Laboratoire Physico-Chimie Curie

Institut Curie, 11 Rue Pierre et Marie Curie-75005 PARIS

TITRE DU STAGE :

Self-organized flagellar-like beating of actin bundles in vitro.

DIRECTEUR de Stage : Pascal MARTIN

Ce stage peut être poursuivi en thèse : OUI – ~~NON~~

Si oui, la thèse est-elle financée : OUI - ~~NON~~

SUJET de la thèse :

The emergent active behaviors of systems comprising large numbers of molecular motors and cytoskeletal filaments remain poorly understood, even though individual molecules have been extensively characterized. We have very recently shown in vitro that flagellar-like beating can be produced naturally and robustly in polar bundles of filaments. Using surface micro-patterns of a nucleation-promoting factor, we control the geometry of actin polymerization to produce thin networks of parallel actin filaments in vitro. In the presence of either myosin Va or heavy-mero myosin II motors added in bulk, we have recently shown that growing actin filaments self-organized into bundles that display periodic wave-like beating resembling those observed in eukaryotic cilia and flagella. The aim of the traineeship will be to study the role of fluid viscosity on the wave properties (frequency, wavelength, waveform) as well as the conditions that allows neighboring bundles to synchronize their oscillations. In the longer term, these artificial cilia may be used to mediate particle transport or as micro-swimmers. Our results will guide theoretical descriptions of wave-like beating in polar bundles of filaments in collaboration with Jean-François Joanny (UMR168 Institut Curie / Collège de France) and Frank Jülicher (MPIPKS Dresden).

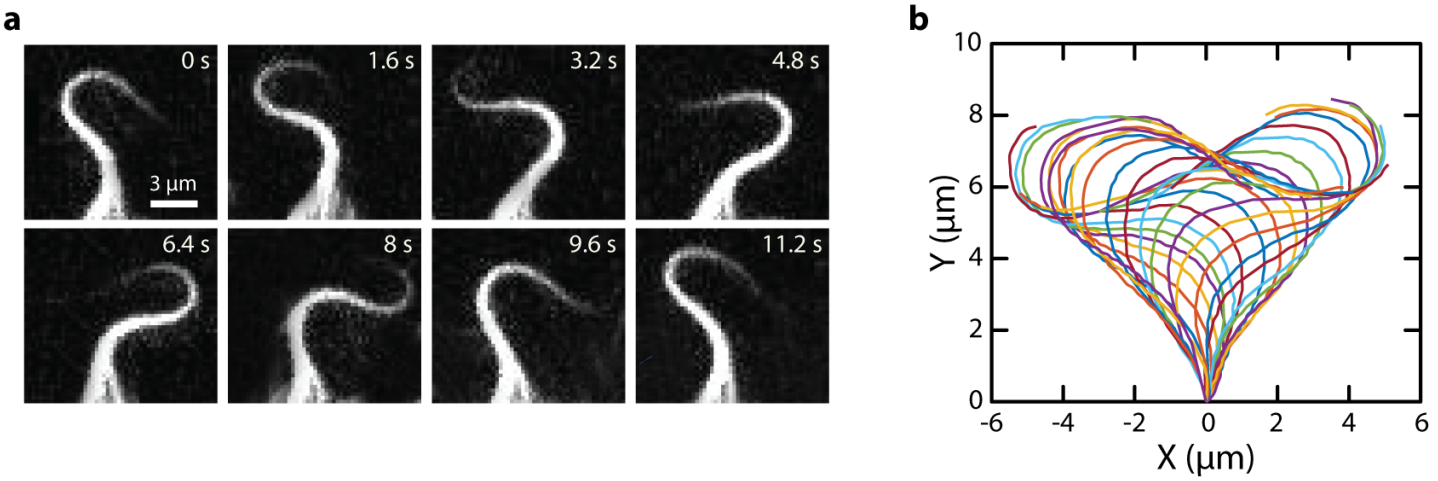

Figure: **a.** Wave-like beating of an actin bundle driven by the mechanical activity of myosin motors in vitro. **b.** automatic tracking of the bundle's shape results in the beating pattern of the actin bundle shown in **a**.