Acquisition of plastids and rise of the photosynthetic function was one of the major turning points in eukaryotic evolution. The primary plastid originated from an endosymbiotic event involving cyanobacteria (a eukaryotic organism engulfed photosynthetic bacteria) and was subsequently spread to different eukaryotic lineages by secondary endosymbiosis (a eukaryotic organism engulfed another eukaryotic organism containing already a primary plastid) all over the tree of life. Despite its obvious advantage, photosynthesis has been lost many times in parasitic plants and algae. Examples of important research topics in this context are the reduced plastids in obligate human pathogens including the causative agents of malaria (*Plasmodium*) and toxoplasmosis (*Toxoplasma gondii*). Usually the organisms that have lost photosynthesis still retain colourless (lacking photosynthetic pigments) plastids that have crucial non-photosynthetic metabolic functions, but little is known about the functions of the vestigial plastids in non-pathogenic colourless algae.

The project is focused on the evolution of reduced non-photosynthetic plastids in free-living unicellular algae. I would like to answer the questions **what are the main functions of the vestigial plastids in the colourless algae and why the vestigial plastids and their genomes are retained even after losing photosynthesis**. I will study colourless and photosynthetic representatives of two groups of microalgae - euglenophytes (e.g., *Euglena gracilis*) and ochrophytes (e.g., diatoms and kelps). In order to identify the main functions of their reduced plastids, I will sequence their plastid genomes and their whole transcriptomes. Using bioinformatics tools I will identify genes in the plastid genomes and plastid-targeted proteins in the transcriptomes. That will allow to reconstruct metabolic pathways maintained in the vestigial organelles.