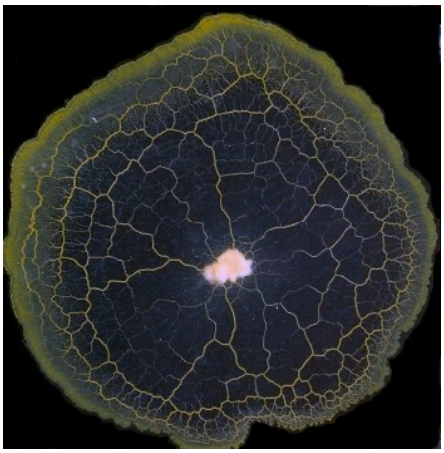
Postdoctoral position opening
CONTRACTILE ACTIVITY, FLOWS AND NETWORK RESHAPING OF GIANT UNICELLULAR *P. POLYCEPHALUM*

Supervisor : Marc Durand, MSC, Université de Paris (http://www.marcdurand.net/)

PROJECT:

Flows over remarkably long distances are crucial to the functioning of many organisms, across all kingdoms of life. Coordinated flows are fundamental to power deformations, required for migration or development, or to spread resources and signals. A ubiquitous mechanism to generate flows, particularly prominent in animals and amoebas, is actomyosin cortex-driven mechanical deformations that pump the fluid enclosed by the cortex. Surprisingly, even in the absence of a pacemaker like a heart, cortex dynamics can self-organize to give rise to coordinated flows on vastly different scales. The aim of this project is to study the interplay between actomyosin contractile activity, fluid flows, and shaping of the organism in *Physarum polycephalum* (popularized as *Blob* in the media), a model organism intensively studied by the scientific community [1].

In its vegetative phase, called *plasmodium*, this organism is made of thousands of undifferentiated cells fusing in a single, multinuclear cell, which can reach macroscopic sizes (dozens of cm²). This organism then develops a tubular network in which oscillatory flows (with period ~ 1 minute) are generated by the contraction of the membranous layer surrounding the "veins".



P. polycephalum in its plasmodium stage.

In spite of its apparent simplicity, the growth of the tubular network shares common features with the development of vascular systems in higher organisms, or with the mechanisms that take place in the irrigation of tumors. In particular, one can clearly identify two stages in the development of the plasmodium: a growing phase during which *P. polycephalum* explores its environment covering all the plane with a very dense and ramified tubular network. Then a reorganizing phase during which the organism seems to follow an optimization scheme: the network is less and less reticulated. Such self-organized structure also exhibits a number of properties (resilience, efficiency, adaptability) that are highly desirable for technical applications.

The proposal aims at investigating the sophisticated interplays that take place between contractile activity, flow distribution, and network reshaping in *P. polycephalum*. We will study in particular how various spatial geometrical confinements affect the contractile waves and network architecture.

[1] Christina Oettmeier *et al.* 2017 *J. Phys. D: Appl. Phys.* **50** 413001.

SCIENTIFIC ENVIRONMENT:

The recruited post-doc will benefit from a world-class interdisciplinary environment within the MSC lab which developed expertise in soft condensed matter and biophysics : http://www.msc.univ-paris-diderot.fr/?lang=en

SKILLS:

We seek motivated researchers, with background in experimental physics of biological systems. Postdoctoral position is for a period of one year, with estimated starting date **October 2020**.

CONTACT:

Interested candidates can apply by sending their CV (including publication list) and a short research statement (with plans and motivations) by email to marc.durand@univ-paris-diderot.fr.