Faculté des Sciences
Aix*Marseille Université

A envoyer au responsable du master BBSG :
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FORMULAIRE STAGE Recherche-M2 BBSG
(période de stage : du 5 janvier 2017 au 3 juillet 2017)

Titre du stage : `Effect of integrin activation on the mechanical response of living cells using atomic force microscopy`

Laboratoire (intitulé, adresse, site web) :
BioAFMLab U1006 INSERM & AMU, Parc de Luminy TPR2, http://bio-afm-lab.com/felix.rico. Our lab focuses on the development and application of atomic force microscopu (AFM) and high-speed AFM in biology. We have recently used HS-AFM to unfold single proteins at high speeds [1] and to map quantitatively the mechanics of living cells[2]. Our interdisciplinary work lies within the fields of biophysics and molecular and cell biology.

Equipe : BioAFMLab U1006 INSERM & AMU
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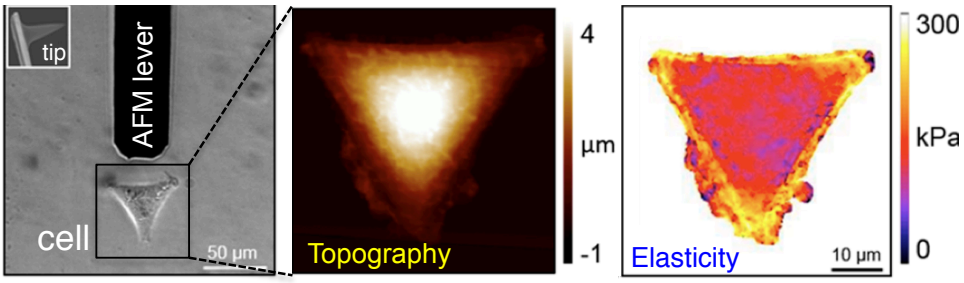
Descriptif du stage : **Cells** change their **mechanical properties** in response to their external microenvironment. **Integrins** are adhesion molecules that link mechanically the inside of the cell with the extracellular space. This is possible by the formation of specific bonds between integrins and the extracellular matrix. There are different types of integrins that, in turn, change their binding state. The specific role of each integrin and the effect of the binding state on the mechanics of the cell are still poorly understood. **Atomic force microscopy (AFM)** is one of the most versatile and used **nanotechniques** in material and biotechnology research. AFM uses a flexible microlever with to obtain images of nanometer (10^{-9} m) resolution and to manipulate biomolecules and cells with piconewton (10^{-12} N) force precision. In our lab we use the most advanced AFM systems: high-speed AFM, which work 1000 times faster than conventional AFM and allow movies of biological samples and microsecond force measurements; and cellular AFM coupled to optical microscopy.



In this project, the student will use AFM on **living cells** grown on **micropatterns** to determine the effect of integrins type and state on their mechanical response. Force measurements and mechanical mapping will be used. Besides AFM and **optical microscopy**, the student will learn cell culture and novel micropatterning methods, and image processing and analysis techniques. The resulting data will be susceptible of being published in a peer review journal.

Student profile : We seek highly motivated students with background in biophysics, nanotechnology and/or cell biology. Programming skills will be a plus. The student will devote most of the time to carry out AFM experiments. We will encourage students to continue for a PhD within the group. A good level of English will be useful.

References

1. Rico, F.; Gonzalez, L.; Casuso, I.; Puig-Vidal, M.; Scheuring, S. *Science* **2013,** 342, (6159), 741-743.
2. Rigato, A.; Rico, F.; Eghiaian, F.; Piel, M.; Scheuring, S. *ACS Nano* **2015,** 9, (6), 5846-56.