



LagLivLab's Joint meeting

Welcome!



Our student board: new members

- Adam
- Kristina
- Håkon
- Nigar



Microfluidics



Our Group

- Adam
 - Claudia
 - Erik
 - Kristina
 - Tiril
-
- Endre
 - Thomas



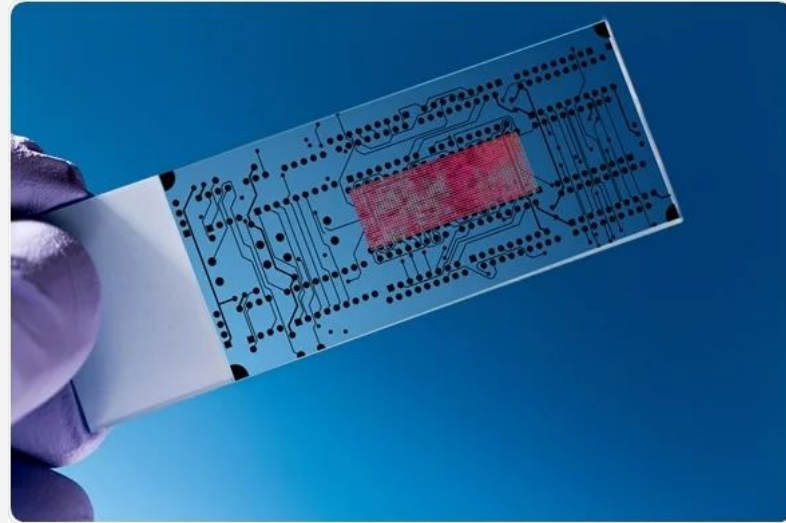
What is Microfluidics?

- Young discipline
- Miniature scales
- Easy to control



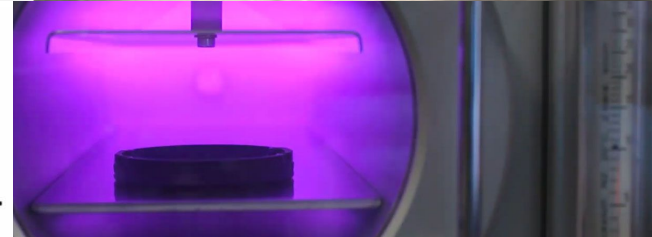
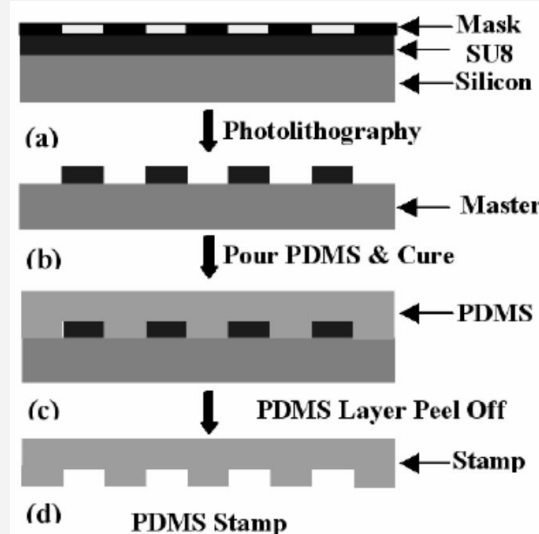
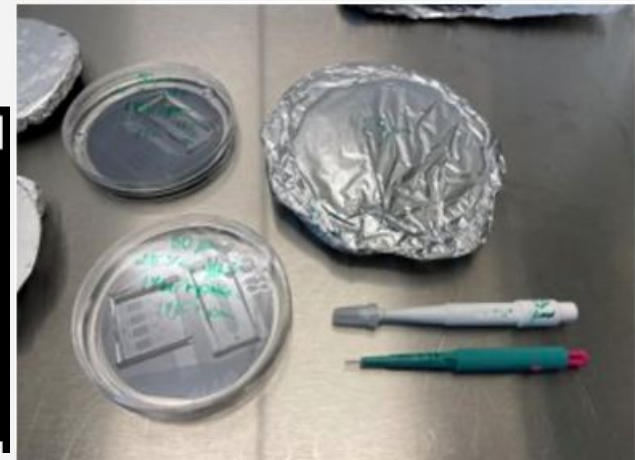
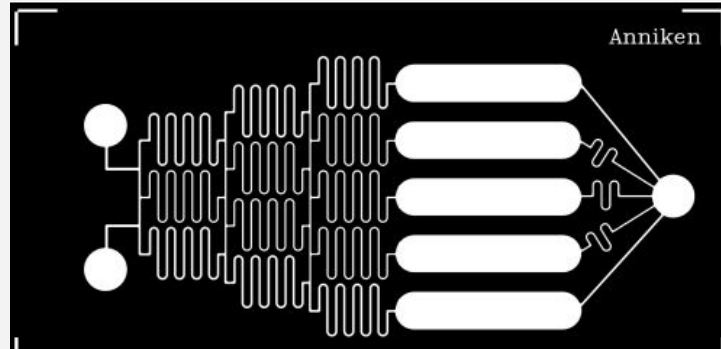
Lab-on-a-Chip

