



SFB1425 - Heterocellular Nature of Cardiac Lesions: Identities, Interactions, Implications

Collaborative PhD-Project

based at the Lab for Bio- and Nano-Photonics at IMTEK and Institute for Experimental Cardiovascular Medicine

Nano-Structural Basis for Mechanical Fibroblast-Cardiomyocyte Cross-Talk

Background

Many scars are a-cellular and mainly composed of fibrillar collagen. In the heart however, fibrotic tissue is much 'alive', with the ubiquitous network of the extracellular matrix (ECM) providing a scaffold for structural and mechanical integration of cells embedded within it – mainly cardiomyocytes (CM) and fibroblasts (FB). What are the scar microstructures that arise following cardiac injury? What are the factors that influence the interaction between CM and FB during lesion development? Only recently it was hypothesized that FB interact with CM via integrin-guided tunneling nanotubes (TNT), which is supposed to integrate CM within the ECM.

Project Description

The fragile nature of the 100nm thin TNT diameter make it difficult to monitor TNT structure and behaviour in living cells. Therefore all we will use Rotating Coherent Scattering (ROCS) microscopy, a novel method for label-free fast super-resolution imaging (with 150nm spatial and 100 Hz temporal resolution) in combination with optical tweezers and MHz thermal noise tracking of attached nano-beads and TNTs, to monitor their changing mechanical behavior over time.

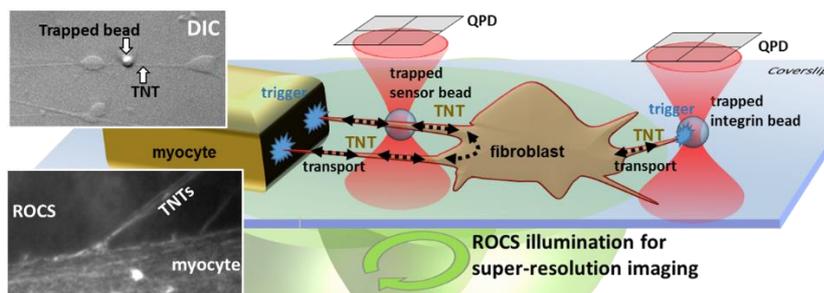


Figure: Interaction measurements of cardiomyocyte with fibroblast via TNTs using rotating coherent scattering microscopy, optical tweezers and thermal noise tracking.

Research Areas

Biophysics & Optics

Experimental Tasks

- Live cell super-resolution imaging and manipulation
- Biophysical characterisation of cell-cell interactions

Student Background

Physics and Engineering, in particular Biophysics and optics

Starting Date

from 01.07.2020

PhD Advisor

Prof. Alexander Rohrbach, Lab for Bio- and Nano-Photonics, Dept. of Microsystems Engineering, Univ. of Freiburg : rohrbach@imtek.de
Web: www.imtek.de/bnp

in cooperation with
Dr. Eva Rog-Zielinska, Inst. for Experimental Cardiovascular Medicine, Univ. of Freiburg:
eva.rog-zielinska@uniklinik-freiburg.de

Contact

jobs@SFB1425.uni-freiburg.de

Applications via
SGBM portal

Qualifications and Requirements

We seek a motivated physicist/engineer with a background/strong interest in biophysics and microscopy/optical tweezers. The candidates (PhD salary of 66% E13) will prepare cells, design biophysical experiments, perform super-resolution microscopy (ROCS), 3D thermal noise tracking, optical tweezing, advanced data analysis and computer modeling. The candidate should have an excellent MSc in a field relevant for the proposed study, English language proficiency at level B2 or higher.

