Master2 internship proposal

Institut Jacques Monod, Université de Paris, CNRS
Research Team : 'Regulation of Actin Assembly Dynamics'
Group Leaders : Antoine Jégou / Guillaume Romet-Lemonne
in collaboration with
Research Team : 'Polarity and Morphogenesis'
Group Leaders : Antoine Guichet

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Investigating the labeling of actin networks by various actin probes

Project summary

The **actin cytoskeleton**, consisting of interconnected filaments, plays a major role in many cellular functions. To this end cells assemble different types of networks with specific architecture, dynamics and mechanical features. To observe them in vivo, a large array of fluorescently labeled small actin binding probes has been developed over the last 30 years. As more probes are available, it has appeared that some probes are able to target and label some actin networks, others much less efficiently.

While the structural details of binding interfaces of probes onto actin filaments have been well characterized recently, we are still missing an in-depth understanding of the parameters that make some probes specific to a limited subset of actin networks.

The project is based on a collaboration between a biophysics lab, investigating actin assembly dynamics with cutting edge in vitro approaches, and a team of biologists deciphering the molecular mechanisms that control cell polarity and tissue morphogenesis in relation with the cytoskeleton.

The project will aim at better understanding the molecular events that govern the **architecture and dynamics of actin networks**. In particular, using **in vitro approaches (microfluidics, micropatterning and fluorescence microscopy)**, specific actin networks with specific mechanical constraints will be built and their labeling by different fluorescent probes will be assessed. Those results will be correlated to in vivo observations in a developmental context.

This internship will be carried out in close collaboration between the two labs. The experiments will allow us to discover how actin probes can specifically label specific actin networks in cells and propose new views on the internal dynamics and their protein content.

This internship will be an excellent opportunity to be placed at the interface of two fields of biology by discovering in vitro experiments with purified proteins and the benefit of great control of experimental conditions and characterizing intracellular dynamics in a developing whole organism (in vivo).

We are looking for curiosity-driven and motivated students who are open to original experimental approaches.

The 'Regulation of Actin Assembly Dynamic' lab: Our lab has developed biophysical experimental approaches based on microfluidics and micropatterning in order to decipher the individual molecular reactions regulating the emergence of actin networks. The team gathers 12 researchers/students/engineers with multidisciplinary skills, and from 5 different nationalities, to create a very dynamic atmosphere.

The 'Polarity and morphogenesis' lab: Our lab (10 researchers/students) conducts research at the interface between cell and developmental biology using the *Drosophila* fly as a model system. By combining genetic and confocal microscopy approaches we decipher the involvement of microtubule and actin networks in intracellular polarity and tissue morphogenesis.

The 'Regulation of Actin Assembly Dynamic' lab (www.actindynamics.net)

Our lab conducts research at the interface between biochemistry, cell biology and physics. Over the years we have developed biophysical experimental approaches based on microfluidics and micropatterning in order to decipher the individual molecular reactions regulating the emergence of actin networks.

The team gathers 12 researchers/students/engineers with multidisciplinary skills, and from 5 different nationalities, to create a very dynamic atmosphere.

The 'Polarity and morphogenesis' lab
(www.www.ijm.fr/research-topics/research-groups/guichet-lab/?lang=en)

Our laboratory conducts research at the interface between cell and developmental biology using the *Drosophila* fly as a model system. Over the years, we have developed experimental approaches combining genetic and confocal microscopy particularly in vivo, in order to decipher the involvement of microtubule and actin networks in intracellular polarity and tissue morphogenesis.

The team brings together 16 researchers/students/engineers with multidisciplinary skills to create a very dynamic atmosphere.

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