ESR6 - Swimming in complex 3D structured environments

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Swimming bacteria like *E. coli* achieve propulsion in a low Reynolds number environment by rotating a bundle of flexible helical flagella. Theoretical approaches usually treat the bundle as a thick and rigid effective helical filament. On the other hand, both direct observation of fluorescently labelled flagella and multiscale molecular dynamics simulations reveal that the bundle is a more dynamic and strongly interacting complex whose detailed behavior may have important effects on both single cell propulsion and interactions with neighboring cells and confining structures.

In this project the Early Stage Researcher (ESR) will trap and align individual cells and pairs of cells to directly observe the dynamics of individual fluorescent flagella and explore the effect of confining structures on bundle conformation and bundle-unbundle transitions. Three-axis holographic microscopy will be used to directly image the full 3D trajectories (position and orientation) of interacting cells starting from controlled and reproducible geometries obtained with optical traps.

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.
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 Italy 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 Roberto DiLeonardo (roberto.dileonardo@uniroma1.it). 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).
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