

Project 3.6 Microfluidic-assisted bioprinting with artificial intelligence tools: towards an atlas for modelling in vitro human biology

Supervisor: prof. dr hab. Maciej Wojtkowski / dr Marco Costantini

Institute: Institute of Physics Chemistry PAS

Unit: Research group No. 31. Digital manufacturing of biomimetic systems - dr Marco Costantini

www: <https://ichf.edu.pl/zespoly/wytwarzanie-cyfrowe-ukladow-biomimetycznych>

Background:

In vitro tissue models are regarded as a critical component of future biomedical research. Currently these systems are mostly created using low-throughput approaches based on prior experience, intuition, and trial-and-error methodology. Such constraints result in the creation of valuable in vitro models, albeit far from optimal.

The goal of this project is to address these limitations by creating a data-driven, high-throughput workflow that includes an innovative microfluidic-assisted extrusion bioprinting (μ -eBP) system supported by advanced image analysis tools for capturing key information about in vitro neo-tissue formation dynamics.

Aim:

The core scientific and technical objectives of the MYO-PATH project are:

- i) the progress towards a deeper understanding and control of cellular dynamic processes involved in the manufacturing of artificial tissues – specifically of skeletal muscle tissue;
- ii) the establishment of blueprints to obtain the highest tissue functionality and scalability potential and prioritize the best cost-effective experimental conditions;
- iii) the generation of a developmental atlas of artificial muscle morphogenesis in vitro. We intend to achieve this goal by developing new tools - hardware and software - for all stages of μ -eBP.

Requirements:

- PHD position 1
- The PhD student should have a background in math/informatics/automation or related fields