EPFL

PhD position

'*Modelling the mechano-chemical coupling in adaptive active matter*'

Living organisms, such as bacteria and eukaryotes, exhibit rich behaviours and display different phenotypes, i.e. different observable characteristics such as physical properties, depending on their often heterogeneous surroundings. Moreover, living cells are active, i.e. convert energy into mechanical work. When conditions remain stable, whether nutrient-rich or nutrient-poor, single populations adapted to those specific conditions are selected. In contrast, environments that fluctuate over time encourage the adaptation and coexistence of phenotypes with diverse mechanical and metabolic traits, even in the absence of genetic differences. Hence, in this project, we aim to uncover 1) the role of proliferation on the flows and collective behaviour of active matter; 2) the effect of phenotypic (mechanic and metabolic) heterogeneity and adaptive strategies on active matter; 3) the impact of the shapes of phenotype landscapes and symbiotic relations on the success of adaptive strategies and relevant timescales.

Preferred skills and qualifications for successful candidates include: (1) Master's degree in Physics or Mathematics (2) demonstrated excellence and previous research experience in statistical physics or biophysics, (3) strong background in numerical simulations (experience in C++ and Python is encouraged) , (5) excellent communication skills in English (both written and spoken), (6) motivation to work on an interdisciplinary project at the intersection of physics, mathematics, ecology, and biology.

This 4-year project is funded by SNSF Ambizione grant 'Active Adaptive Matter' (https://data.snf.ch/grants/grant/232854) and will be supervised by Dr. Aleksandra Ardaševa and Prof. Anne-Florence Bitbol. The starting date is around *February 2026*.

For additional information regarding the position, please feel free to reach out to Dr. Aleksandra Ardaševa (aleksandra.ardaseva@univ-grenoble-alpes.fr).