- Cell culture in a microfluidic chip
- Inject chemicals
- Monitor reactions



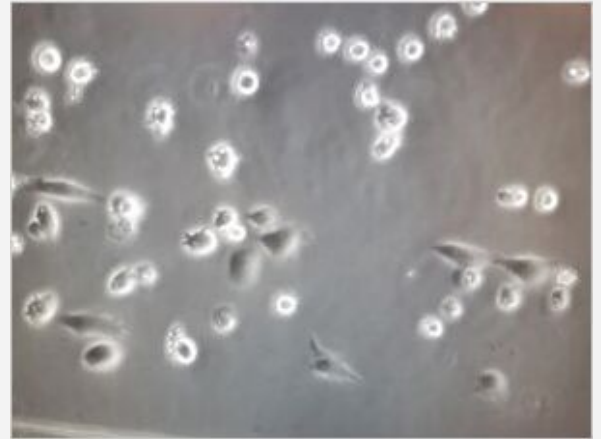
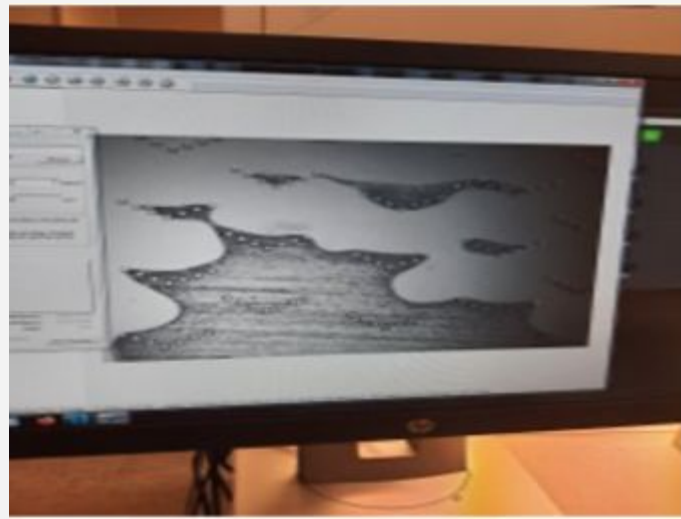
Process

- Mask
- Photolithography
- Plasma
- Cell injection



Past/Current Challenges

- Air Bubbles
- Cell Adherence
 - Fibronectin
- CO2 Balance



Air bubbles problem

Issues:

- Flow instability
- Cell culture damage

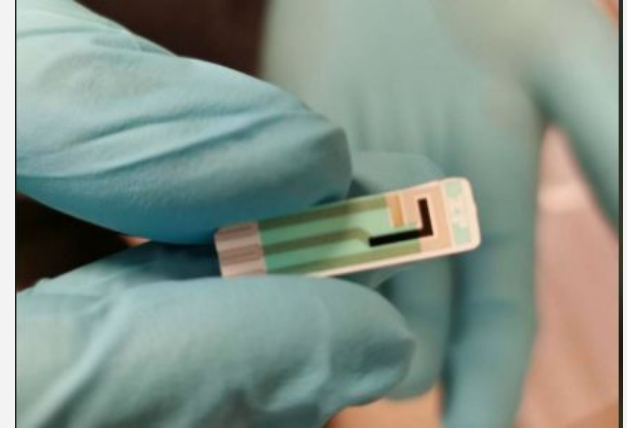
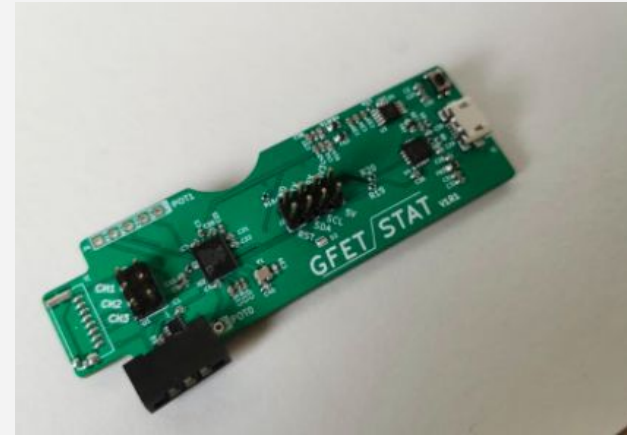
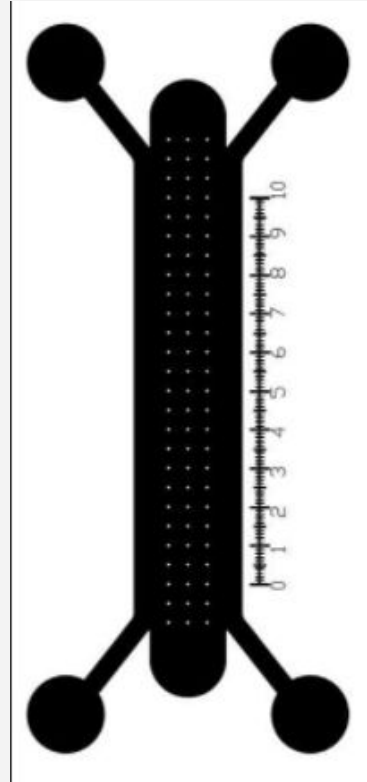
Possible solutions:

