality proves useful to understand different scientific phenomena. We will discuss specific examples in classical and quantum physics were fractals are encountered. In particular, we will explore the relation between fractality and chaos in dynamical systems, and observe fractal energy spectra and wave functions emerging from quantum Hamiltonians.