

**biohack  
academy**



# Music DNA encoding

## 1. 音楽をDNA塩基配列に変換 Encoding Music to DNA Sequence



Note No.	1	2	3	4	5	6						
	Pitch (Frequency)	Duration										
Pitch/Duration	D5	1/4	F5	1/32	D5	1/4-1/8	C5	1/8+1/16	C5	1/16	C5	1/16
Amino Acid -	L - 1	H - 1	N - 1	N - 2	L - 2	M - 1	- 1	K - 1	I - 2	Q - 1	I - 3	Q - 2
DNA codon	TTA	CAT	AAT	AAC	TTG	ATG	ATT	AAA	ATC	CAA	ATA	CAG



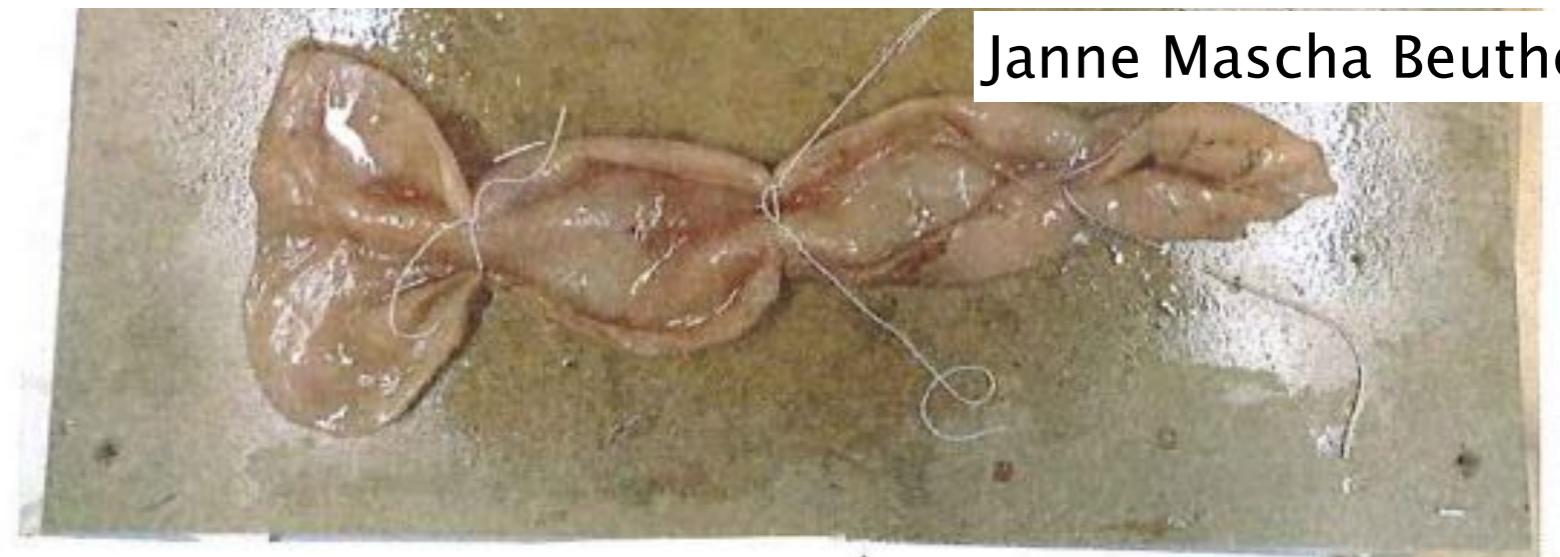
TTACATAATAACTTGATGATTAAAATCCAAATACAG…



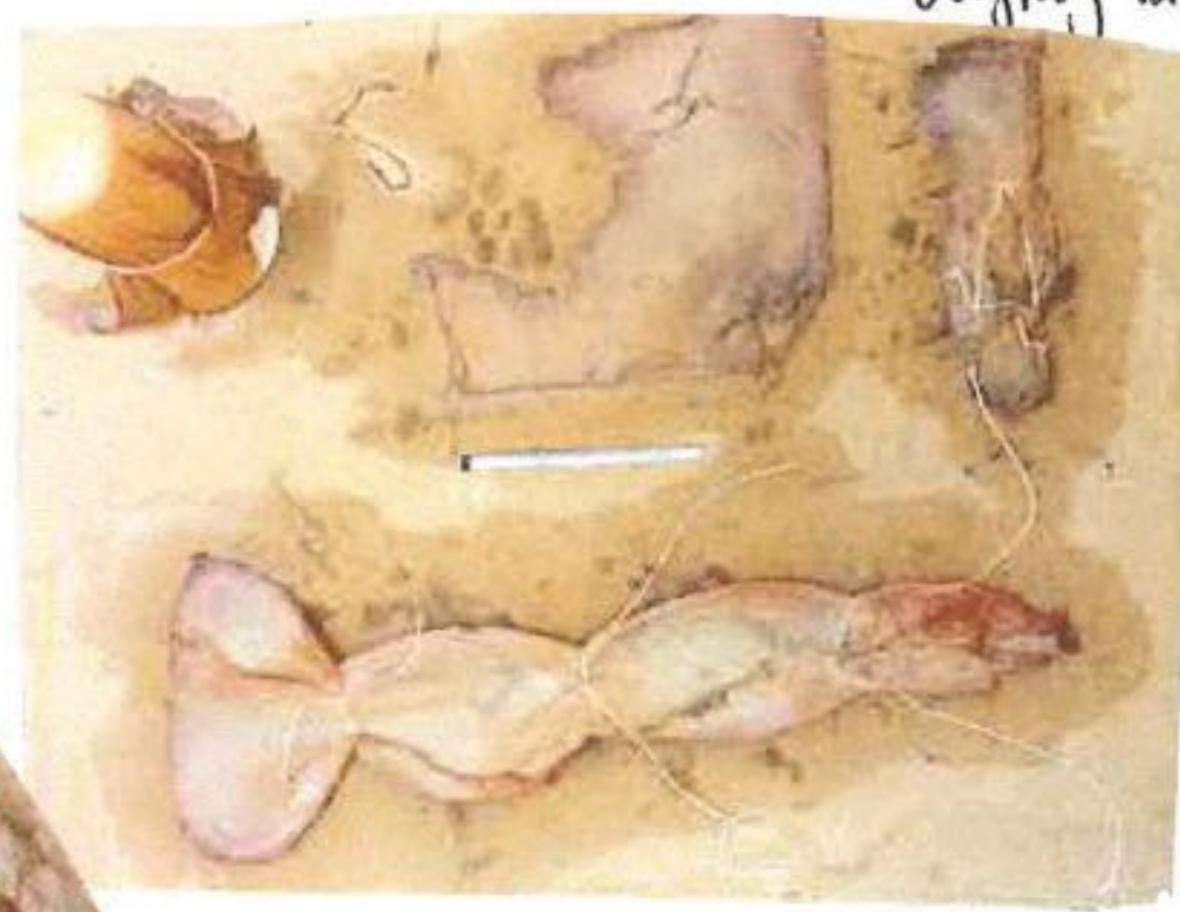
# Experimenting with biomaterials



after  
4 days

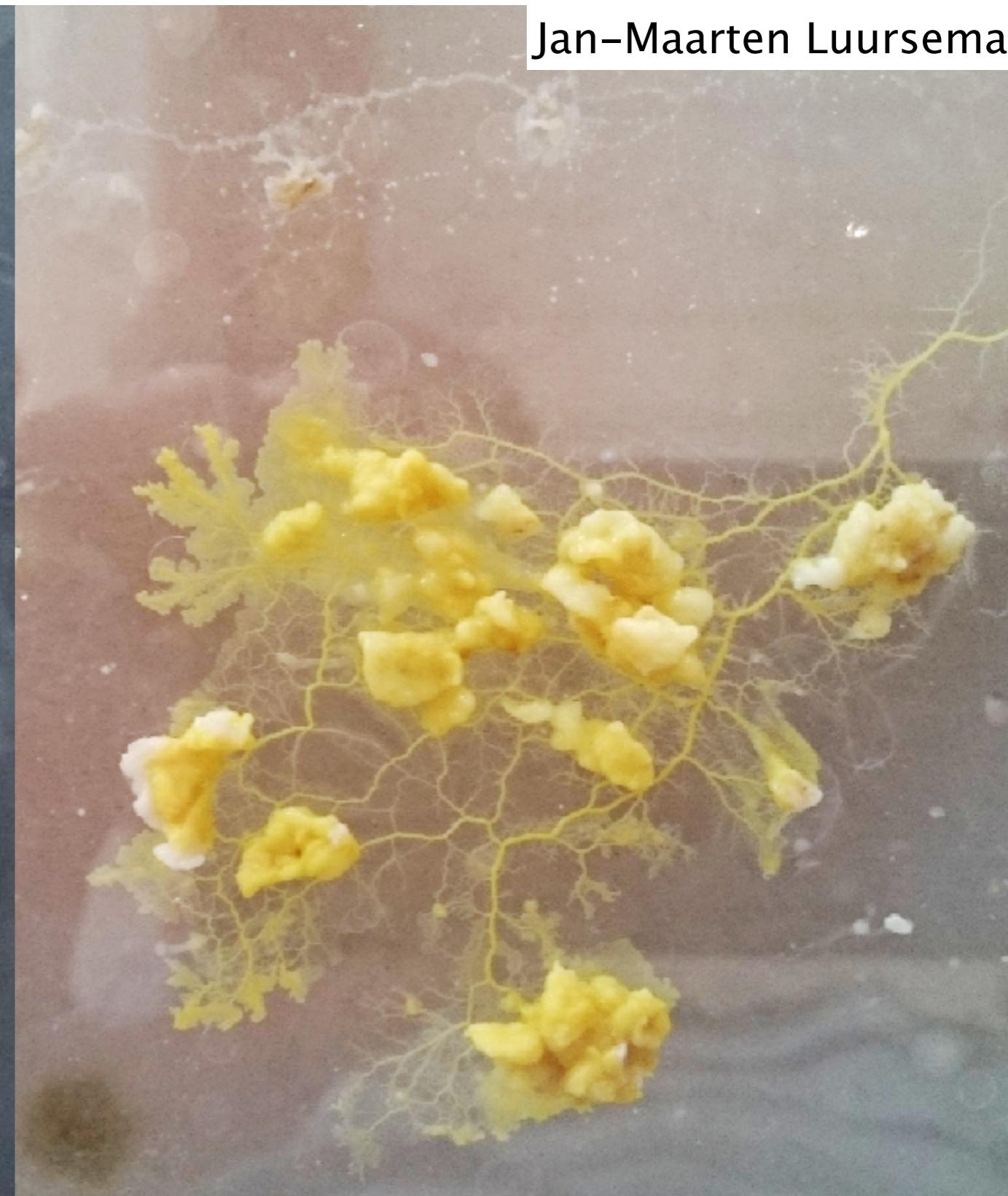
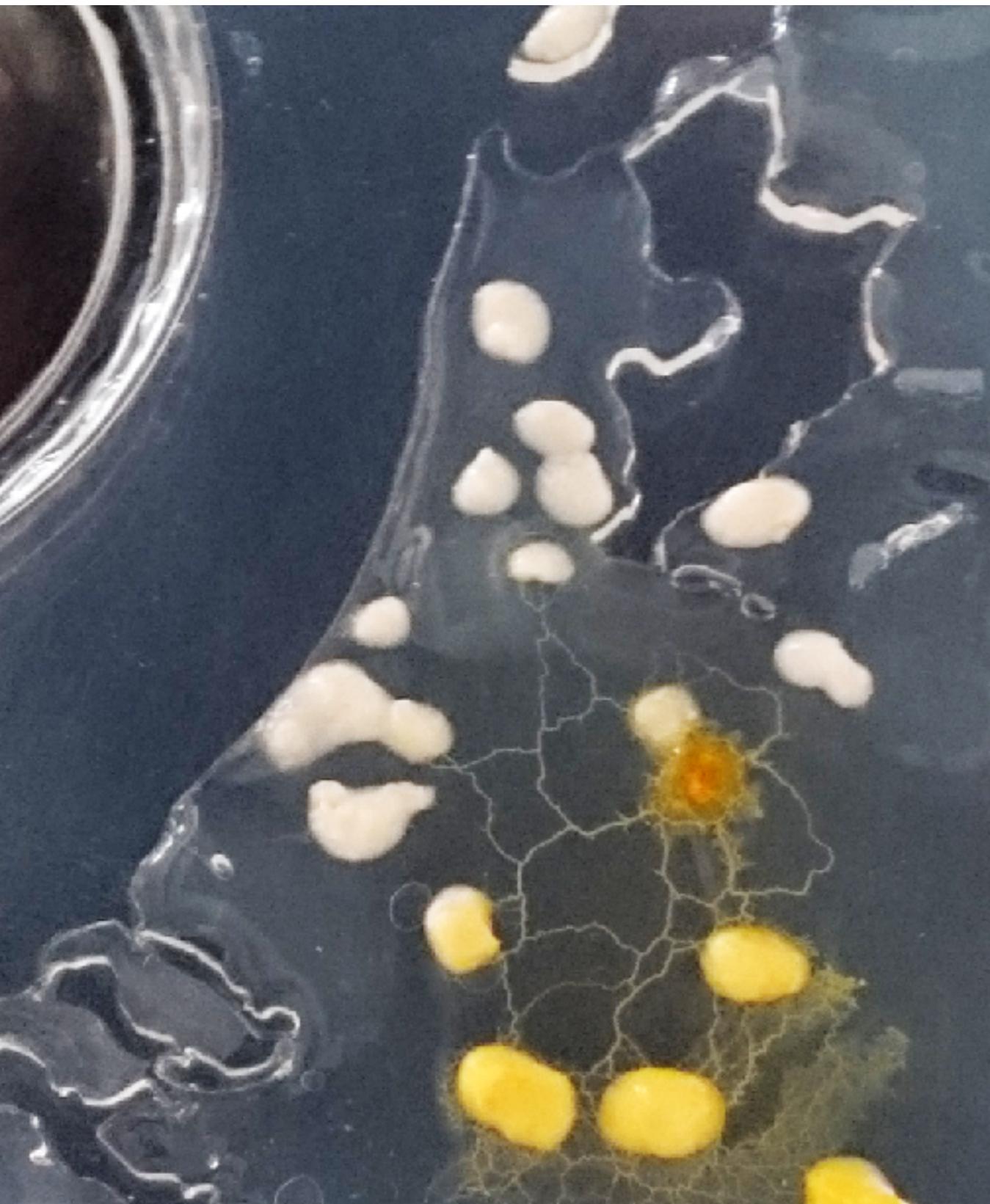