- Bubble trap by Elveflow
- Change the chip design



Future Plans for CO2

- CO2 Control
 - Gas Blender
- New Mask
- Zimmer & Peacock
 - Python Automation



Electrorotation



Who are we?

- Morten
- Nigar
- Lasse
- Luis
- Daniel

And Oliver ! :)



What are we trying to achieve?

Progress and intro to biology and our final goal

- Diagnostic tool for ALD
 - A disease caused by the build up of very long fatty acids
 - Can cause brain and nerve damage, as well as hormonal problems and infertility depending on subtype
 - Hard to diagnose subtype before symptoms appear
- Results in fatty acid aggregates in the cytoplasm
- Build up should be detectable by electrorotation



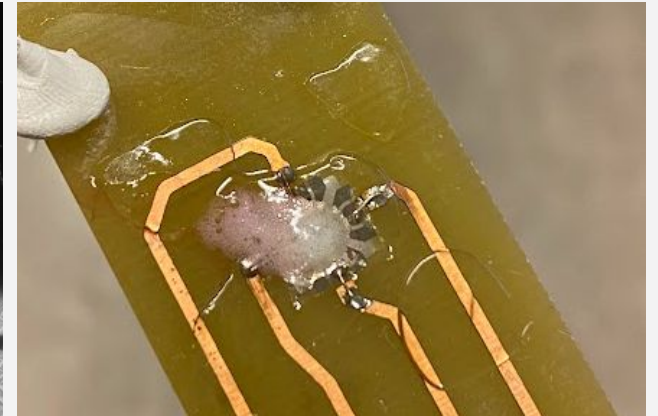
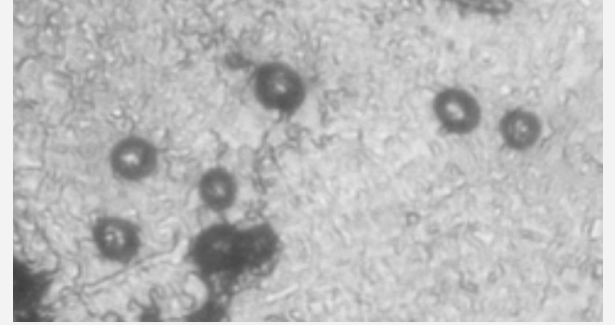
Progress this far

- This semester
 - Three rotation attempts with HeLa cells (with different media)
 - We've gotten some experience working in the cell lab (passaging, microscopy)
 - Routine in terms of rotating the HeLa cells - cleaning the chamber, prepping the medium with cells



Challenges so far

- Unclear visual on cells
 - Unable to see/measure rotation
- Uncertainty regarding suspension media
 - Observed during experiment: GM and Trypsin react to electric field
 - Cells die eventually in distilled water -> time limit
 - Cells form clusters and attach to surfaces in PBS -> time limit





Zoom: 125.0% | Image dimensions: (600 x 600) | Display dimensions: (1640 x 1061)





How are we going to tackle the challenges?

- Get feedback from professionals...;)
 - You?
 - Prof. Jan Gimsa from Germany

- Not giving up and trying rotation again with HeLa cells:
 - New media?
 - Clean the electrode chamber to get clearer results?

