

# Eugene Wigner Colloquium

*joint event of GRK 1558 and SFB 910*



## Prof. Frank Jahnke

Universität Bremen

### “Quantum optics with semiconductor quantum dots in optical microcavities”

Quantum dots are often considered as the active material for the next generation of semiconductor lasers. By placing the quantum dots in optical microcavities with three-dimensional mode confinement, the emission properties of the active material can be tailored. With a single quantum dot emitter in a high-quality cavity, the ultimate limit of miniaturization is reached. The system shows interesting similarities but also important differences in comparison to current experiments on quantum optics with trapped atoms. The quantum-mechanical interaction processes for quantum dots in optical microcavities are discussed. We review the use of these devices as non-classical light sources. Results for the emission of single photons, polarization-entangled photon pairs, as well as stimulated emission in the strong-coupling regime are presented. We also discuss the physics of carrier scattering and dephasing processes as well as their microscopic modeling. Furthermore, novel results for the superradiant coupling of an ensemble of quantum-dot emitters in a nanolaser are introduced, which leads to photon trapping and non-classical light emission.

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**Thursday, 19.06.14 · 16:15h · EW 202**

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[www.itp.tu-berlin.de/grk1558](http://www.itp.tu-berlin.de/grk1558) · [www.itp.tu-berlin.de/sfb910](http://www.itp.tu-berlin.de/sfb910)

The logo for GRK1558, featuring a blue square with rounded corners. Inside the square, the text "GRK1558" is written in large, white, bold letters. Below it, the text "research training group" is written in smaller, white, lowercase letters.