# EUROPHOTONICS-POESII MASTER COURSE

## PROPOSAL FOR A MASTER THESIS

**Dates: April 1st, 2016 – September 30th, 2016**

**Laboratory : Single Molecule Biophotonics @ ICFO**
**City, Country : Castelldefels (Barcelona) - SPAIN**

**Title of the master thesis : Dynamics and interactions of membrane receptors at the single molecule level**

**Name of the tutor of the master thesis :**
Email address : maria.garcia-parajo@icfo.es - carlo.manzo@icfo.es
Phone number : +34 935534158 - +34 935542234
Mail address : ICFO – The Institute of Photonic Sciences
Mediterranean Technology Park
Av Carl Friedrich Gauss, 3
08860 – Castelldefels (Barcelona) SPAIN

**Summary of the subject (maximum 1 page) :**
The student will be involved in an interdisciplinary project, with research being conducted at the interface of photonics, biology and physics. The research will focus on the quantitative study of dynamic interactions on the plasma membrane of living cells at the single molecule level. The student will participate in the design and the construction and the calibration of a new experimental setup for multi-color single-particle tracking and will be involved in the development of tools for the data analysis. The student will conduct experiments on the diffusion and interactions of membrane receptors involved in cell signaling and function, with a particular focus to the immunological response to pathogens. In addition, the student will be exposed to state-of-the-art technology in biophotonics and super-resolution nanoscopy offered by the ICFO SLN. The project will be carried out in collaboration with worldwide leading groups in biology and immunology, offering the successful candidate the opportunity to benefit by a multidisciplinary and international environment.

**Keywords :**
Biophysics – Single particle tracking – Superresolution imaging – living cell membrane – membrane receptors – receptor dynamics

**Additional information :**
* Required skills : Positively valued will be experience in optics/photonics, single molecule biophysics, image analysis and computer programming (Matlab/Octave, Python, R, LabView, Julia,…)

* References:

1 – C. Manzo, M. F. Garcia-Parajo *A review of progress in single particle tracking: from methods to biophysical insights.* Reports on Progress in Physics (2015) 78 (12):124601.

2 - C. Manzo*, J. A. Torreno-Pina*, P. Massignan, G. J. Lapeyre Jr, M. Lewenstein, M. F. Garcia-Parajo *Weak ergodicity breaking of receptor motion in living cells stemming from random diffusivity.* Physical Review X (2015) 5:011021.

3 - J. A. Torreno-Pina, B. M. Castro, C. Manzo, S. I. Buschow, A. Cambi, M. F. Garcia-Parajo *Enhanced receptor–clathrin interactions induced by N-glycan–mediated membrane micropatterning.* PNAS (2014) 111(30):11037–11042.