

PhD Student Position – Role of mechanical stresses in the growth of biofilms

A **3-year PhD student position** is available in the newly formed lab of Dr. Oskar Hallatschek at the **Max-Planck-Institute for Dynamics and Self-Organization** in Göttingen. The student will join a young and interactive research group focusing on nonequilibrium statistical physics and evolutionary dynamics, including theoreticians and experimentalists. We cultivate an international atmosphere and the everyday working language is English. The MPI DS is located close to the center of the medieval town of Göttingen. More information about the group is available on the web at: <http://www.fas.harvard.edu/~ohallats/>

When microbial populations grow on substrates, as e.g. *E.coli* on a Petri dish or a biofilm inside tubing, cell growth predominantly occurs at the margins of the existing colony. Cells in the center of the population have a small or vanishing rate of proliferation. The common view is that the cells in the bulk stop growing as a result of the accumulation of waste products or lack of nutrition. However, elastic stresses could play an important role too in controlling this behavior, either by mechanically damping cell growth or by signaling (mechano-sensing). The P.h.D. project aims at disentangling these competing stress factors to determine their relative role in controlling population growth. To this end, experiments will be designed that allow monitoring elastic stresses that build up when biofilms grow in microfluidic chemostats. At the same time, the P.h.D. student is encouraged to develop a mesoscopic theory of elasticity of growing tissues, possibly based on known models of intracellular force generation. Focusing on relatively simple microbial systems should allow testing quantitatively whether our biophysical understanding of the inner workings of the simplest cells is consistent with the observed cell proliferation response to external stresses. This project will help clarifying the role of mechanical stresses in the regulation of growth of simple tissues.

It is important to note that the project has both an experimental and a theoretical component. The ideal candidate has experience with microfluidics and microscopy techniques and is eager to advance soft condensed matter theory.

The appointment will be on a temporary basis for 3 years. The gross salary starts at approximately €1400,- per month depending on age and experience (TVöD 13/2, Stufe 1). The student will be enrolled in the Göttingen Graduate School for Neurosciences and Molecular Biosciences (GGNB, <http://www.ggnb.uni-goettingen.de/>).

Applicants should have a master's degree or equivalent in physics, math or related fields. If you hold an excellent BSc (1st class honors) please contact us about possible accession. German is not required but international students will be offered opportunities to take German courses. Interested candidates should send a cover letter summarizing their research background and interest in the position, CV, and contact information of two potential referees as a single PDF file to: oskar.hallatschek.applications@gmail.com

Applications will be reviewed beginning December 1, 2008. Interviews will be held in January. Starting date is February 1 2009 or later. If you have any specific questions (e.g. details of the project), feel free to email me.

The Max-Planck-Institute for Dynamics and Self-Organization is an Equal Opportunity/Affirmative Action Employer and has an affirmative action policy for the disabled.

Oskar Hallatschek