17 Sep 2019 kl. 11:00 - 12:00 Building 343, room 017

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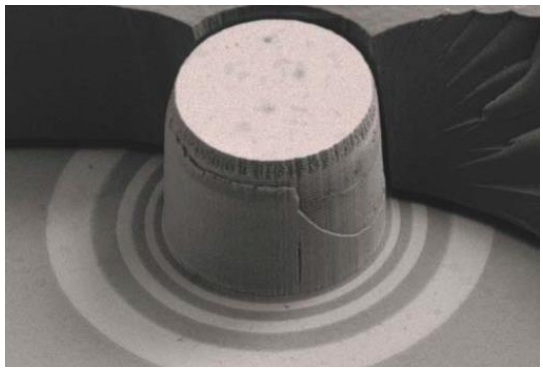
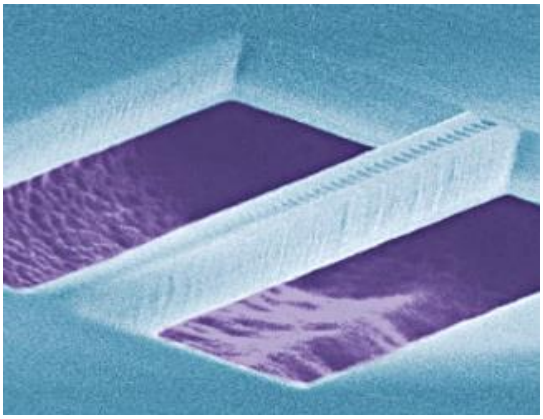
Tailoring the interaction between light and matter in semiconductor nanostructures

Christopher Gies

The quest for miniaturization of integrable optoelectronic devices has led to the development of smaller and smaller light-emitting nanostructures. By placing emitters into the confined electromagnetic field of a microresonator, it is possible to tailor fundamental material properties like spontaneous emission itself. At the same time, the enhancement of the interaction between light and matter fosters correlations between electrons and photons, in the presence of which many-particle correlation effects can change the system behaviour dramatically.





Examples for cavity-QED realizations of semiconductor nanolasers: Micropillar (top) and nanobeam (bottom) resonators with embedded gain material.

For nanolasers operating in this regime, the formation of coherent laser light is no longer connected purely to the existence of stimulated emission. Collective effects, such as sub- and superradiance, and the non-Markovian dynamics of correlations, make us rethink our understanding of lasing and the definition of the laser threshold. The seminar will give insight into the underlying physics, and touch the surface of recent work aiming at using atomically thin semiconductors as new gain materials.

Dr. rer. nat. Christopher Gies is leader of the research group “Quantum Optics of Semiconductors and their Nanostructures” at the University of Bremen. Group website.