

ESR15 - 3D tracking of microbes in multiple gradients

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Digital Holography Microscopes (DHM) record time-sequences of the wave field transmitted through a measurement chamber. Processing of this information provides for each organism its 3D trajectory. The objective of using DHM is to improve the understanding of the interaction between microbes and their environment: partners knowledge of 3D tracking will be shared and combined for various type of organisms and paradigms. In particular, we will use DHM in collaboration with the group of Roman Stocker (ETH) to track bacteria in 3D in order to study their response to multiple gradients by resolving for the first time the response of individual cells for long times. In nature, bacteria often encounter multiple cues simultaneously. For example, at the ocean-sediment interface gradients of oxygen and nutrients are frequent. In the body, gradients of oxygen and nutrients are similarly pervasive. The response to multiple chemicals implies the ability of bacteria to integrate their response, a topic almost entirely unexplored. The Stocker lab has developed microdevices that expose bacteria to multiple, controlled chemical gradients simultaneously. Quantification of the bacterial response, however, has faltered, due to the impossibility of tracking single bacteria for long times. DHM provides the ideal means to overcome this barrier.

In this project the Early Stage Researcher (ESR) will investigate with DHM the 3D response of organisms to multiple geometrical and surrounding environment, for instance multiple gradients for a range of gradient combinations, including parallel and opposing gradients, and gradients of attractants combined with gradients of repellents.

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 theoretical physics, biophysics, and/or soft matter physics, with a strong inclination and a desire to work experimentally at the interface between microscopy, biophysics and microbial ecology. Image processing/ Programming skills, in Python for instance, are very welcome.

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 Switzerland for more than 12 months in the 3 years immediately before starting the PhD.

Hiring procedure: Applications (CV, transcript of studies, statement of motivation and at least one letter of recommendation) should be sent by email to Yves Emery (yves.emery@lynceetec.com). The recruitment is taking place following the [European Code of Conduct for Recruitment of Researchers](#), which all candidates are encouraged to 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).

This project has received funding from the European Union's Horizon 2020 Research and innovation Programme under the Marie Skłodowska-Curie Grant Agreement No. 955910