biohack academy
waag society

BioHack Academy 5
Design, build and use your own biolab

Are you interested in biotechnology, but you don't have a background in either biology or technology? Do you like to make things yourself and tinker with technology? Interested in DIYBio but don't know where to start? Or do you consider yourself creative and innovative and wanna work with some biomaterial? Come and join the fifth BioHack Academy!

Engineers have turned biology into a design discipline and it's now upon us to shape it's applications. After completing the fifth BioHack Academy you will be able to grow your own fuel, food, filaments, pharmaceuticals, fragrances, fungi and much more funky bio stuff at home. We will teach you how to join the bio revolution and how build your own lab equipment using a Fablab, Maker/Hackspace or other shared machine shop.

The fifth BioHack Academy consists of 10 classes. We will explain you how to construct the necessary machines, such as incubators, microscopes and centrifuges, to run your own biolab. Along the way you will learn how to operate them and put them to use in your own project. Whether that's a new type of bio ink, bio polymer, bio fuel or other kind of biohack is entirely up to you.

Moreover, the BioHack Academy is a truly international course. In the past editions, partner labs from the US, Latin America, Asia, Australia and Europe have followed the course simultaneously via remote video. We expect new partners to join this course as well, and grant you to opportunity to collaborate with biohackers from all over the world!

More information can be obtained by contacting:
biohack@waag.org

Date: 29 January – 3 April 2018

Duration: 10 classes in 10 weeks

Number of participants: 15

Subjects:
Microbiology
2D & 3D design
Electronics
Programming
Laboratory skills

Build your own lab equipment:
· Sterile hood
· Incubator
· Microscope
· Stirrers
· Pumps
· Thermocycler
· Spectrometer
· Centrifuge
· Bioreactor

Deadline registration:
20 December 2017

Register at: **waag.org/bha**

How we get it done
Structure of the academy

Waag Society

The BioHack Academy is organized by Waag Society, an institute for art, science, and technology with a long standing tradition in opening up technologies to the public. Waag Society's Open Wetlab allows anyone to experiment with bio materials. Together with artists, hackers, designers, activists and scientists we work in the Open Wetlab to open up biotechnology.

Structure of the academy

In just 2.5 months you will build up your own lab equipment. The programme is really a hands-on bootcamp. By the end of the course you and your fellow class mates will be turned into fully equipped biohackers, capable of growing a broad range of biomaterials ready to continue production independently at home.

For starters, you may choose a product from our collection, such as violacein (purple dye), cellulose (biopolymer), ethanol fuel (yeast fermentation), spirulina algae (super food), lactic acid (yoghurt), penicilin (antibiotic), kombucha (drink), acidic acid (vinegar), citric acid (aspergillis), mycelium (filaments) and/or tell us about your own living material of choice. The Academy is build up of 10 classes where every week consists of lectures, practicals and building a specific device.

The lectures, given on Monday mornings, will be recorded as well and posted on the Vimeo channel so you can replay each at home. The goal of these sessions is to give you insight in what kind of tool we are building and it's usefulness in the lab.
You may choose to either replicate the design of the tutor, improve/hack it or build your own device from scratch. It's up to you how sophisticated things may get.

During the practicals you will acquire the skills necessary to grow your own materials. We will also build equipment and learn how to use it. Depending on your prior knowledge this may be easy or you may need to invest additional time at home to study and practice. The BioHack Academy is an international course given in Amsterdam and in parallel in various other places around the world. During the lectures there is a live connection with the partner labs (when time zone allows). So you will be able to meet your fellow students of all around the world.

Your tutors:

Roland van Dierendonck
Roland is leading the BioHack Academy #5. He has co-organized events about open source hardware, digital biology and biomaterials at Waag Society's Open Wetlab, and exhibited several bio-related art-science works. Next to this, he teaches in the biospace at the Product Design department of the Utrecht University of the Arts. He really enjoys tinkering with creative technologies and music, making illustrations, and collaborating with diverse people.

Roland has a MSc. in Media Technology at Leiden University and a BSc. in Bèta-gamma, specialization in Biology, at the University of Amsterdam.

Xiamyra Daal
Xiamyra is the main tutor of the local Amsterdam BioHack Academy practicals. Besides that she coordinates the Do It Together Bio workshops and guides the Open Wetlab Evenings where she shares her fascination and enthusiasm for biology with everybody. Xiamyra studied Biomedical Sciences in Leiden during which she gained her laboratory experience. Xiamyra loves to make things herself. Currently she is building her own lab at home.

How we get it done
BioHack Academy graduation

In order to learn from each other, all students are required to keep track of their progress on a documentation webpage. You can use it as an online lab journal / inspirational board or create a beautiful website with it. This way you can also follow the progress and/or get inspiration of participants of the other labs.

Finalising the academy
Completing the Academy you will receive a BioHack Academy certificate. The project Github page and Vimeo channel will be open to the public to share the results with the Open Source biotech community at large.