drying in shape objects  
from 15.04





# Design intelligent infrastructure



Jan-Maarten Luursema

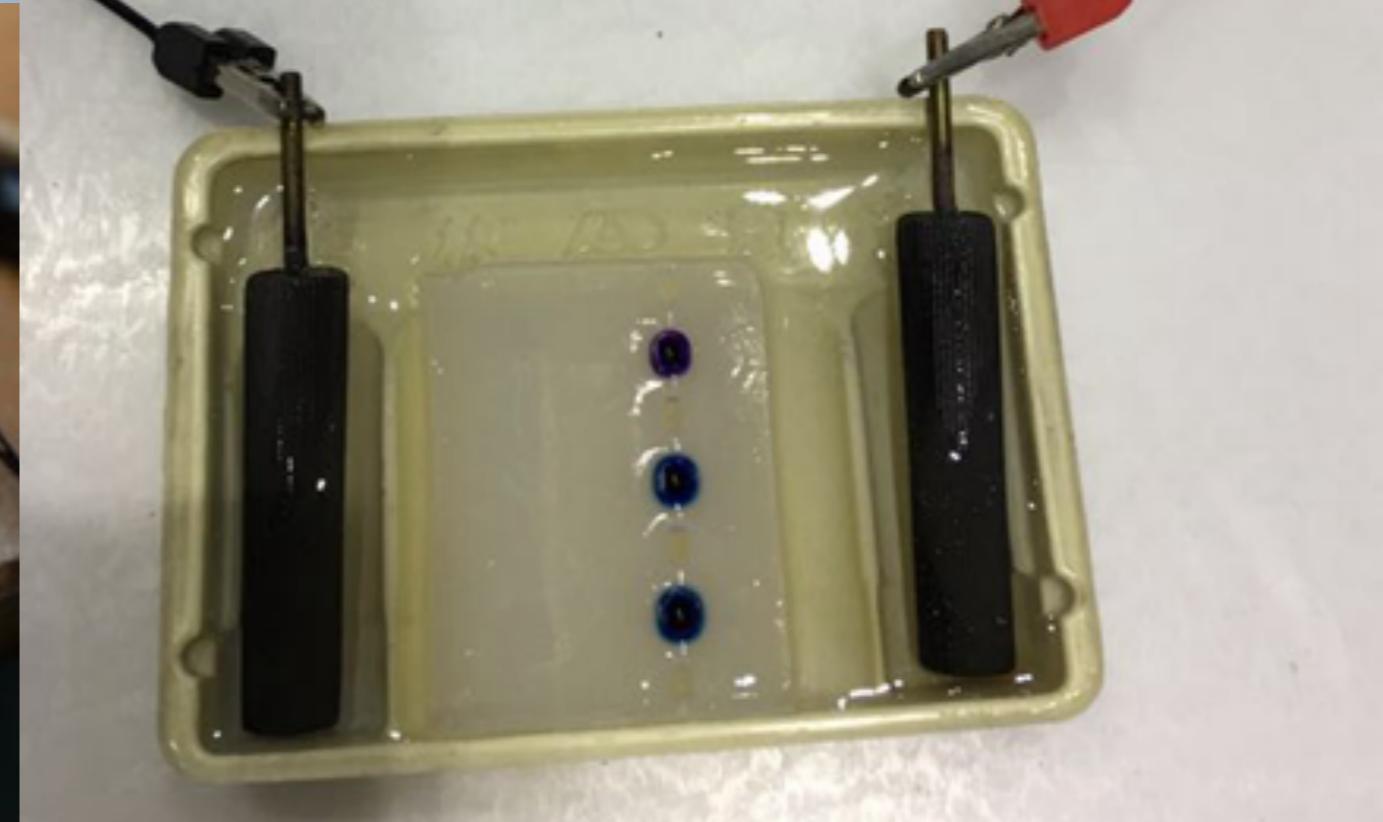
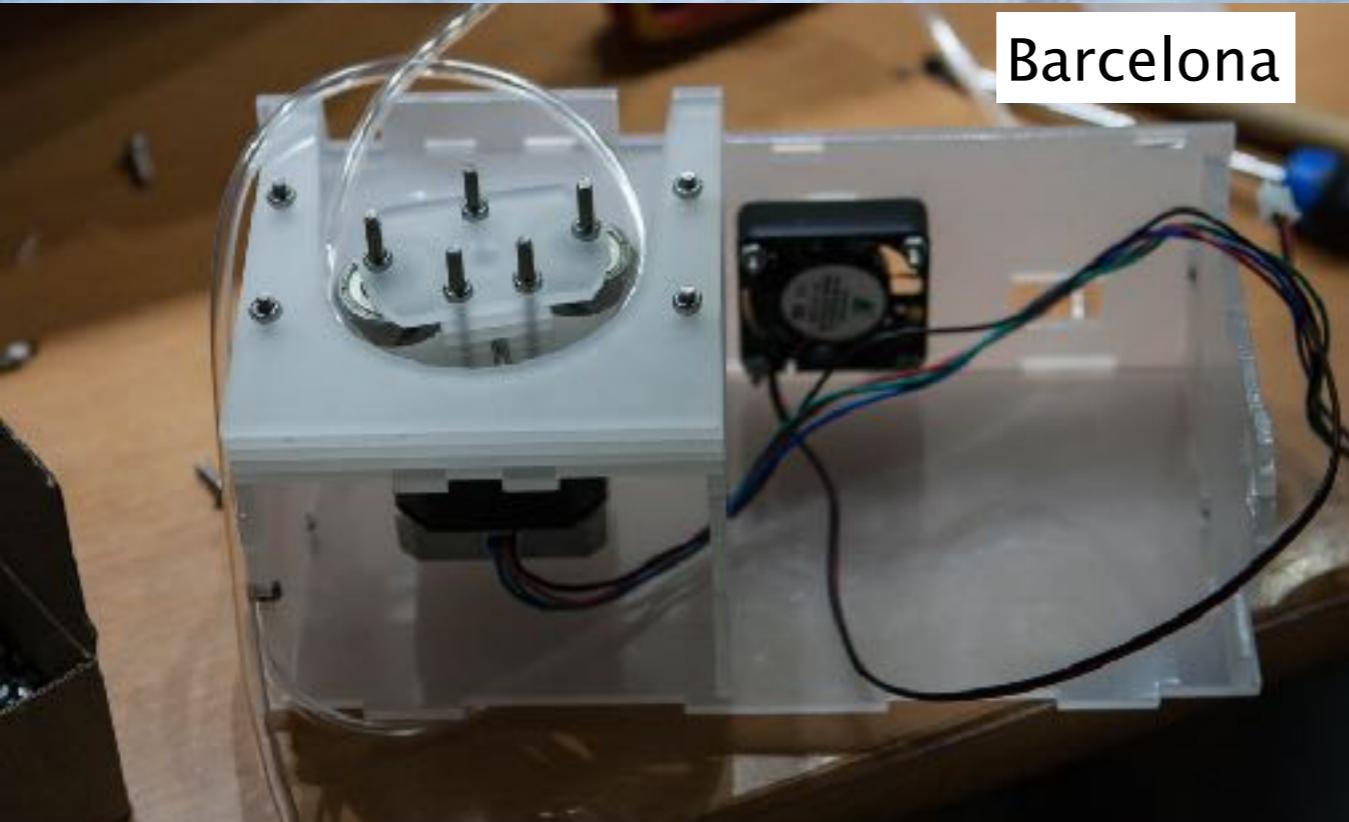
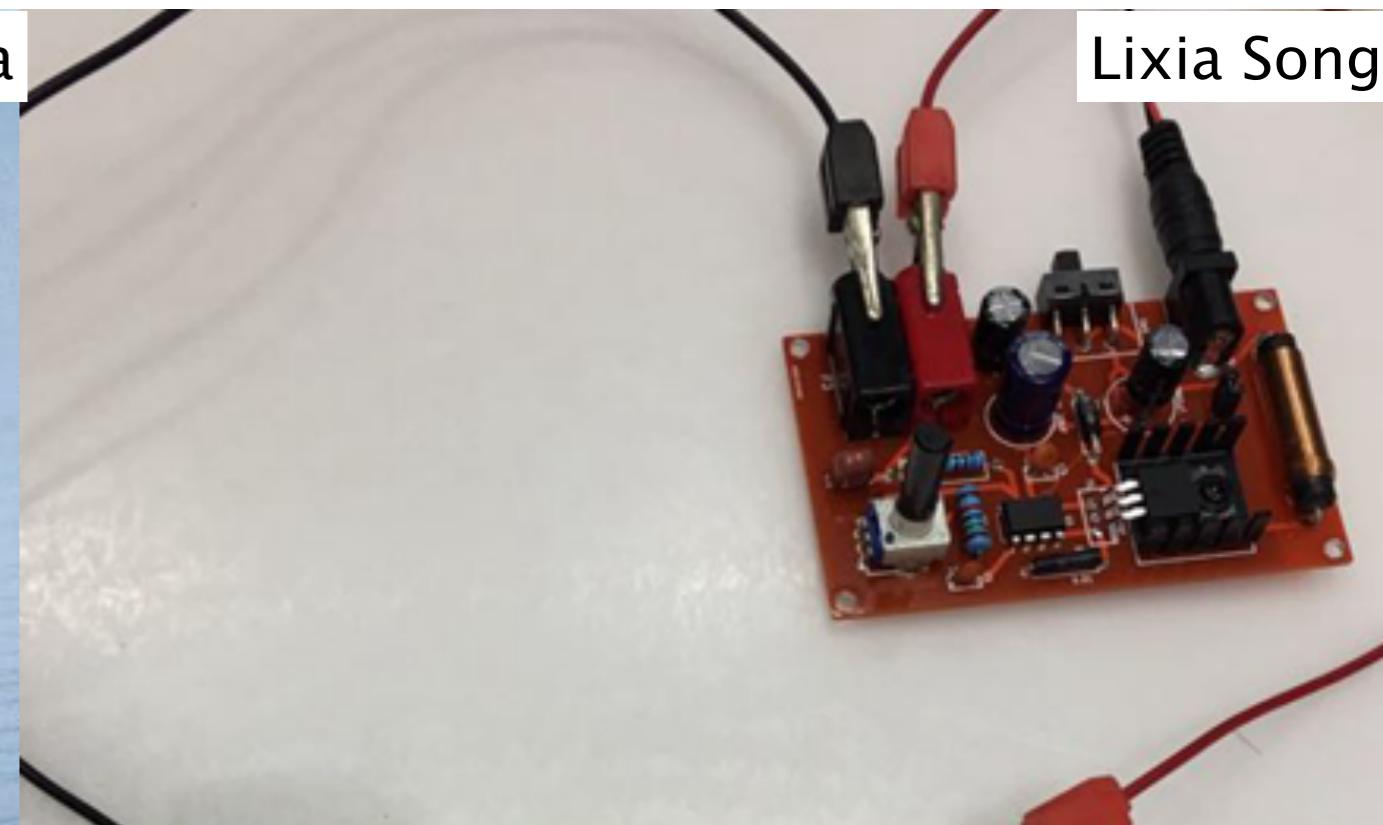


