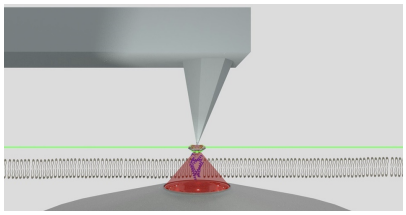
Advanced microscopy

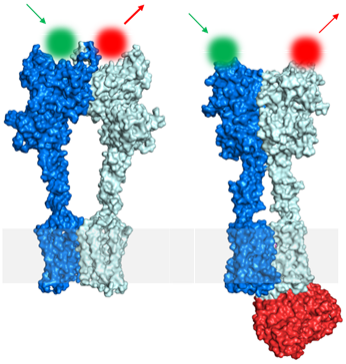


1- Image model lipid membranes by correlative AFM / confocal / FLIM

Teacher: Cédric Godefroy

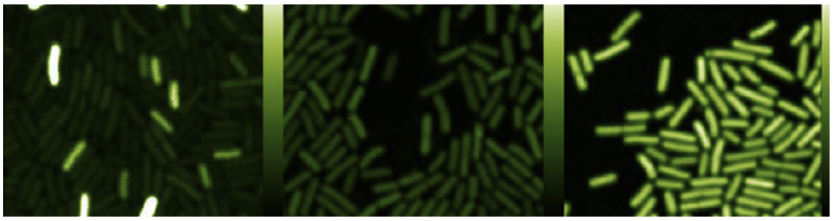
In this practical, students will learn how to acquire simultaneously AFM, confocal and FLIM images with the correlative AFM-Fluorescence Spectroscopy setup. They will image gel and liquid phase supported lipid bilayers labeled with Bodipy dyes. They will learn how to align an AFM probe with a confocal spot, how to acquire AFM images in QI mode and, finally, how to acquire FLIM images. Students will correlate the differences between gel and liquid phases within the model membranes in terms of morphology, height and mechanics (AFM) and in terms of viscosity (using the Bodipy lifetime measurements, FLIM data).

2- Structural dynamics of metabotropic Glutamate receptor by smFRET



Teachers : Emmanuel Margeat, Robert Quast

In this practical, we will learn how to perform single molecule FRET on purified G-protein coupled receptors. We will label the receptors on live cells, extract them in detergents. We will perform smFRET acquisitions in confocal geometry, in the presence of various ligands, to understand their role on the conformational dynamics of the receptor.
This practical is based on the following study (mainly Fig. 3) :
https://www.nature.com/articles/s41467-021-25620-5



3- Characterize promoter strength in E.coli by N&B

Teacher : Caroline Clerte

Quantification of the absolute number of GFP molecules expressed per living cell.
Libraries of promoters will first be engineered in *E. coli* to explore a large range of gene expression levels during SynBio practical courses. Then, Quantification of GFP molecules expressed in these libraries will be performed by cytometry and Fluorescence Fluctuation Scanning microscopy using 2 Photons Excitation coupled with Number & Brightness analysis.

4- Nuclear Pore Complexes imaging in human cells by confocal, Airyscan and STORM microscopies

Teachers : Jean-Bernard Fiche & Christine Doucet

Nuclear pore complexes will be labelled by immuno-fluorescence in fixed cells. The goal of this practical is to explore confocal, airyscan and STORM microscopy techniques and understand the specificities of each technique. By developing an image analysis routine, you will extract different parameters from cells such as pore density and pore diameter.