Projektmodul: ***Introduction to nano-optics***, summer semester 2014

I will give an introduction to the field of nano-optics and discuss selected topics in detail. Nano-optics deals with optical phenomena on the nanometer scale. Techniques or structures such as confocal microscopy, scanning near-field optical microscopy, or plasmon resonant nanoparticles allow us to confine light to subwavelength volumes and to optically probe single nano-objects. This opens up exciting possibilities in studying fundamental aspects of light-matter interaction on the level of single molecules and nanoparticles as well as for applications in, for example, enhanced light emission and absorption and optical sensing. The course will give the necessary background to the field. Selected topics will be presented in more detail in the lectures and discussed in seminar talks.

Preliminary list of topics:

1. Introduction, theoretical concepts
2. Focusing of optical fields
3. High-resolution microscopy
4. Optical near-fields, near-field microscopy
5. Light-emission in nanostructures
6. Quantum emitters
7. Optical spectroscopy on the nanoscale
8. Surface plasmons, general introduction
9. Surface plasmons and optical antennas

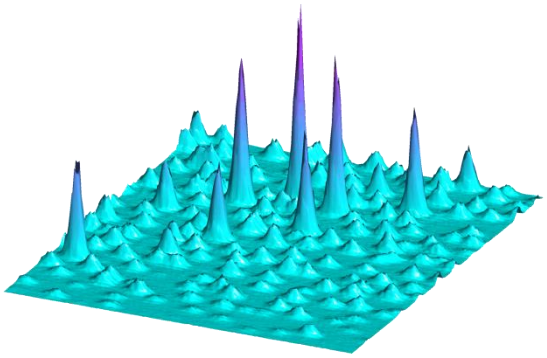
Weekly 2 h of lectures will be given accompanied by a seminar in which problems and case studies are discussed. A laboratory project (Praktikum) completes the module.

The module is suitable for master students with a background in physical or inorganic chemistry or physics. After successfully completing the module the student has good knowledge of light-matter interaction on the nanoscale. The module provides the necessary basic skills to work in the field of nano-optics.

The course will start with a startup meeting on Tuesday 8.4.2014, at 13:00 in Seminarraum PC147 (PC-Praktikum). If you are interested in the course but cannot attend the meeting please send an email to klas.lindfors@uni-koeln.de.

Literature, selected parts of

1. L. Novotny and B. Hecht, Principles of Nano-Optics, Cambridge University Press (2012).
2. S. A. Maier, Plasmonics, Springer Verlag (2007).
3. J. D. Jackson, Classical Electrodynamics, John Wiley & Sons, Inc. (1998).



Photoluminescence image of single semiconductor quantum dots.