# DIY Biohack Academy kit



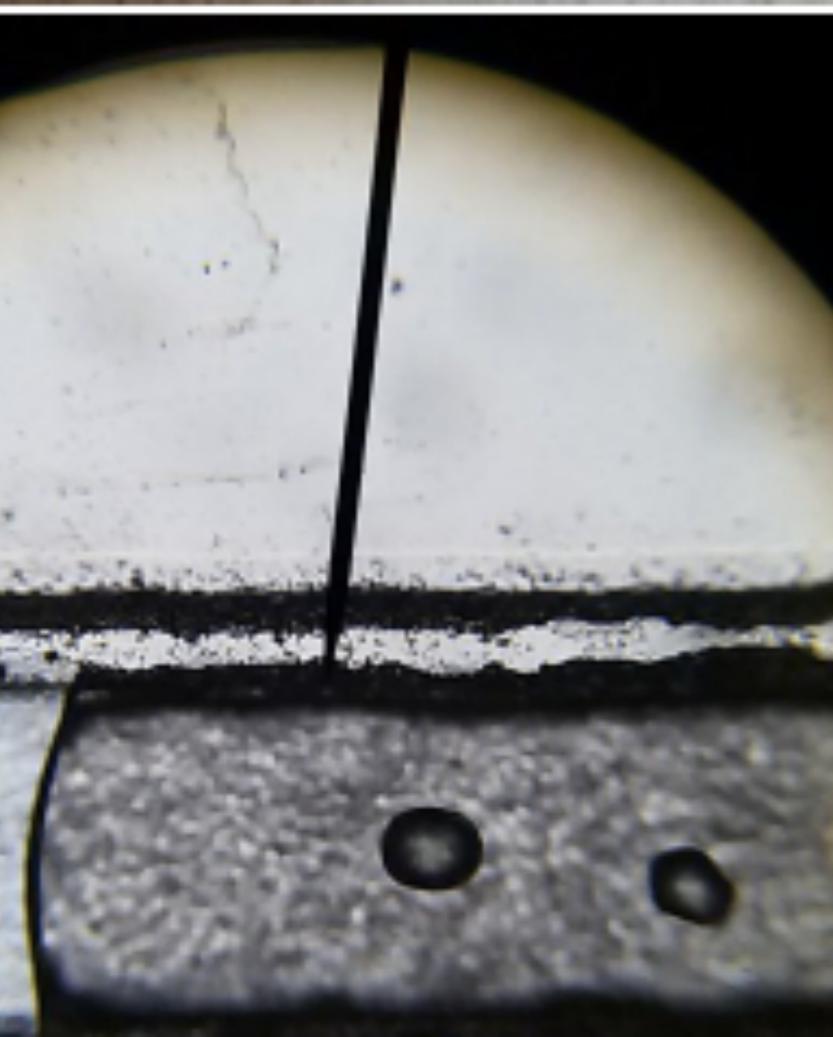
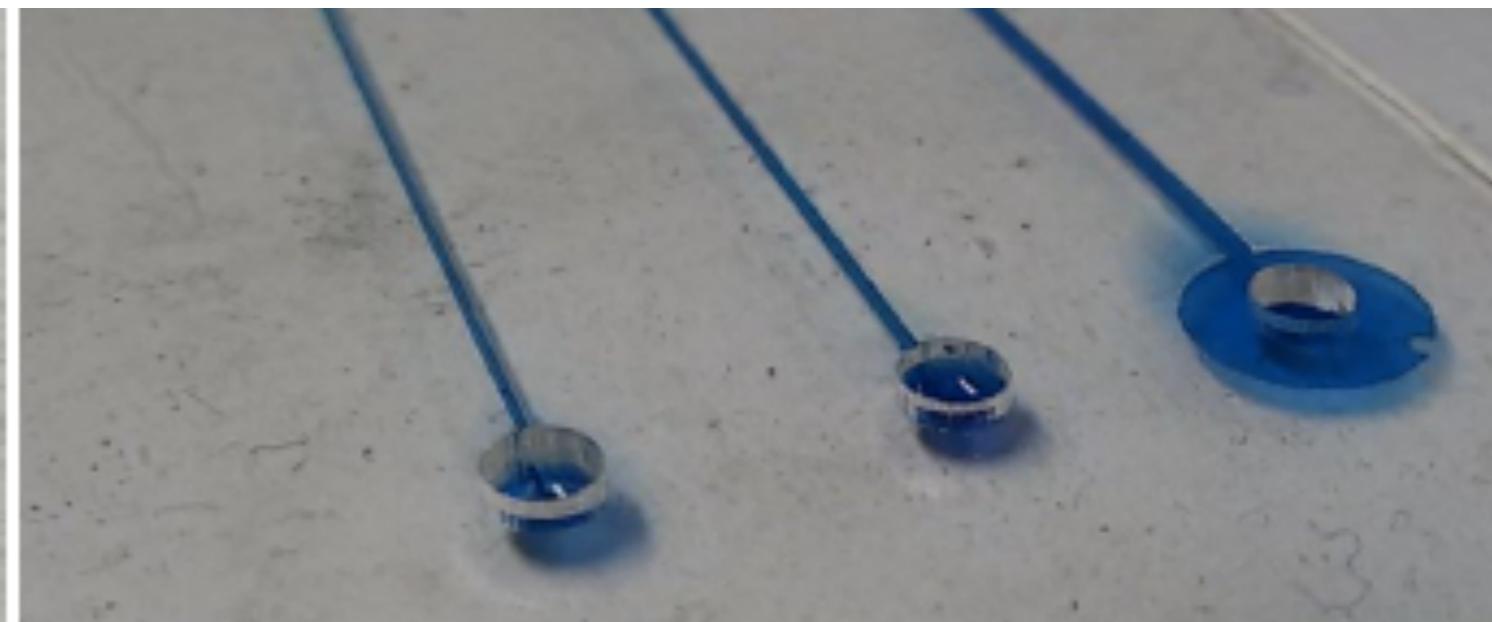


