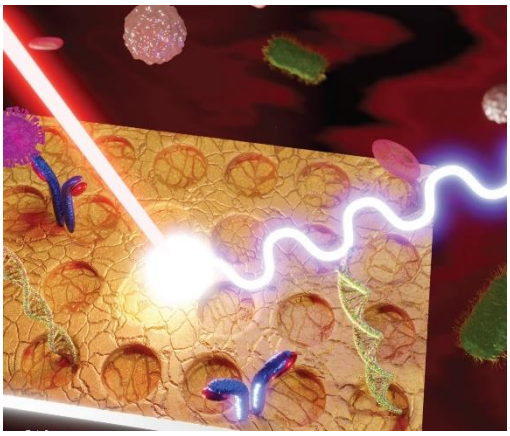
Master Projects

Immediate MS projects are available in department of physics for the 2022-2023 academic year. Projects are on the development of plasmon enhanced optical sensors. The students will be exposed to micro/nano fabrication, nanophotonics, microfluidics, cellular/molecular biology etc.
For students interested in Master projects or semester projects, the following projects are available to be performed during academic semesters. Please send your questions, CV and your availability to the corresponding supervisor.

1. Nanoimpringting lithography for nanophotonic structure fabrication

Developing a low-cost fabrication technique empowers transferring technology from research stage to industry. This project is about moving from expensive and time-consuming e-beam lithography to nanoimprinting. Students will participate in the fabrication process as well as the optical characterization of the structures for various applications. Techniques involved are: Micro-nano fabrication methods, metrology including SEM & AFM, optical characterization and spectral measurement. This project is available as a Master or semester project based on student's schedule.

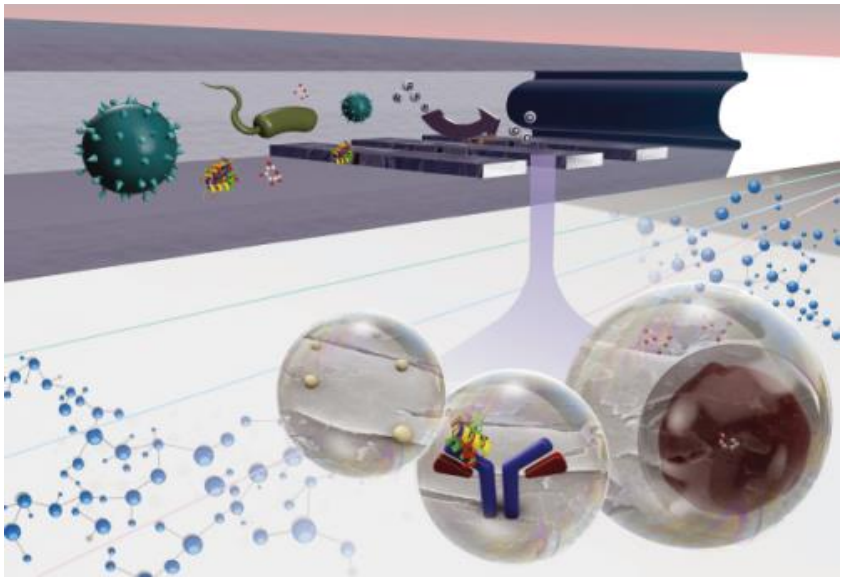


[For more information please read the following paper: Plasmonic metasurface assisted by thermally imprinted polymer nano-well array for surface enhanced Raman scatteringJ Segervald, N Boulanger, R Salh, X Jia, T Wågberg - Nano Select, 2022]

(Supervisor: Jonas Segervald <jonas.segervald@umu.se> and Xueen Jia <xueen.jia@umu.se>)

2. Microfluidic biosensors for protein detection

This project is about detecting biomolecules using state-of-the-art nanophotonics platforms combined with microfluidics. Students will participate in the fabrication process as well as the optical characterization and in-flow and static measurements. Techniques involved are Micro-nano fabrication methods, metrology including SEM & AFM, optical characterization, and spectral and imaging measurement.