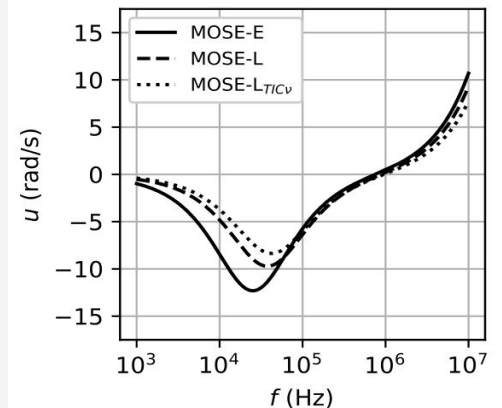


The next steps in the project

- Acquire tools/techniques that lets us consistently and clearly observe the cells rotating
- Produce replicable rotation spectra of HeLa cells
- Produce reference spectrum for control cells (Mouse cell line)
- Attempt to identify subtypes by comparing their rotation spectra with the reference spectrum



ex.



Bioactuator



Who we are and what is bioactuator

- Håkon - Bioscience
- Daniela - Molecular Biology
- Domantas - Physics
- Sindre - Bioscience



Supervisors

- Kayoko Shoji
- Denis Reis de Assis
- Steffen Nøvik
- HTH
 - Hybrid Technology Hub
- Domus Medica

