Research Coordination Meeting

Meeting Report

Date: 14-15 March 2019

Venue: Universitätsklinikum Aachen, AöR, Aachen, Germany

Organizer: Rudolf Leube

Participants: 5

This small scoping meeting was to discuss cell stretchers devices that accommodate live cell imaging. Recent publications have highlighted dielectric elastomer actuators (DEAs) as the latest technology. They are a soft and compact actuation technology that can generate large strain (>400%), have a very fast response time (<1 ms), can be miniaturized and, most importantly, are both tissue culture compliant and compatible with fluorescence microscopy systems permitting real-time imaging of the biomechanical effects upon the cell and its structural components. Most existing choices utilize sets of mechanical motors or pneumatic systems which via microfluidics and fluid pressure deform a suspended membrane on which cells are grown. They lack the speed and flexibility to support current mechanobiological questions especially now with the advent of optogenetic tools to measure and effect strain in cells. The venue was chosen because of its tight links between the life sciences and bioengineering. An emerging focus at RWTH Aachen University is elucidating the contribution of the cytoskeleton to cell mechanics and using the gained insights for improved tissue engineering and treatment of human diseases (supported, e.g. by the EU (incem.rwth-aachen.de) and the German Research Council (me3t.rwth-aachen.de)). COST researchers from Finland, France, and the UK as well as scientists from several Germany cities have already committed themselves to participate in the planned meeting for the future GP discussed at this research coordination meeting.

Besides the fundamental differences in discipline-dependent approaches, the wrap-up identified numerous issues that will require future attention concerning:

- material properties (e.g., homogeneity, biocompatibility, batch variability, embedding, surface alterations upon use, embedding, chemistry, resilience, transparency)
- topography
- force application (e.g., type of actuation, global vs. local, strength, frequency, reversibility)
- imaging (e.g., 3D resolution)
- identification of relevant parameters.

The examples suffice to show that very different types of expertise are needed and have to be coordinated to fulfil the wishes/hopes of the community for user friendliness, reproducibility and comparability. Specific hopes/wishes were expressed such as a modular design of stretching devices for multiple purposes, the inclusion of curved surfaces and the analysis of collective behaviour at high resolution.