

Master thesis project:

‘From environment to evolution: why retain genes in organelles?’

Master-thesis background

Mitochondria and chloroplasts power complex life. From their endosymbiotic origins, they retain their own (highly reduced) genomes, encoding important bioenergetic machinery. Why some species retain more genes in their mitochondrial and chloroplast DNA than others remains a mystery – and one at the center of eukaryotic evolution.

New evolutionary theory has proposed a link between an organism’s environment and the set of organelle genes that it retains – more dynamic environments favor more gene retention. We have an exciting and unique experimental setup with which to explore this “universal” theory. We can constrain individual cells in place and subject them to changing environments while simultaneously measuring their survival and performance with detailed microscopy. Using a selection of algal species, this project will test evolutionary predictions with single-cell measurements, both revealing new aspects of phytoplankton behavior and testing this grand-scale evolutionary theory.

Master-thesis project description and aims

In this master thesis, you will use our unique, cutting-edge automated microscopy in combination with advanced cell tracking to measure the effects of dynamic light exposure to different phytoplankton. The hypothesis is that organisms retaining more organelle genes will be relatively less challenged by dynamic environments.

Methods

In this project, you will learn the following methods:

- Basic microbiology
- High-throughput automated fluorescence microscopy
- Tracking single-cell movements in large image datasets
- Transferrable statistical and data science approaches

You should be a master-level student with some experience in e.g. image analysis, microscopy and/or phytoplankton and a keen interest for interdisciplinary science.

Students from all walks of life and backgrounds are welcome to apply!

Have a look at what else we are up to: <https://behrendtlab.com/> ;
<https://org.uib.no/stochasticbiology/>

Interested? Please contact Lars Behrendt, lars.behrendt@scilifelab.uu.se. The scope of the project is a 45-60 hp master thesis