2. – Growth of a bacterial biofilm

Supervisor(s): Dr. Marco G. Mazza, Prof. Andrew Archer

Project details

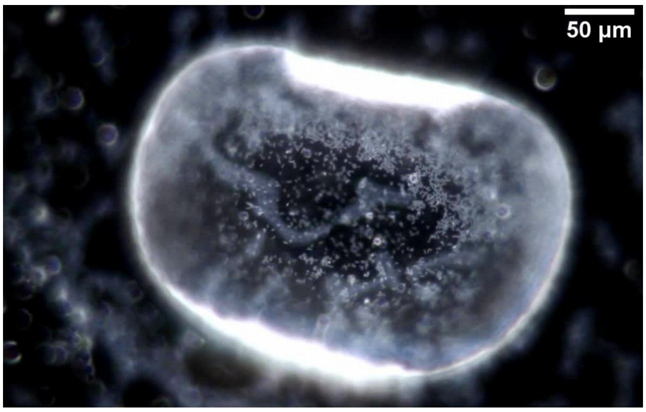
The vast majority of living organisms are microorganisms such as bacteria and archaea. We now know that most microorganisms do not live in the planktonic state, but rather in organized communities called biofilms. These are complex, self-organized consortia of microorganisms that produce a functional, protective matrix of biomolecules. Physically, the structure of a biofilm can be described as an entangled polymer network which grows and changes under the effect of gradients of nutrients, cell differentiation, quorum sensing, bacterial motion, and interaction with the environment.

This project aims at identifying the role of active motility affects morphology and structure in the early phases of biofilm formation. The student will develop and apply theoretical and computational methods to study a mesoscopic model of biofilms that includes mechanical forces between particles, mechanical and electrostatic forces with a solid surface, and hydrodynamic interactions.

The student will join an interdisciplinary group that focuses on nonequilibrium statistical mechanics. We are seeking an outstanding, industrious student with a background in physics, applied mathematics, or related fields. Prior experience on computer programming is not necessary, but mastering languages like C and python will be key to the success of the project.

Entry requirements:

Applicants should have, or expect to achieve, at least a 2:1 Honours degree (or equivalent) in physics, applied mathematics, or related subjects. Some experience in programming languages like C/C++ or Python is a necessary prerequisite. Experience in one or more of the following subjects will be an advantage: statistical physics, soft matter, hydrodynamics, molecular dynamics simulations.



References

M. G. Mazza, "*The physics of biofilms - an introduction*", J. Phys. D: Appl. Phys. **49**, 203001 (2016).