

Development of enhanced TIRF microscopy to study the dynamics of viral assembly at the single molecule level.

The plasma membrane is the exit or the entry gate of many intracellular pathogens (bacteria, viruses). These processes have a precise temporality and they are spatially regulated at the scale of a few molecules. Recent optical microscopy methods have allowed to measure the dynamics and the localization of these molecules at the membrane of living host cells, leading to a strong input in the understanding of these mechanisms. Amongst these optical microscopy methods, evanescent field excitation microscopies (such as TIRF microscopy) have been implemented in a multimode way (space, time) this last decade, either by analyzing temporal fluctuations of these molecules (Im-FCS) or by using a spatial super resolution approach combined to trajectories analyses of single molecules (spt-PALM). However, these methods suffer from their weak sensitivities.

The main goal of this thesis is to drastically improve this sensitivity in order to locate and track these molecules with high spatial and temporal accuracy. For this purpose, we will use resonant multi-dielectric stacks. The enhancement of the local field induced by the stacking will allow a sharp increase in this sensitivity over the entire cell surface and thus an improvement in the pointing accuracy (~ 10 nm) or temporal resolution (<1 ms) of these single molecules positions and motions. This enhanced excitation will open new perspectives not only for monitoring virus assemblies in the cell at the single molecule level but also in numerous other applications.

This thesis is an interdisciplinary thesis supervised by an experimentalist physicist (Aude Lereu / Institut Fresnel) and a biophysicist/biologists (Cyril Favard / IRIM). The position is funded for three years (36 months) by the CNRS. The CNRS is an equal opportunity employer and supports gender equality.

We are looking for a highly motivated and excellent candidate with a strong background in general physics, optics and microscopy and a commitment for technological applications, and a strong interest in understanding molecular mechanisms occurring in cell biology/virology. For this position, the candidate is expected to be enthusiastic about a collaborative interdisciplinary environment. Programming skills will be an added value. The candidate will be mainly located in Marseilles for the 6/8 first months of the contract and then move to Montpellier during the 28/30 last months. If your profile matches the description, please send your application including all documents (motivation letter, CV and contact details) until August 31, 2019 preferably by e-mail in a single pdf file.

For further information please contact:

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