LABORATORY
OF
BIOPHYSICS

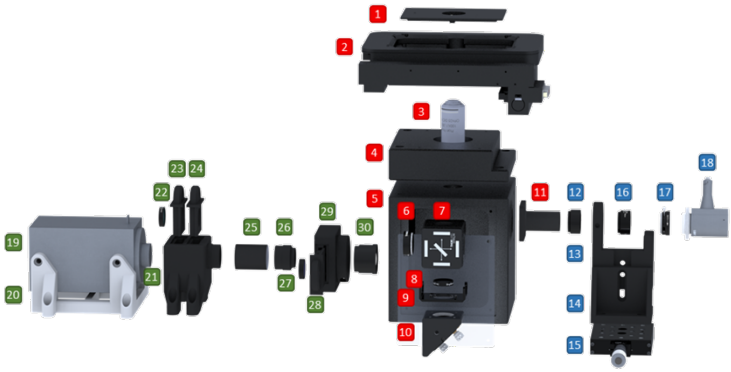
WAGENINGEN
UNIVERSITY & RESEARCH

New (open) hardware and software for super-resolution microscopy

The Hohlbein group in the Laboratory of Biophysics is dedicated to method development and open science. We have a long track record of publishing open hardware and software to advance the field of super-resolution microscopy. We developed an open microscopy framework, the miCube, (https://doi.org/10.1101/437137, https://hohlbeinlab.github.io/miCube/index.html) and published new algorithms to localize single fluorescent molecules as fast as possible (https://doi.org/10.1063/1.5005899 and https://doi.org/10.1016/j.ymeth.2020.07.010).

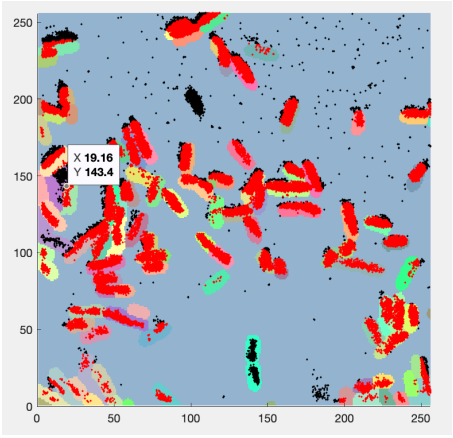
To expand our single-molecule and single-cell research, we have various exciting and highly collaborative projects for internships, BSc, and MSc theses available.

Spectrally-resolved single-molecule localisation microscopy. We recently submitted a patent application in which we describe a novel way of discriminating colour on a black and white sensitive camera chip. To push that idea further, we want to elaborate, how many colours determined by the emission spectrum of single molecules we can simultaneously distinguish. Potential directions include software development (e.g., Deep Learning, clustering algorithms), nanoparticle synthesis (e.g., in collaboration with the laboratories of Soft Matter and Physical Chemistry or BioNanoTechnology) or further optical hardware optimisation.



Real-time super-resolution microscopy. Currently, we do not process our super-resolution microscopy data in real time. There are, however, a number of promising Python based software frameworks that could by explored and tested (e.g., https://python-microscopy.org/). We are further constantly working on improving the experimental and computational workflow of our projects in super-resolution food microscopy and single-molecule bacteriology.

Any thesis will be closely supervised and supported by the members of the group.



Segmented bacteria (coloured areas) with localisations of single fluorecent proteins moving inside the bacteria (red) and spurous background localisations outside bacteria(black).

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