INTERNSHIP PROPOSAL

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Thesis possibility after internship: MAYBE
Funding: YES If YES, which type of funding: ANR

WAVES AND MECHANICAL RESPONSE IN ACTIVE SOLIDS

Active matter describes systems in which the elementary constituents consume energy to produce work. In active liquids, this work is turned into motion and the interactions lead to fascinating collective motion, as widely observed in nature, from bird flocks to cellular cytoskeletons.

In active solids, the elementary constituent are embedded in an elastic matrix in which they exert local stresses. These stresses deform the matrix. The induced strain in turn acts on the active units. As a result of this retro-action one observes spontaneously oscillating solids. Eventually, designing the elastic matrix and its coupling to the active units, one could program a new type of functional materials.

In the past three years we have tailored an artificial system that combines activity and elastic architecture and demonstrated that selective and collective actuation is a hallmark of active solids https://twitter.com/i/status/1561626005520932864. These results open a brand-new avenue of research, from further experimental and numerical investigations to theoretical analysis. Examples of open questions are:

- What is the fate of collective actuation in the thermodynamics limit?
- Is there a transition controlled by noise and of what type?
- How does the sound propagate in such active solids?
- What is the mechanical response of such materials?

We can run new experiments, taking advantage of our existing set-up, but also perform numerical and theoretical analysis of the models we developed for describing those systems.

Please, indicate which speciality(ies) seem(s) to be more adapted to the subject:

Condensed Matter Physics: NO Soft Matter and Biological Physics: YES
Quantum Physics: NO Theoretical Physics: YES