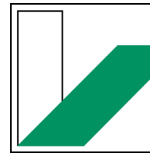


# Physikalisches Kolloquium



UNIVERSITÄT  
BAYREUTH  
Physikalisches Institut

## Quantum Billiards with Free Electrons

Microscopy with light or electrons has given us powerful tools to study the nanoscale world. Fast electrons provide atomic resolution through their short de Broglie wavelength, yet their precise quantum state is usually not relevant. Quantum optics, in contrast, examines the quantum properties of light and its interaction with matter at the level of individual quanta.

When light interacts with free electrons, these areas meet, and quantum-optical concepts enter electron microscopy. Optical fields can shape an electron wave function or create superposition states, and such interactions can even lead to entanglement between electrons and photons.

This talk will present these recent developments, which establish free electrons as a controllable quantum system with new applications in measurement, control, and light generation.

**Dienstag, 25. November 2025 | 17 Uhr s.t. | Hörsaal H18 (NW II)**



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