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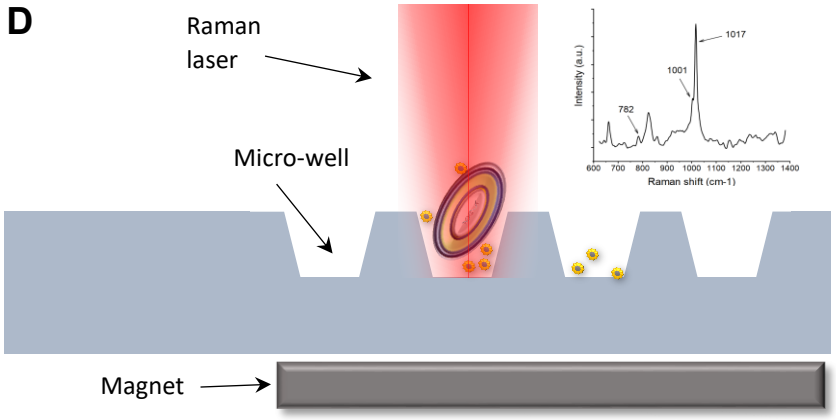
3. Single cell/bioparticle biosensing

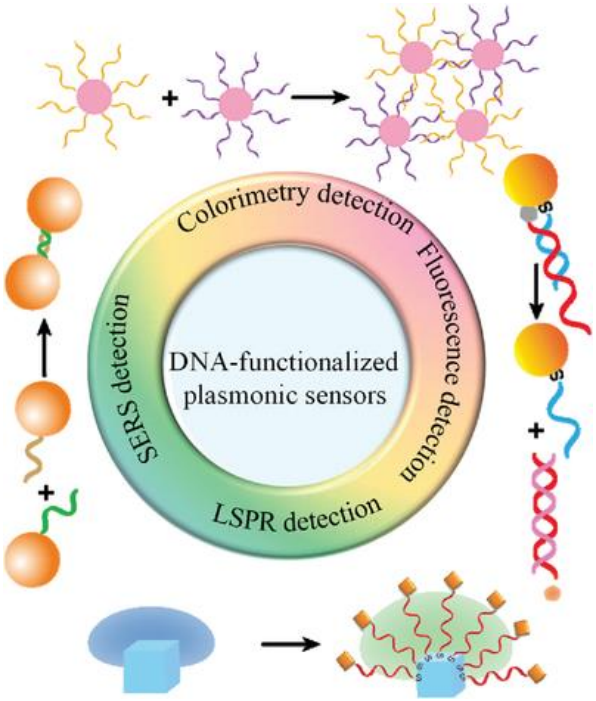
In this interdisciplinary project, we integrate our on-chip sensor technologies with micro/nanofluidic systems for efficient bio particle trapping and detection. Particularly, we leverage a microfluidic platform and nanophotonic biosensors, which enables real-time cell capture and analysis in under physiological conditions. The main goal is to build a versatile and robust technique for high-throughput and multiparametric single-cell analysis that can pave the way for a wide range of biomedical applications. Basic knowledge in biology, microscopy, and familiarity with the micro/nanofabrication processes is required. Previous experience with cleanroom work and/or handling live cells is a plus.



(Supervisor: Dmitry Malyshev Dmitry.malyshev@umu.se and Xueen Jia <xueen.jia@umu.se>)

4. Plasmonic nanosensor for gene test

Plasmonic nanomaterials, especially Au and Ag nanomaterials, have shown attractive physicochemical properties, such as easy functionalization and tunable optical bands. In recent years, plasmonic nanomaterials–based sensors have been extensively investigated because they are useful for genetic diseases, biological processes, devices, and cell imaging. In this interdisciplinary project, we will develop a sensitive microRNA nanosenor based on Au nanorods and nano spheres, target gene biomarker both detected in solution or on a normal glass slides by optical methods including colorimetry, fluorescence, and localized surface plasmon resonance etc. The nanocarrier will be characterized by TEM, SEM & DLS and other spectral measurement. This project is available as a Master or semester project based on student's schedule.



(Supervisor: Dmitry Malyshev Dmitry.malyshev@umu.se and Xueen Jia <xueen.jia@umu.se>)