# Invent new lab tools





# Experiment with microfluidic chips





# Kombucha Skin



Laura Olalde

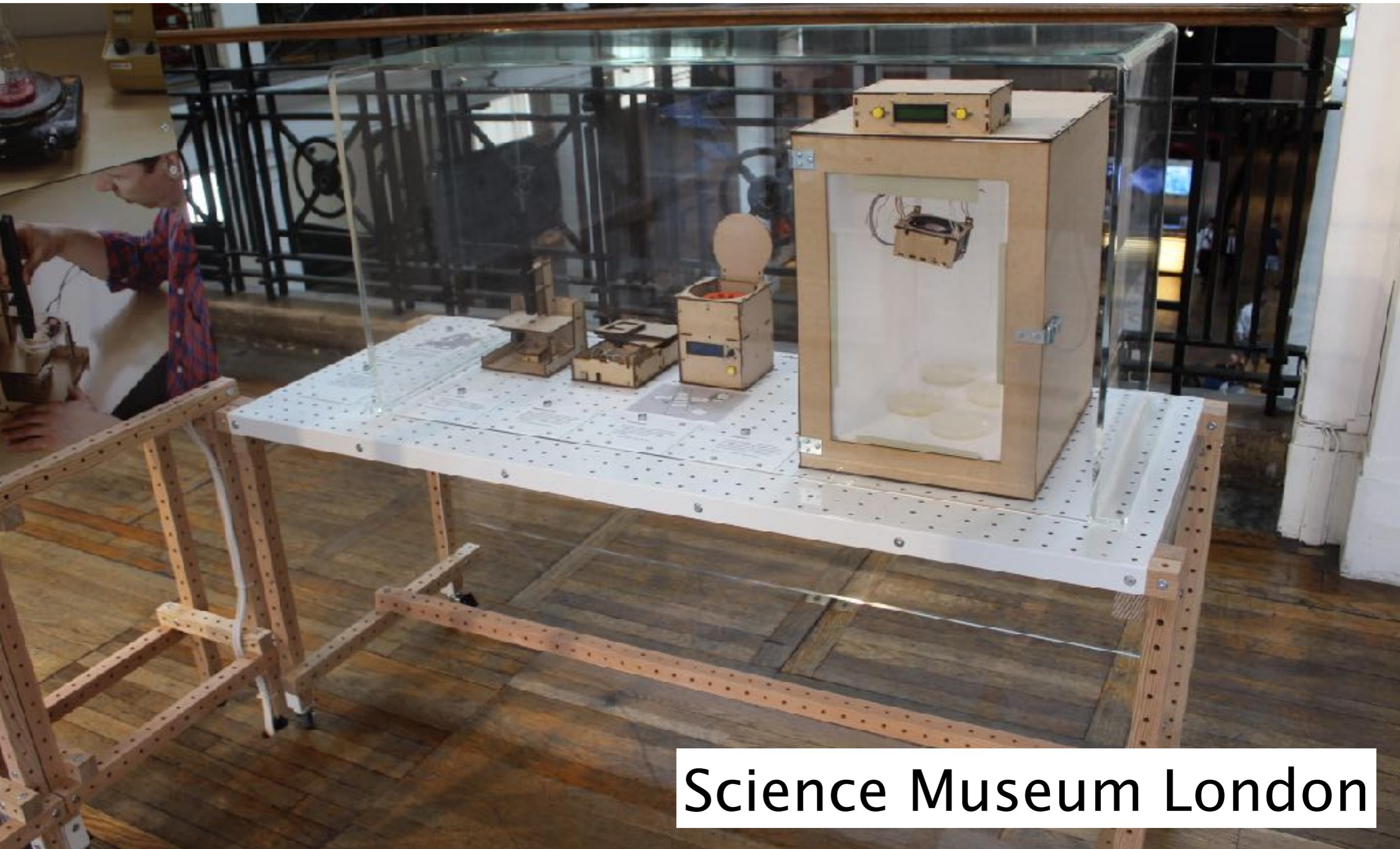


# Video track plant growth





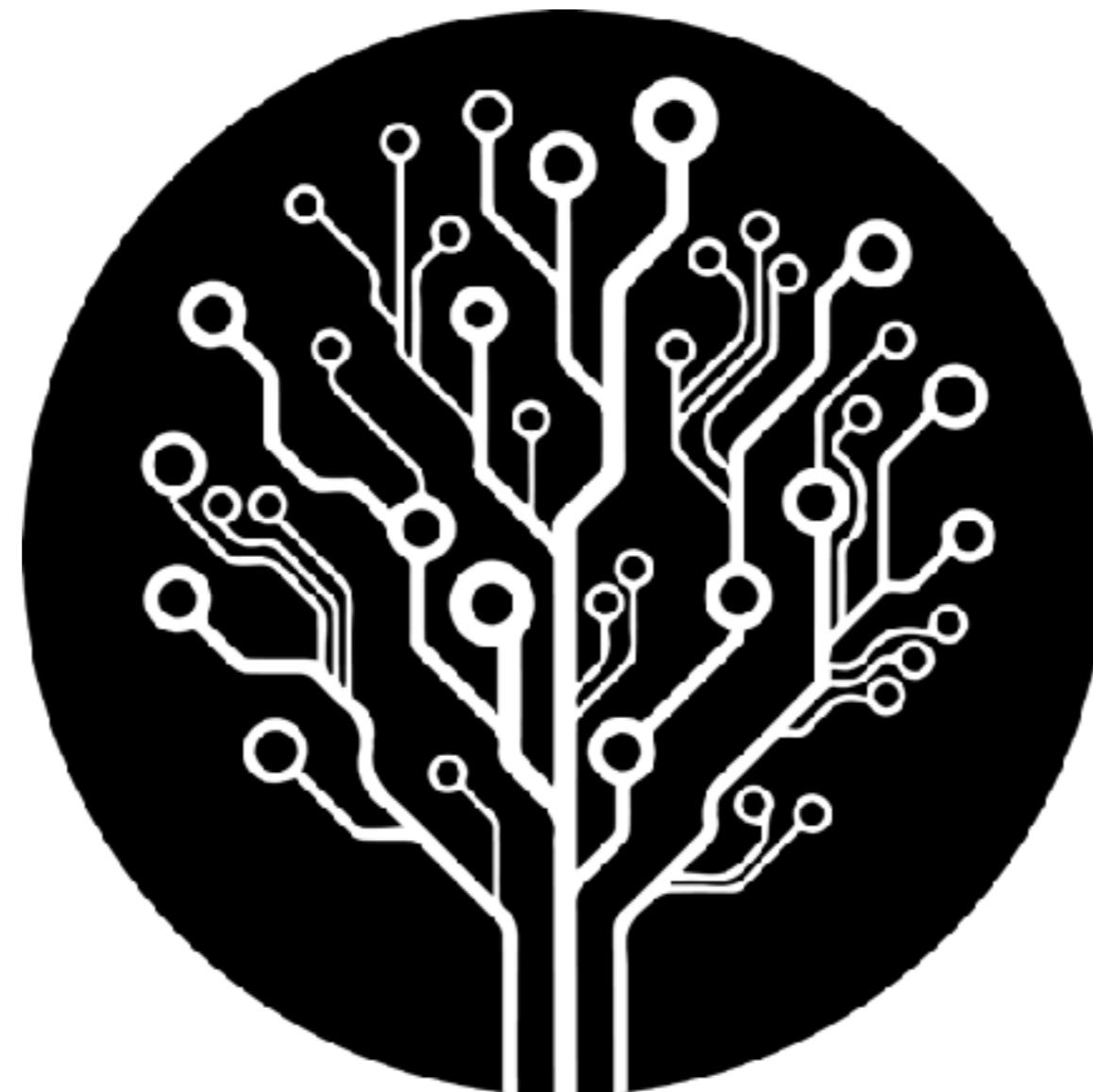
# End up in galleries & museums



Science Museum London



Welcome –ようこそ– 환영 – Welkom



**biohack  
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# BioHack Academy Partner labs

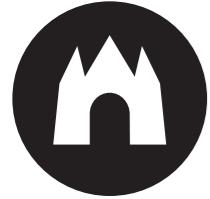




# Today's schedule

- Introduction
- History of Biohacking
- 3D design tools
- Sterile hood design

- 
- Biosafety



# The Challenge

# Build your lab

# Use it

# Share it



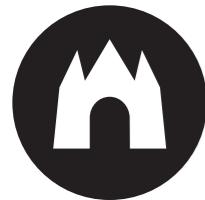
# Build a lab



biohack academy  
waag society

## Open Source BioHack Kit





# Everything Open Source

This repository Search Pull requests Issues Gist

BioHackAcademy / BHA\_Stirrer Unwatch 4 Star 2 Fork 7

Code Issues 0 Pull requests 0 Projects 0 Wiki Pulse Graphs Settings

BioHack Academy Magnetic Stirrer Edit

14 commits 2 branches 1 release 1 contributor GPL-2.0

Branch: master New pull request Create new file Upload files Find file Clone or download

PieterVanBoheemen BHA4 update	Latest commit ed9670a on Dec 16, 2016
Pictures	pictures + assembly guide
BoM.md	BHA4 update
LICENSE	init
Magnetic Stirrer-Cut-Sheet.svg	BHA4 update
Magnetic-Stirrer-Fritzing.fzz	BHA4 update
Magnetic-Stirrer-Sketchup.skp	BHA4 update
README.md	BHA4 update
Stirrer-Assembly.pdf	pictures + assembly guide

README.md

BHA Stirrer



# The difference





# Use your lab



Waag Society - CC-BY-SA 4.0



Waag Society - CC-BY-SA 4.0



Waag Society - CC-BY-SA 4.0



Future Everything - CC-BY-SA 3.0



# Share it



18:13

Contacts

Current Call  
Eduardo Lopez 18:13

Recent

- Jelle Bosdijk 1
- Anneli Amminkert 0
- Pieter Bosma 2
- Wouter Bruins 1
- STX Rabo Plenair 1
- Willem Botha 1
- per\_xl 2
- mmppepalkonstant... 1
- Dips 1
- Gomit Nizan 1
- Jonathan Minchin 1
- Brosin 1
- Antonella Cortile 1

