Stuttgarter Physikalisches Kolloquium

Max-Planck-Institut für Intelligente Systeme
Max-Planck-Institut für Festkörperforschung
Fachbereich Physik, Universität Stuttgart

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Dienstag, 21. Januar 2020	**16.00 Uhr c.t.**	**Hörsaal 2D5**

Stuttgarter Max-Planck-Institute, Heisenbergstraße 1, 70569 Stuttgart-Büsnau

Gastgeber: Prof. Peer Fischer, Max-Planck-Institut für Intelligente Systeme, Telefon: 0711 689-3560

Actuating Nanostructures: Using light on the nanoscale

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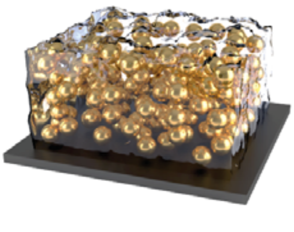
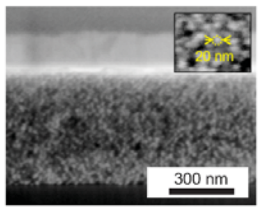
Abstract

The ability to confine light now routinely to $1nm^3$ volumes enables new functionalities for optoelectronic switching at ultralow energies, and can generate optical forces sufficient to move individual atoms, molecules, and nanoparticles. I will show how we now create ultralow volume plasmonic cavities trapping light to the atom scale, and are routinely able to watch individual molecules and bonds vibrating. Using nano-composites of plasmonic nanoparticles and thermos-responsive polymers I will demonstrate the utility of the nN forces produced at sub-μs speeds, for creating new types of active nanomachinery, utilizing the scaffolds of DNA origami. High throughput synthesis allows the scale-up of these actuating nano-transducers (ANTs), opening up video-rate large area display technologies. Close-packed films of ANTs act to pump water in/out of permeable membranes using light, produce switchable metamaterials.





Using DNA origami we couple few dye molecules together optomechanically, and produce strong-light matter coupling that changes their quantum emission properties. We also watch redox chemistry in real time, watching single electrons shuttle in and out of single molecules, as well as 2D materials confined in the same gap. Prospective applications range from (bio)molecular sensing to fundamental science. I particularly focus on applications to nanomachinery actuation by light.