## Project 3.10 Plasmonic nanoparticles decorated with fluorescently-labelled mRNA: using singlepair FRET effect for investigating enzymes active in mRNA metabolism

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## Background:

The aim envisioned in this interdisciplinary project is experimental optical detection and quantification of the activity of the enzymes responsible for mRNA degradation using novel double-labelled nucleotide- and mRNA-based fluorescent probes, whose optical response can be strongly enhanced with plasmon excitations in silver nanowires. To this end we want to synthesize appropriate probes, conjugate them specifically with silver nanowires and using advanced fluorescence imaging, monitoring in real-time changes of the FRET efficiency upon incorporation of particular enzymes.

Particular attention will be placed at using double-labelled RNA FRET probes, as they provide a way to monitor various RNA hydrolases. The ability to monitor enzymes with RNA is important for regulating the expression of genetic information. Fluorescent labelling of RNA plays crucial role in developmental and structural studies, as well as investigations of gene expression, cellular immune responses, and delivery of mRNA based therapeutics, thus creating the drive to improve and expand the current toolbox of chemo-enzymatic RNA modifications.

## Aim:

The aim of this interdisciplinary project is experimental optical detection and quantification of the activity of the enzymes responsible for mRNA degradation using novel double-labelled nucleotide and mRNA-based fluorescent probes. The optical response of those probes can be strongly enhanced if chemically grafted to plasmonically active silver nanowires.

## **Requirements:**

- The PhD candidate should have good knowledge about metallic nanoparticle synthesis or surface modification or molecular interaction and microscopic methods,
- MSc or equivalent in chemistry, biochemistry, physics or a related area