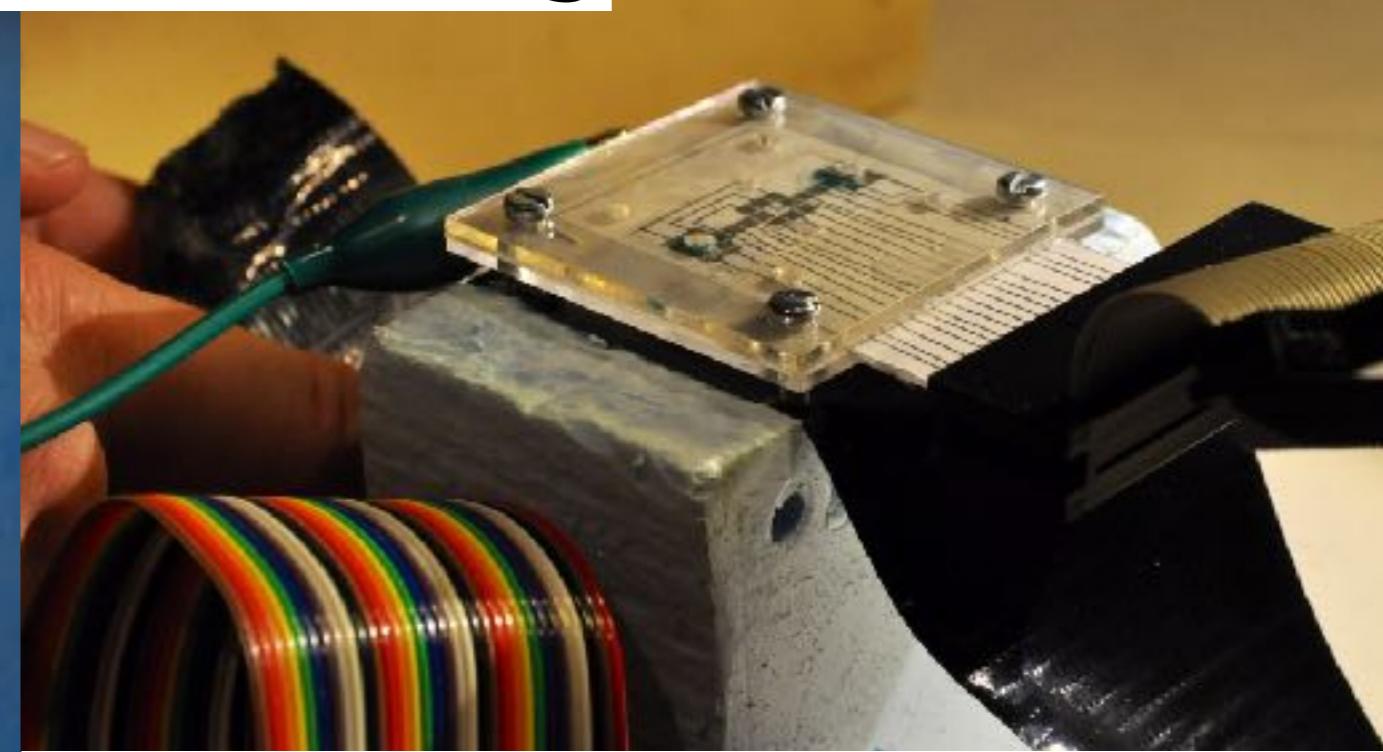
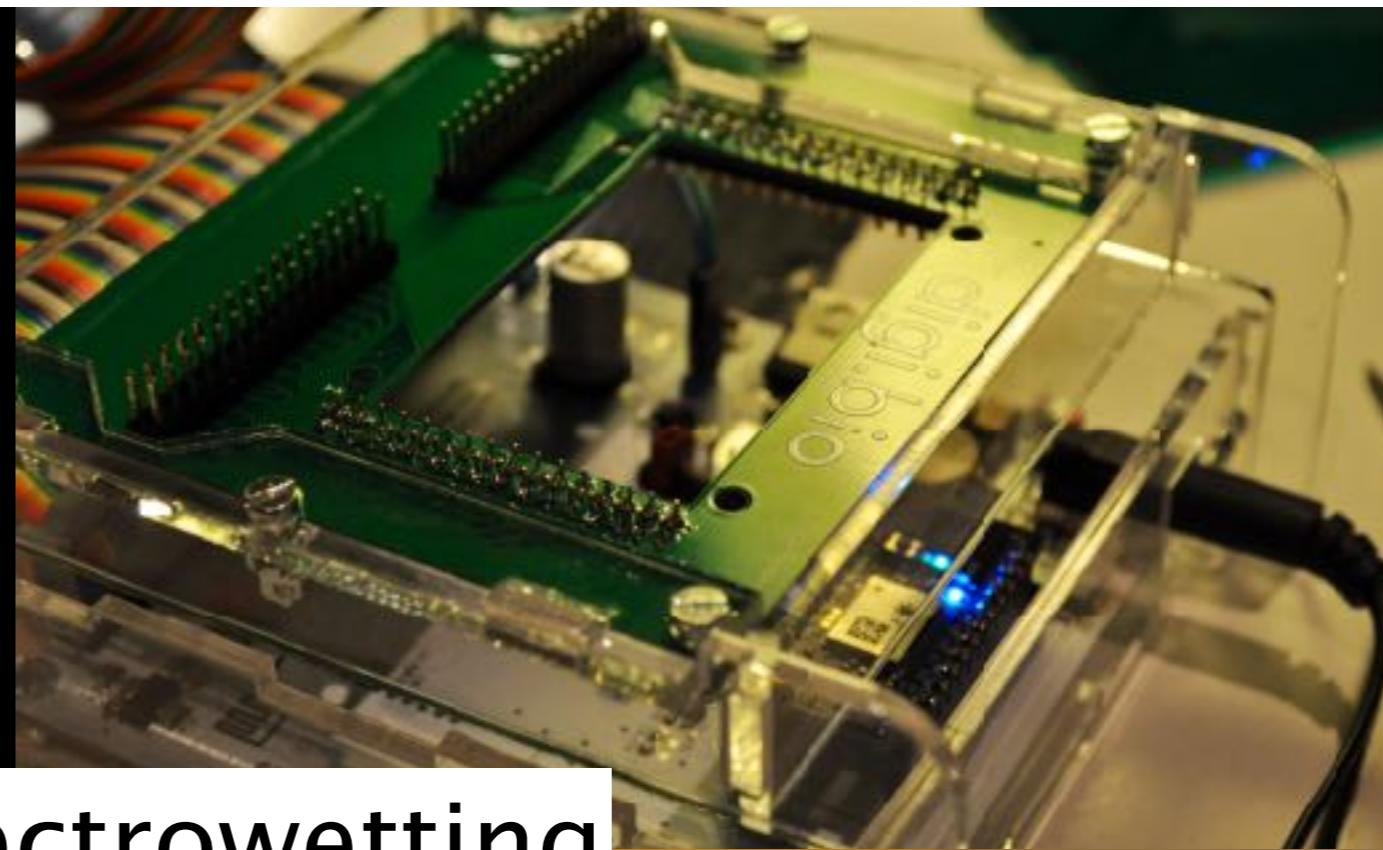
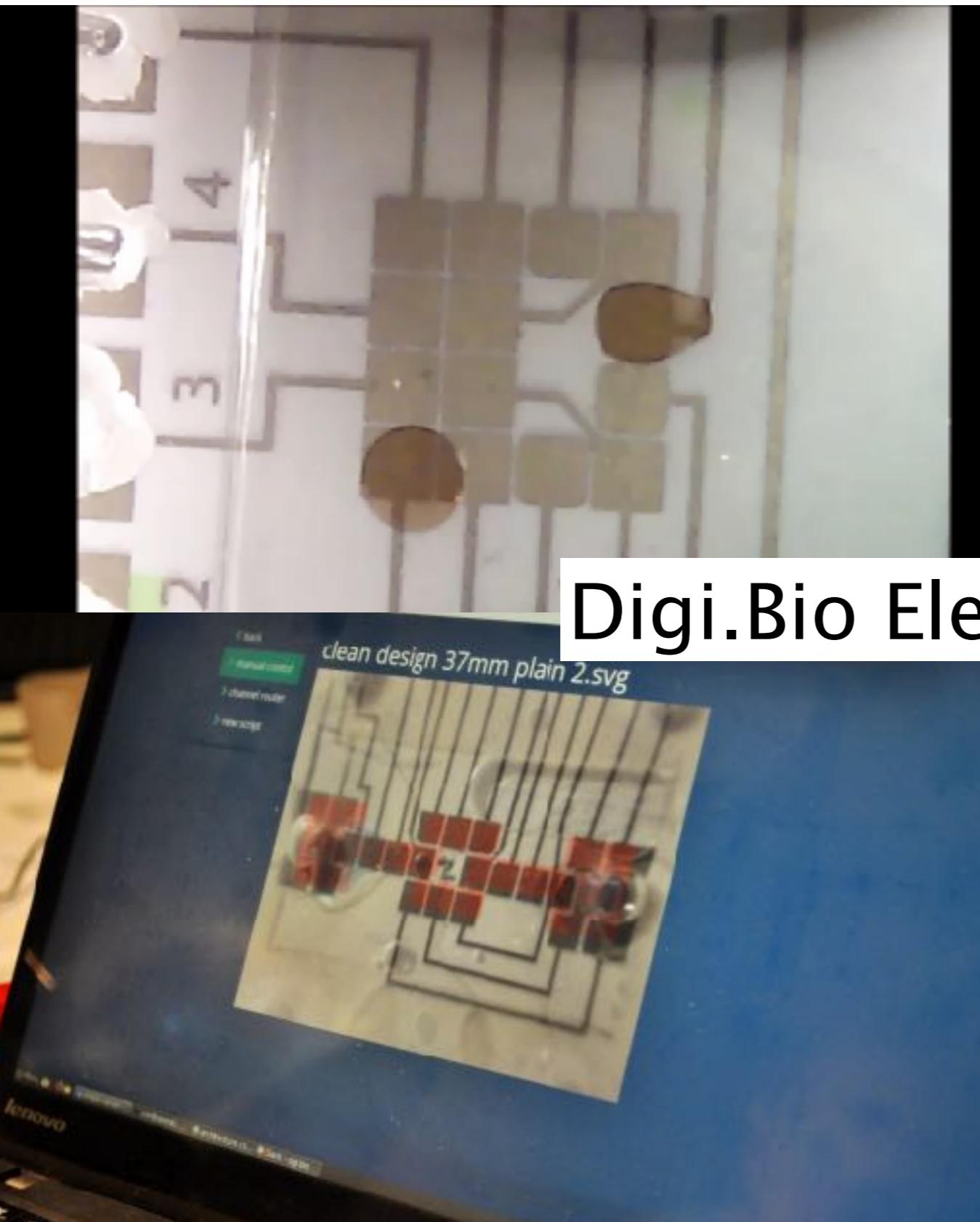




