

# Diploma- / Master thesis

## *Towards smart microscopy: Deep learning and adaptive optics*

Image: Y. Rivenson and A.  
Ozcan, arXiv:1805.08970  
(2018)

### Motivation

Microscopes have already been built in the early 17th century and have since been a driving force for progress in biology and medicine. In spite of their long existence, only recently novel techniques such as adaptive optics, wave front shaping and deep learning techniques mark the beginning of a new era of smart and intelligent microscopes. These microscopes promise to allow deeper imaging at higher resolution while requiring less and less user inputs and specimen preparation.

In cooperation with the University of Freiburg and the Helmholtz centre for environmental research (UFZ) in Leipzig, we research and develop confocal and structured illumination microscopes with adaptive components for aberration correction and three-dimensional scanning and smart evaluation procedures to increase automation and minimize the specimen preparation requirements. Within the scope of a diploma or Masters thesis you can contribute to this research.

### Possible Tasks (selection)

- Control and characterisation of optical components such as novel adaptive prisms or bi-actor membrane lenses
- Application and evaluation of smart signal processing and data evaluation techniques such as deep neural networks (DNN)
- Optimizing the optical setup
- Measurements at biological specimen such as zebrafish embryos

The tasks can be adapted to your specific skills and interests.

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