Nanoseminar: “DNA Origami crystals”

Time: 16.3.2018 at 09:00 in YN121
Speaker: Prof. Tim Liedl (Ludwig-Maximilians- Universitat, Germany)

Abstract: Over the last decades, DNA has proven to be an excellent self-assembling molecule for constructing functional two- and three-dimensional nanostructures and materials. By offering attachment sites for active nano-components on such DNA objects, our group has realized complex and nanometer-precise assemblies of fluorophores, plasmonic nanoparticles and biomolecules.

The initial proposal catalyzing the rapid development of DNA nanotechnology was to arrange periodic DNA frameworks to host guest molecules for crystal structure analysis. Despite enormous efforts and great successes, placing guest molecules in designed DNA crystals remains a challenging goal. Ned Seeman and Chengde Mao reported a 3D DNA crystal based on the "tensegrity triangle", where three DNA duplexes are interconnected in a self-restricting over-under, over-under, over-under fashion. By adopting this design principle, we here present a tensegrity triangle design based on DNA origami that crystallizes into three dimensional, micrometer-scale assemblies. TEM and SEM analysis confirmed periodic assembly on the micrometer scale and surprisingly good order over longer distances. One of the advantages of using our comparatively large and rigid DNA origami building blocks lies in the possibility to host up to 30 nm large guest molecules such as gold nanoparticles of different sizes. SAXS measurement showed excellent scattering peaks from the DNA origami crystals and the corresponding peaks for Au nanoparticle precisely arranged on the guest molecule positions.

Our results demonstrate the assembly power of DNA origami and our ability to fabricate 3D materials that are designed on the molecular level while reaching macroscopic dimensions.