# Doing It Together Science



# Digi.Bio Electrowetting





# The goal of this Academy

## Skills you will learn:

- Microbiology
- Molecular biology
- Biotechnological reactor design
- Spectral analytics
- Bio informatics
- Analog electronics
- AVR microprocessor programming
- 3D drawing and parametric design
- 2D computer aided design
- 3D printing
- Open design licensing
- Chemical and biological safety

## Tools you will learn to use:

- All the tools you will build yourself
- Lasercutter
- 3D printer
- Arduino processing language
- OpenSCAD 3D modeling
- Sketchup 3D modeling
- Fritzing electronic circuit design
- Inkscape 2D design
- Markdown language
- Github



# The Team



Roland van Dierendonck



Per Staugaard



Lucas Evers



Henk Buursen



# Schedule: Classes

1	Introduction	Jan 29
2	Microbiology	Feb 5
3	Molecular Bio & Electronics	Feb 12
4	Optics	Feb 19
5	Genetics	Feb 26
6	YOUR PROJECTS	March 5
7	Biomaterials & Separation techniques	March 12
8	Bioinformatics & Spectrometry	March 19
9	Open lecture	March 26
10	Graduation Show	April 2



# Schedule: Devices

1	Sterile Hood	Jan 29
2	Magnetic Stirrer	Feb 5
3	Incubator	Feb 12
4	Microscopes	Feb 19
5	Thermocycler & Gelbox	Feb 26
6	YOUR PROJECTS	March 5
7	Centrifuge	March 12
8	Webcam spectrometer	March 19
9	Bioreactor	March 26
10		April 2



# Schedule: Practicals

1	Digital Fabrication Device construction	Jan 29
2	Cultivating microbes	Feb 5
3	Arduino Microbe isolation	Feb 12
4	Microscopy	Feb 19
5	DNA fingerprinting PCR	Feb 26
6	YOUR PROJECTS	March 5
7	P2P reviewing Bioinformatics	March 12
8	Spectrometry	March 19
9	Open Lab	March 26
10	Final presentation	April 2



# Example schedule: Microbes

1		Jan 29
2	Cultivation	Feb 5
3	Isolation	Feb 12
4	Characterisation	Feb 19
5	DNA	Feb 26
6		March 5
7	Down stream processing	March 12
8	Spectral analytics	March 19
9	Bioreactor	March 26
10		April 2



# Weekly Project Meetings

Project meetings to discuss:

1. Develop your own project;
2. Set up your own documentation site on Github;
3. Publishing progress;
4. Collaborations with peers;
5. Go through the assignments



# Syllabus

- <http://biohackacademy.github.io>
  - Lecture Slides
  - Lecture Videos
- Device blueprints, circuits and code: Github Repositories
- Cultivation media
- Practical protocols
- **Forum**



## Welcome Biohackers!

In BioHack Academy you design, build, use and share your own biolab. Each edition connects several groups around the world passionate about biotech and hacking.

This is the central Syllabus of the BioHack Academy.

## Syllabus Navigation

- [Classes](#), for lecture PDFs and videos, information on the BHA devices, practicals and other links
- [Participants](#), links to the personal pages of participants
- [Organisms](#), a list of organisms used in the BHA
- [Cultivation media](#), a list of cultivation media
- [Forum](#), link to the Forum of the BioHack Academy
- [Github repositories](#), Open Source DIYBio lab equipment repositories

## Partnerlabs BHA6

The partner labs are

- [Waag Society's Open Wetlab - Amsterdam](#)
- [BioClub Tokyo - Japan](#)
- [The Social Media Workgroup, University of New Mexico - USA](#)
- [Biolab Seoul - South Korea](#)

If you want to get in touch, send us an e-mail: [biohack -at- waag -dot- org](mailto:biohack -at- waag -dot- org)

[Or join our BHA Facebook group](#)

## Previous editions

Have a look at the result of previous editions:



# Share! Facebook group, Forum, ...

BioHack Academy

Pieter | Home | Find Friends

Pieter van Boheemen  
Edit Profile

FAVORITES

- News Feed
- Messages
- Events
- BioHack Academy
- BioHack Academy

APPS

- Games
- Belote.com
- Belote Multijoueur
- Suggest Edits
- Picks
- Saved
- Photos
- Find Friends

PAGES

- Fablab Amsterdam
- Pages Food
- Like Pages
- Create Page
- Create Ad

GROUPS

- Facebook Liberati... 20+
- Create Group
- New Groups

EVENTS

- Create Event

**BioHack Academy**  
Public Group

Joined Share Notifications

Discussion Members Events Photos Files Search this group

Write Post Add Photo / Video Create Poll Add File

Write something...

Pieter van Boheemen changed the type of group: BioHack Academy to Study Group.  
4 hrs

Like Comment

Seen by 8

Write a comment... Press Enter to post.

Pieter van Boheemen made Xiammy Dee an admin.  
7 hrs

Xiammy Dee

ADD MEMBERS

+ Enter name or email address...

MEMBERS 14 Members (6 new)

Message Invite by Email

DESCRIPTION Edit

BioHack Academy is a global 10 week course on creative biotechnology by Waag Society

GROUP TYPE Study Group

TAGS Add Tags

Add a few descriptive keywords.

GROUP CHATS

No group chats, start one now.

+ Start New Chat



**some  
rights  
reserved**