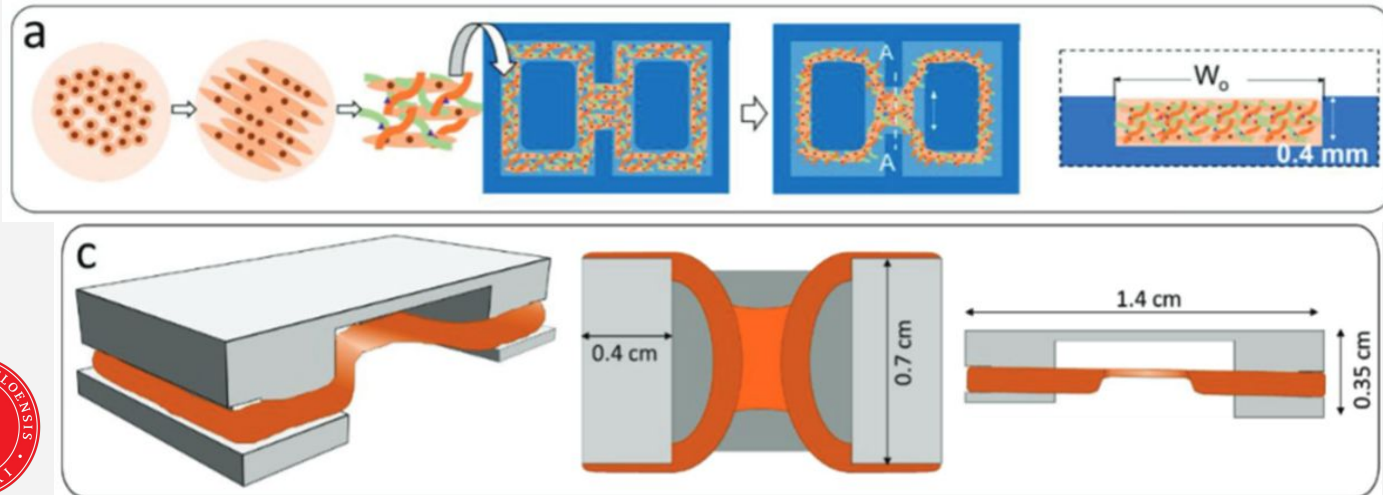


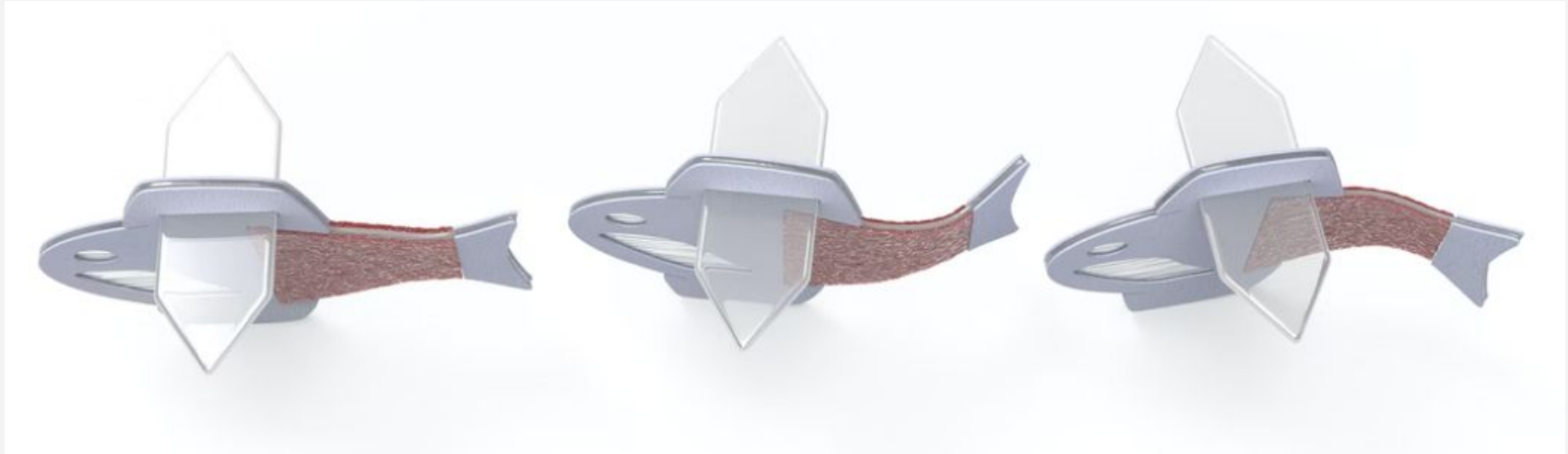
Who we are and what is bioactuator

Bio-actuator

Bio: Life

Actuator: Device that causes motion





(SEAS communications, Wyss institute, 2022)





[Harvard John A. Paulson School of Engineering and Applied Sciences](#) (2016)



Why?

- Human/Animal Organs
- Alternative for mechanical robots
- Soft robotics



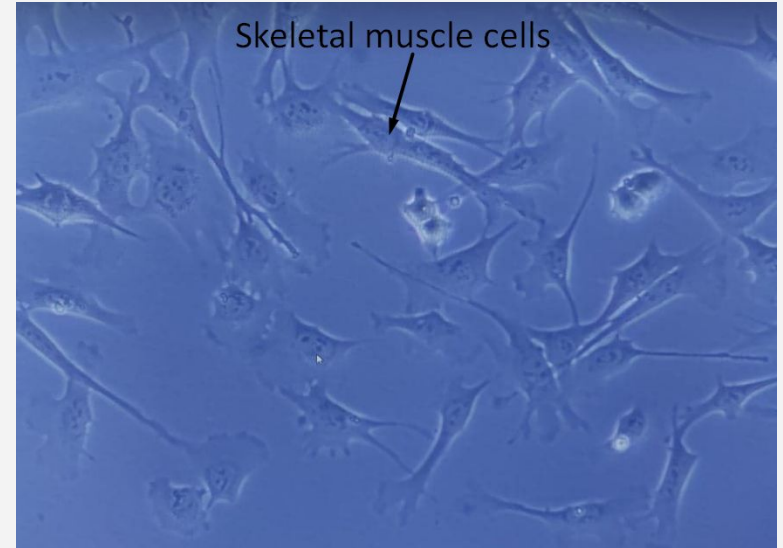
Our role in this

This is a huge field, and we want to contribute!



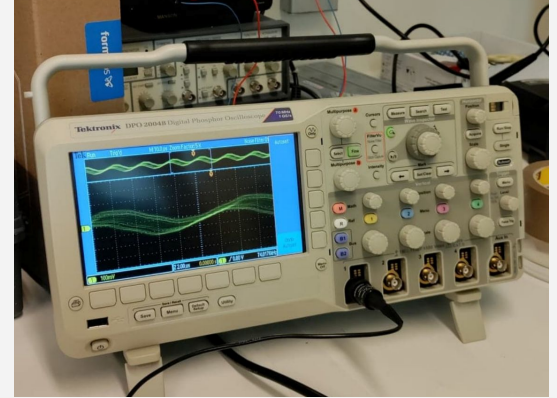
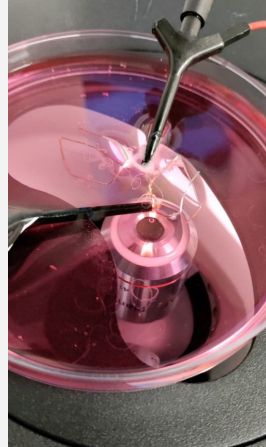
Cells

