

# Postdoc position opening : Biophysical study of the tendrils of climbing plants

**Context** The climbing plants like vine (but also cucumber, squash, watermelon, peas...) have rod-like supple organs called tendrils which allow them to fix to supports. They can be seen as modified leaves which will grow and exhibit strong periodic oscillating motion of the tendril (nutating phase, see videos online for the vine or the cucumber), exploring space until they reach an obstacle (contact phase) and attach to it, winding around it and making a twist (writhing phase, see videos online for the cucumber or vine).

We have created a consortium called DYNABINE<sup>1</sup>, to investigate, understand and control the biophysics and biomechanics phenomena by which the tendrils generate force (by growth and thigmotropic conformational changes).



**Project** In the framework of our Dynabine project, we are opening a postdoc position to investigate the very nature of the structure of the tendrils, and their evolution during growth. We want to explore different avenues:

1. **The Hydraulics of short timescale movement of the tendril** We have observed that the tendrils display fast (in a few minutes) and reversible movements after mechanical solicitation. We want to investigate and characterize the nature of this strongly non linear response. We will in particular look at memory effects and spatial dependence of the excitation.
2. **The Mechanics of growing tendrils** In order to understand the spatial stress pattern within the growing tendril, we plan on performing laser ablation on specific locations (ventral or dorsal sides). Subsequent deformations will reveal the effective residual stress inside the plant. These results will be related to theoretic

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<sup>1</sup>together with Dražen Zanchi and Émilien Dilly at Université de Paris Diderot, Sébastien Neukirch at Sorbonne Université, and Thierry Simoneau and Thierry Lacombe at INRAE Montpellier. See a video teaser of the project.

cal models developped with physicists of Université Paris Cité (Émilien Dilly and Dražen Zanchi).

- 3. Histology of the tendril** By performing an histological study of the tendrils. We aim at monitoring the underlying structure of the tendril as a function of time. Quantification of serial sectioning will provide important geometric data for the mechanical models. We also want to perform light sheet imaging on cleared samples to reveal the full internal 3D structures of the tendrils at different developmental stages.

**Skills** We are looking for a highly motivated candidate keen on performing experiments on tendrils. Experience with laser ablation techniques and/or light sheet imaging is a plus but not mandatory.

**Environment** The successful applicant will be supervised by Julien Derr (ENS Lyon, Mosaic group of the RDP lab), and Dražen Zanchi (Université Paris Cité, MSC lab). The position will be located in the RDP lab of Lyon, which is internationally renowned for plant science. The postdoc will benefit from the very inter-disciplinary atmosphere in the Mosaic group. The candidate will also very regularly discuss their results with the Dynavine consortium, and in particular with Parisian physicists who are doing complementary mechanical experiments on the same systems (cucumber, vine, ...).

**Starting date** Early 2024 (flexible). The contract is a 1 year contract with possible reconduction.

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