

# ESR14 - Jamming in Active Suspensions

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The projects currently developed at the PMMH, in the “*active fluids group*” are oriented toward applying the concepts of “active matter” to the dynamics and hydrodynamics of bacterial populations. Active matter is a subject at the crossing point between statistical physics, hydrodynamics and biology. In this context, the group is currently assessing the swimming properties of motile bacteria exploring, individually or collectively, different controlled environmental situations. In the lab, we are using soft-lithography microfluidics to design micro-channels with different levels of geometrical complexity. Varying the chemical and the rheological properties of the suspending fluid, we currently seek to determine the emergent transport properties of a bacterial suspension and relate individual swimming properties to the large scale transport processes.

When the concentration of bacteria is large, one observes the emergence of collective motion which coincides with the appearance a “critical fluid behavior i.e. undergoing macroscopically a transition to a zero viscosity regime and also one can observe the emergence of large scale vortices spanning the size of the systems.

In this thesis project, we will seek to understand the influence of the collective effects on the transport processes and on the constitutive properties of the fluid. We will seek to investigate to which extend, “jamming” processes occurring naturally with passive particles at high concentration, would be maintained or eventually suppressed, in the case of such active suspensions flowing in various geometrical conditions, for example through porous system or constrictions.

In the framework of the ETN project, the Early Stage Researcher (ESR) will work in the active-fluid group of the PMMH-ESPCI but also will carry a secondment project in collaboration with an ETN partner. One of the choices would be in the group of Avraham Be’er at the Ben-Gurion University of the Negev in Israel.

**Salary:** The PhD salary is based on the [regulations of appointment and remuneration](#) for Marie Skłodowska Curie Fellows in ITN networks. The successful candidate will also benefit from additional funding for several visiting trips (typically 1 month each) in the partner teams.

**Requested profile:** We welcome highly-motivated applicants holding a MSc and with excellent background in experimental physics, biophysics, and/or soft matter physics.

**Further obligations:** The ESR is expected to travel to network partners for secondments and a mini-project for durations up to 2-3 months. In addition, the ESR participates in outreach activities (social media, participation in public events), as well as dissemination to popular press.

**Funding conditions:** Candidates must not have resided or carried out their activities - work, studies, etc.- in France for more than 12 months in the 3 years immediately before starting the PhD.

**Deadline for applications: Nov 19, 2021.**

**Hiring procedure:** Applications (CV, transcript of studies, statement of motivation and at least one letter of recommendation) should be sent by email to Eric Clement ([eric.clement@upmc.fr](mailto:eric.clement@upmc.fr)). The recruitment is taking place following the [European Code of Conduct for Recruitment of Researchers](#), which all candidates should study.

**Selection process:** PHYMOT is open to researchers regardless of gender, religion, ethnicity, disability, sexual orientation, political views, language, age and nationality. Applications from highly qualified applicants from outside the EU will thus be equally considered to other applicants. The integration of refugees is an EU priority and we will ensure equal opportunities to the researchers whose scientific careers have been interrupted. To ensure a gender balance in the project and work towards the Commission’s own policies on narrowing the gap between the genders in research, should two applicants be found to be equally qualified the preference will be given to the one that will balance the gender distribution in the entire Network. All submitted applications will be checked against the defined admissibility and eligibility criteria (e.g. submitted electronically, readable,

complete, in English, including grades and references), and applicants will be informed by email within two work weeks on the outcome. Evaluation criteria include: Scientific background (with particular focus on theoretical physics), previous publications, capacity for creativity and independent thinking and leadership, mentoring and presentation abilities.

**Protection of personal data:** The personal data of the applicants will be handled in compliance with applicable EU and national law on data protection (GDPR).

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