

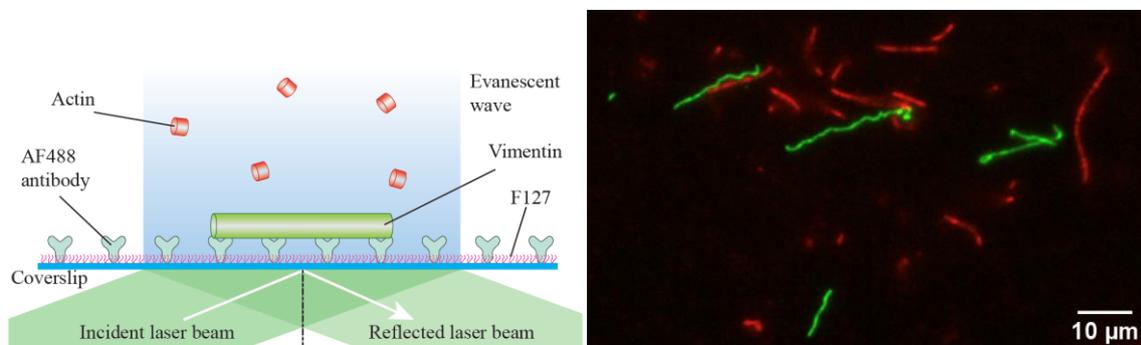
M2 project – 2021/2022

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***In vitro* reconstitution of mixed networks of actin and vimentin**

The cytoskeleton is responsible for the mechanical properties of living cells and is composed of three types of interconnected filaments. Among them, actin forms dynamic networks that can remodel rapidly in response to their environment, but are not mechanically resistant to deformation. Conversely, vimentin forms stable networks that are highly extensible and resistant to rupture. Although having very different properties, actin and vimentin are involved in many common cellular functions such as cell migration or mechano-sensitivity, and work in coordination to perform them. However, very few studies have focused on the interaction between actin and vimentin at the molecular level to understand the mechanisms involved in this coordination.

The objective of the internship is to elucidate how the dynamic morphology of mixed actin and vimentin networks is determined by its molecular components. We want to understand how actin and vimentin networks regulate their respective properties, either directly or through cross-linking proteins. To do so, the different components will be purified, and the vimentin/actin interaction will be reconstituted *in vitro*. The mixed networks and their dynamics will be observed by fluorescence microscopy and microfluidics, and the different morphological and dynamic properties will be quantified under different conditions. Through this project, we expect to elucidate how the coupling between two very different filament networks allows for emergent properties that are essential to ensure the mechanical integrity of the cell.



This internship will be done jointly with a post-doctoral fellow, in order to work in pairs and be quickly productive. The experiments will allow to discover the basis of the regulation of actin and vimentin cytoskeletons, and to discover the advantages of *in vitro* experiments with purified proteins offering a great control of the experimental conditions. The internship can be extended by a PhD thesis funded by an ANR recently obtained to finance the project. The team 'Regulation of Actin Assembly Dynamics', at the Institut Jacques Monod, is a very dynamic, multidisciplinary team, working at the interface between biochemistry, cell biology and physics. It is composed of 12 people of 5 different nationalities. We are looking for motivated students, open to original experimental approaches and whose curiosity is an important driver of their learning process.

Bibliography:

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