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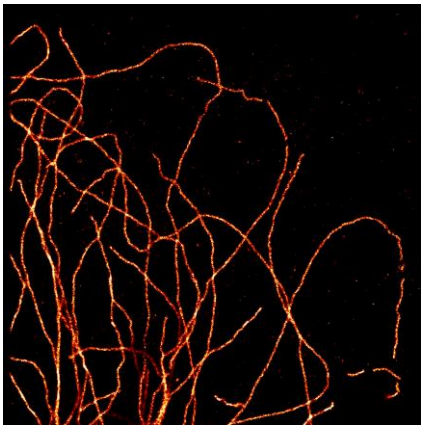
Master Thesis Project

New approaches to multicolor 3D STORM Microscopy

Super-resolution microscopy methods have recently allowed us to visualize biological structures using fluorescence microscopy down to the nanometer scale. In particular, STORM [1], a type of localization microscopy that relies on fluorescent dyes imaged in an adapted chemical environment is a popular technique due to the use of standard dyes and standard inverted microscopes. However, multicolor 3D imaging is limited by the few number of protocols that yield equally good images in the different channels and can work away (up to 10-15 micrometers) from the coverglass.



In this project, we want to develop new protocols [2,3] for multicolor 3D-STORM. In particular we identified a new environment that is particularly suitable for a variety of red dyes and want to see if multicolor imaging with green and/or far-red dyes is suitable.

This project is mostly experimental and combines aspects of sample preparation (cell biology, immunochemistry, and chemistry), microscopy, and image/data analysis (ImageJ /Python/ Matlab).

References:
[1] Huang, Bo, et al. "Three-dimensional super-resolution imaging by stochastic optical reconstruction microscopy." Science 319.5864 (2008): 810-813.
[2] Nicolas Olivier, Debora Keller, Pierre Gönczy, Suliana Manley. "Resolution doubling in 3D-STORM imaging through improved buffers." PloS One 8.7 (2013): e69004.
[3] Nicolas Olivier, et al. "Simple buffers for 3D STORM microscopy." Biomedical optics express 4.6 (2013): 885-899.

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