- C2C12 - Myoblast cell line from mice
 - Differentiates into contractile myotubes (skeletal)
- iPCs - Induced pluripotent stem cells
 - Used for inducing cardiomyocytes
- Great opportunity for wet lab experience
 - Passaging 2-4 times a week



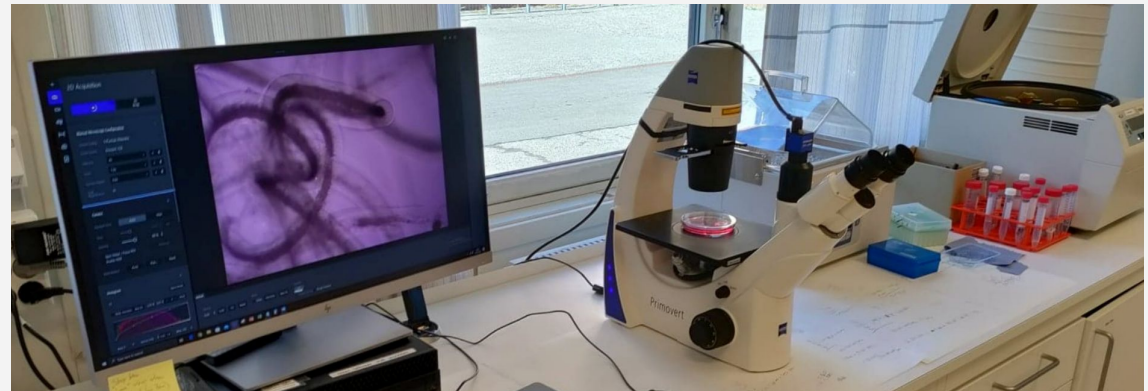
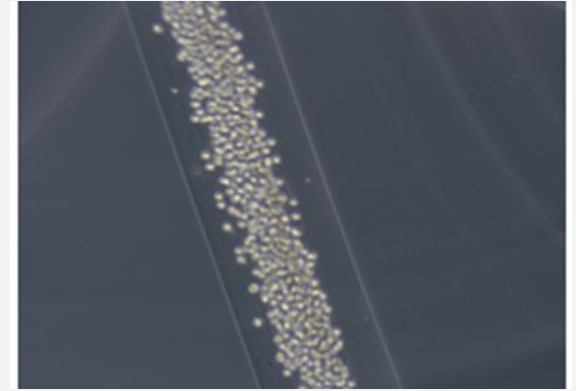
Stimulation

- Generating specific pulses
- Pulsar 6b
- Arduino board

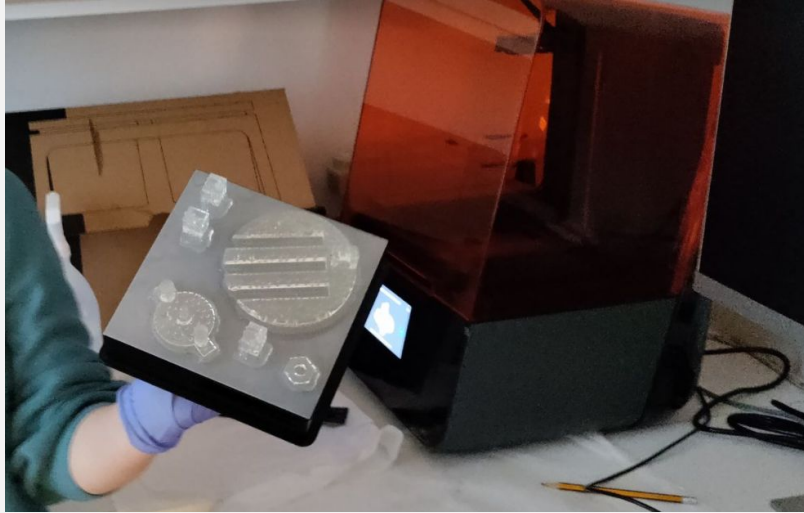


Making cell-fibers

- Aligning all the cells parallel to each other
- Stronger contraction



3D - printing structures



AUTODESK[®]
FUSION 360[™]



