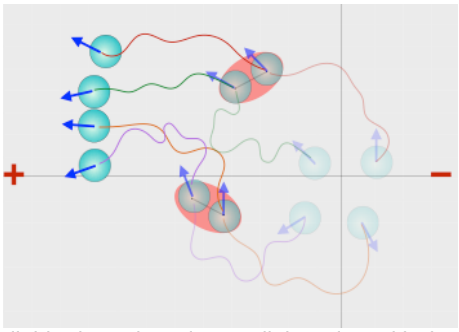
Universität Rostock Traditio et Innovatio

Master Thesis

Modeling *in vitro* cell migration under the influence of direct current (DC) and alternating current (AC) electric fields

Cell migration, the collective and directed movement of individual cells is critical for both development and tissue repair of an organism. Experiments have shown that by applying external electric fields cell migration can be guided in a controlled manner. Electrical stimulation of cells therefore serves as a powerful approach in achieving effective healing of damaged tissues, such as bones, through electrically active implants. Studies at the single cell molecular level have revealed the role of a complex network of signaling pathways in intracellular electrical signal transduction. However, the mechanisms underlying the collective decision making in cell migration in response to the external electric fields is not yet fully understood.



The focus of this project is to study the migration of osteoblasts and human mesenchymal stem cells under the influence of external DC and AC electric fields, respectively. The computational model for cell migration presented in our recent pilot study[1] will form the basis of this project for further exploration on how different modes of electrical stimulation influence collective behavior in cell migration of different cell types. The experimental data is available through a close collaboration with the experimental partners in the University of Rostock and the Dresden University of Technology.

Interested student is expected to:

- Be highly motivated and have interest in bio-electromagnetics and biophysics
- Obtain in-depth knowledge within the subject area of the master thesis
- Be able to solve problems in an autonomous manner
- Good computational and programming skills, preferably using Python programming language

The student will receive training in:

- Building models for complex biological systems, here electrically stimulated migrating cells
- Performing image and data analysis
- Writing a comprehensive scientific report
- Communicating their research results and other professional matters

[1] Dawson JE, *Sellmann T, Porath K, Bader R, van Rienen U, Appali R and Köhling R (2021) , Computational model for migration of human osteoblasts in direct current electric field, doi:* https://doi.org/10.1101/2020.12.15.422893

Feel free to contact at the below mentioned email address alongwith with your CV

Jonathan Edward Dawson and Ursula van Rienen

Institute of General Electrical Engineering, University of Rostock, Albert-Einstein-Straße 2 | 18059 Rostock

Contact: jonathan.dawson2@uni-rostock.de 21.04.2021