

POSTDOC POSITION

Self-contracting vascular solids

**Mechanical and Engineering Institute of Marseille (IMI)
Marseille, FRANCE**

Target start date: September 2023

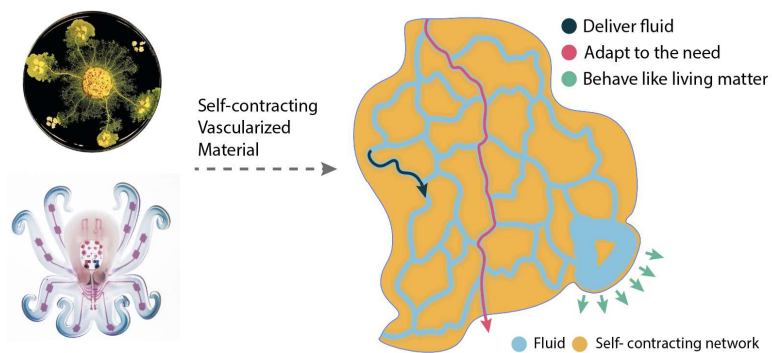
CONTACT

Martin Brandenbourger - IRPHE
martin.brandenbourger@univ-amu.fr

Joel Marthelot - IUSTI
joel.marthelot@univ-amu.fr

Context. Inspired by nature, pneumatic soft robots use vascular networks and external pumps to twist, deform, move and bend in ways that traditional hard robots cannot. So far, these soft robots lack autonomy compared to organisms, which control fluid transport in vascular networks in much more advanced ways. From animals to fungi, one of the most efficient fluid transport mechanism is based on vessels that can actively contract upon local sensing of stimuli. This adaptative fluid transport enables advanced functionalities in organisms such as autonomous locomotion toward objectives.

The main goal of the proposed research is to **design self-contracting vascular networks to study active solids that deform upon sensing**. To this end, the postdoc will develop artificial active solids containing self-contracting networks and model how active fluid flows control their mechanical properties. (Fig. 1).



Graphical abstract: (Left) The behavior of a slime mold is based on self-contracting vascular networks. In state-of-the-art soft robots, networks do not self-contract. (Right) We propose to design and study self-contracting vascularized materials that autonomously react to their environment.

Profile. Candidates with either Physics or Engineering backgrounds and interested in the general area of soft/compliant mechanics, active matter or fluid mechanics are welcome to apply. The following areas of experimental expertise are particularly welcomed: rapid prototyping, micro-fabrication, material science and mechanical testing. Skills in scale analysis, theory, and proficiency in finite element analysis are a plus.

Environment. IRPHE and IUSTI are laboratories of CNRS and Aix Marseille University located in Marseille, France. They are part of the Mechanical and Engineering Institute (IMI), one of the leading French Institutes in fluid and solid mechanics with opportunities for strong interactions with local and international collaborations.

Application procedure. Applicants are welcome to directly contact Martin Brandenbourger and Joel Marthelot with a detailed CV before June 10th 2023.