We are currently seeking a highly motivated medical student (f/m/d) for a project on

"Cell-mimicking Microgels to Model Retinal Epithelium Ageing"

Age-related macular degeneration (AMD) is the leading cause of sight-loss in western countries and is characterized by the gradual phenotypical change of the retinal pigment epithelium (RPE) in the central region of the retina named macula. This phenotypical change leads to the local degeneration of the retina and sight loss. Associated with macular degeneration is the localized presence of aberrant accumulation of extracellular material underneath the RPE layer named "Drusen" which generate high localized mechanical stress. Due to their high intercellular adhesion level, epithelial cells collectively behave, leading to emerging mechanical and biochemical properties. Thus, it is reasonable to think of epithelia as materials whose elasticity, toughness or brittleness can be deduced from the distribution of monolayer stresses. Being a postmitotic epithelium, while ageing, RPE function is ensured by a monolayer plastic adaptation characterized by cellular deformations and multinucleations that compensate for natural cell loss. We speculate that the monolayer plastic adaptation increases monolayer stress heterogeneity, thus its brittleness and the ability to tolerate the mechanical stress originating by Drusen. Currently, it is possible to investigate the mechanical effect of plastic adaptation only qualitatively in fixed tissues.

The project aims to establish an in-vitro experimental model to artificially induce plastic adaptation using phototunable cell-mimicking microgels and quantify its effect on cell monolayer mechanics. This innovative system will not only set the basis for bottom-up research in age-related RPE mechanobiology but also open possibilities for novel applications of microgel systems.

The student will be part of a team of chemists, biologists and physicists from the research group of De Laporte (DWI) and Di Russo (UKA).

Your tasks will be:

- Optimization of phototunable microgels production via microfluidic
- Characterization of mechanical properties of the microgels
- Biofunctionalization of the microgels and their incorporation in epithelial monolayers
- Traction-force microscopy and follow-up computational analyses in MATLAB and Fiji software

Your profile:

- You are studying chemistry, bioengineering or a related discipline
- You are interested in basic research or in the field of mechanobiology
- You are interested in mammalian cell culture
- You are a reliable and careful worker with the ability of integrating well in a team

If you are interested please send a short motivational letter, CV and transcripts via email at dirusso@dwi.rwth-aachen.de