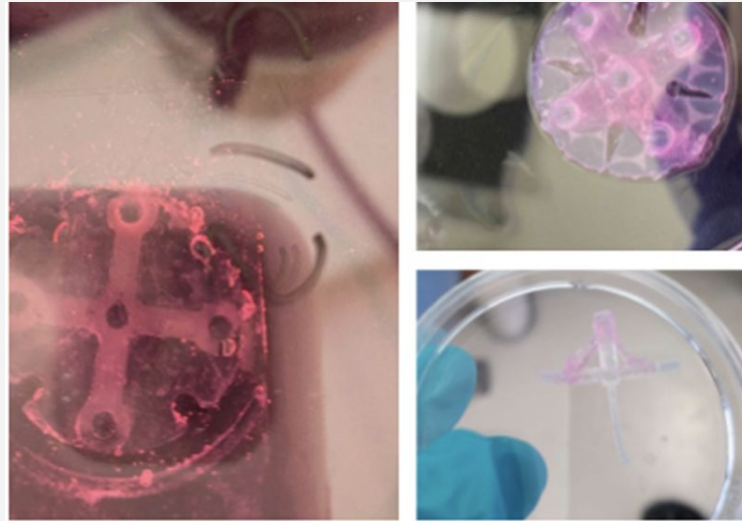
Goals for this semester

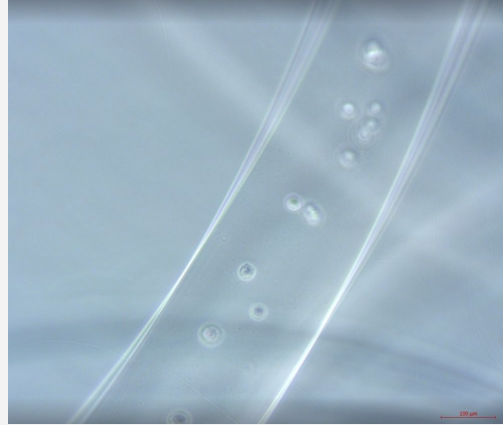
- Continue stimulating the cells
- Optimizing the pulse for stimulation
- Make our own stimulation set-up
- Long term goal:
 - Measure the force exceeded by muscle cell contraction (mN - milliNewtons)



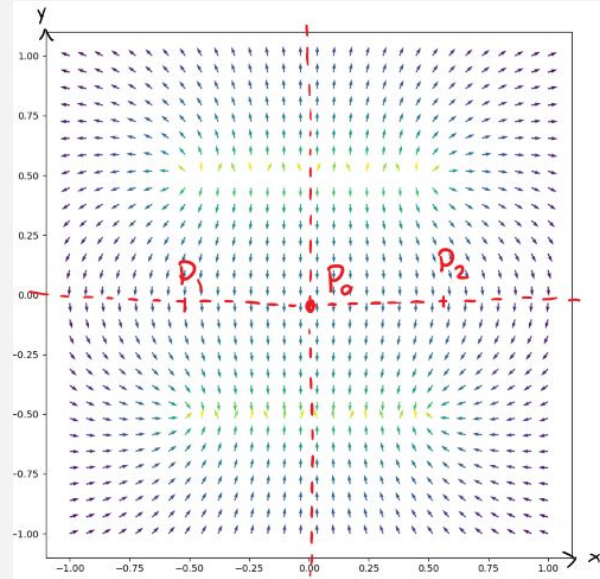
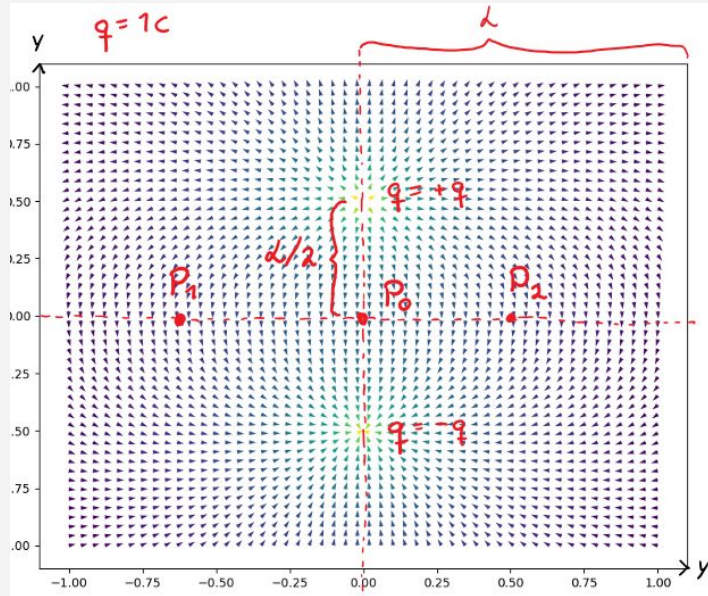
Stimulating cell fibers

