RUHR-UNIVERSITÄT BOCHUM

RUB

PHYSIKALISCHES KOLLOQUIUM

WINTERSEMESTER 2023/24

Montag, 16.10.2023, 12 Uhr c.t.

NONLINEAR FEEDBACK-DRIVEN EMERGENCE, FROM MODELOCKING OF LASERS TO COLLECTIVE LASER-MATTER INTERACTIONS

Ömer Ilday, Ruhr Universität Bochum

Nonlinearity is often seen as a source of instability but also underlies self-organization, collective behavior, and lasers. Our long-term goal is to gain a better understanding of emergence, not only to predict outcomes but to figure out how to pick the conditions that lead to a particular outcome. We explore this using laser physics and laser-matter interactions as model systems, building analogies among seemingly unrelated phenomena using toy theories, which we test experimentally, often resulting in technological advancement. In 2002, we proposed Nonlinearity Management to overcome the instabilities of modelocked lasers, which led to new laser concepts. A decade ago, we began a program to translate the lessons of modelocking to a broader class of phenomena, spanning pattern formation, optical tweezers, holography, and laser surgery.

These taught us the importance of nonlocal nonlinearities that constitute positive feedback, which motivated new explorations that range from a new form of laser modelocking to implications of nonlocal nonlinearities for complex pattern formation and the most enigmatic symmetry-breaking phenomenon in biology. This is an ongoing story that continues to be shaped; I will walk you through what we learned and will attempt to share the sense of adventure that nonlinear emergence instills in me.

Die Einführung erfolgt durch Ömer Ilday

Die Fakultät lädt alle Interessierten herzlich ein. Die Veranstaltung findet im Hörsaal HZO 20 statt.

Physik und Astronomie
from matter to materials