- Make them by our own
- Wrap around the structure



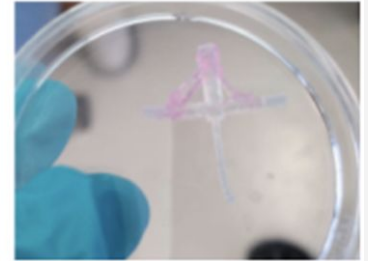
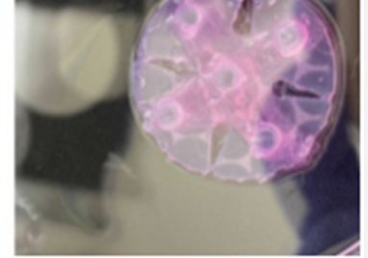
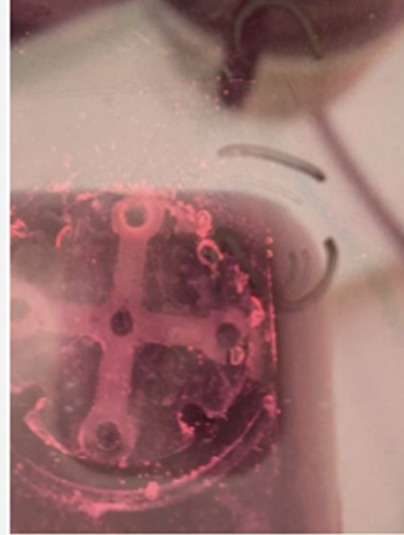
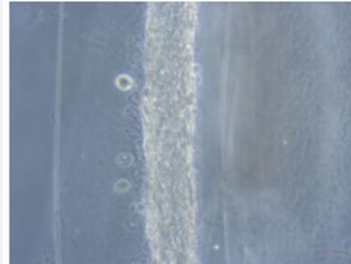
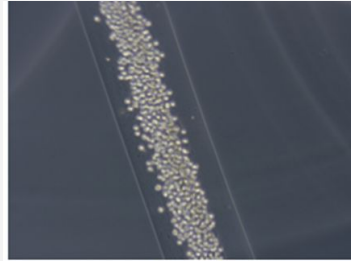


Simulations

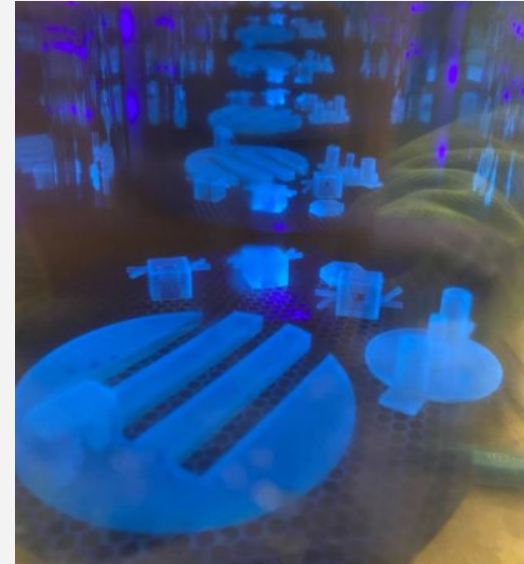
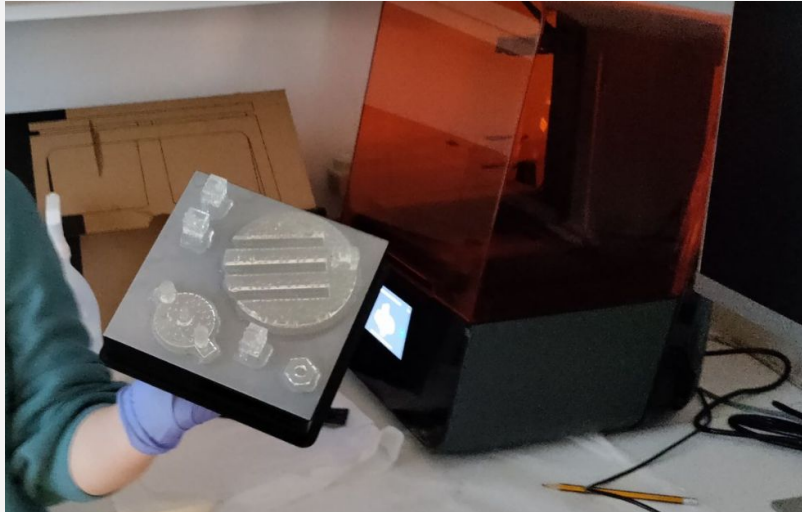


Our previous progress

- Learned how to not to kill our cells
- Designed the mould and printed it
- Stimulated



Printing the structure



Testing our set-up