In possession of your own biofactory, you may continue to advance your production skills, engage in directed evolution experiments, produce biogas, purify water, purify polluted soil, just to give a few. Biology has no limits!

Location
Waag Society
Nieuwmarkt 4
1012 CR Amsterdam

Timing
The practicals take place on Monday and Tuesday during the day and the lectures on Monday evenings.

Your tutors:

Lucas Evers
Lucas is head of the Waag Society's Open Wetlab programme and has profound knowledge of the intersection of biology, design and art.

He has an education as an artist and teacher in the creative arts and studied politics at the University of Amsterdam. He is co-initiator of the Do It Together Bio series and the Bio Art & Design Award.

Emma Parechi
Emma Pareschi works as hardware developer at Waag Society within several projects at hardware and software integration. She is also involved in the international Fab Academy course.

Emma is Italian by origin and now lives in Amsterdam. She has a M.Sc. in Physics, specialization in electronics and she worked as analog design engineer of integrated circuits for a semiconductor company based in Villach (Austria).

BHA 5 schedule 2018

30 January – 3 April 2018

The BHA5 programme consists of 10 classes. Step by step we go through several biological techniques and construct all the necessary machines you need to run a biolab. Each lecture is given the week in advance of the related practicals so that you can fully study the topic before going into the practical.

This schedule is tentative - changes may occur.

	Week 1	**Week 2**	**Week 3**
Lecture topics	History of biohacking Safety & ethics 3D design in Sketchup	Microbiology Bio art / design Documentation	Biomaterials Coding Arduino Digital Electronics
Device build	Sterile hood	Stirrer	Incubator
Practicals	Fablab and Wetlab tour 3D design Principles of electronics	Cultivating microbes	Isolating microbes Arduino coding

	Week 4	**Week 5**	**Week 6**
Lecture topics	Optics Liquid culturing	Genetics Biosensing	Midterm presentations
Device build	Microscope	Thermocycler & Gelbox	n.a.
Practicals	Microscopy Cell staining	DNA extraction DNA profiling	Work on your own project

	Week 7	**Week 8**	**Week 9**
Lecture topics	Bioethics	Bioinformatics Spectrometry	Guest speaker Biotic Games
Device build	Centrifuge	Spectrometer	Pumps & Bio reactor
Practicals	P2P reviewing Work on your own project	PyMol Iodine Clock Reaction	Grow your own certificate Work on your own project

Week 10: graduation show
The BioHack Academy will be closed with the Graduation Show that will have an online and offline programme. During this event every participant will have the chance to present their project in an online marathon session. You are welcome to invite your friends and family to show them the outcome of your 2,5 months of intense learning.

Equipment & skills

What do we use? What will you learn?

This is the BioHack Academy open source kit and these are the machines that you will be building:

Required prior knowledge
There is no specific knowledge required, enthusiasm and a do-it-yourself attitude is definitely needed in case you start from scratch. We are not going to build the lab for you. Be creative and inventive and when things do not work out, use the knowledge of the instructors and the other participants to get the most out of it.

Skills you will learn:
- Molecular biology
- Microbiology
- Biodesign and bioarts
- Chemical and biological safety
- Biotechnological reactor design
- Spectral analytics
- Bioinformatics
- 2D computer aided design
- 3D drawing and parametric design
- 3D printing
- Laser cutting
- Analog electronics
- AVR microprocessor programming
- Image processing
- Mechanics
- Open design licensing

Tools you will use to acquire these skills:
- All the tools you will build yourself
- Laser cutter (BMR)
- 3D printer (various)
- Arduino processing language
- Inkscape 2D design
- SketchUp and FreeCAD 3D modelling
- OpenSCAD 3D modelling
- PyMol protein rendering
- Fritzing electronic circuit design
- Markdown language
- GitHub

Practical information
Costs, payment and location

Location
You can follow the BHA course either at Waag Society's Open Wetlab in Amsterdam or at one of the international partner labs.

Open Wetlab biohacker space at Waag Society
All classes will take place in the Open Wetlab, a unique BioHack space on the bleeding edge between art, science and technology. The lab is co-located with the Amsterdam Fablab in the Waag building in Amsterdam.

International partner labs
In order to take part in the academy remotely, you need to have access to a BioHack Academy partner lab. Keep an eye on the BHA website http://biohackacademy. github.io to check which are participating. The partner lab will provide you with biological samples, space to perform the practicals and will you give access to all tuition materials. The coordinators of the partner labs have been trained to help you out as much as possible.

Costs
The costs consist of a tuition fee and material costs. The tuition fee is a fixed sum for the entire course whereas the material costs are determined by you. Partner labs may have deviating costs.

BioHack Academy 5 tuition fee: 2.000 Euro (incl. VAT). Expected material costs: ± 500 Euro (when building all equipment). Early birds discount applies until Augustus 1st, 2017.

Tuition fee
The tuition fee includes two full days of guidance by instructors, two days access to the Amsterdam Open Wetlab and Fablab facilities, access to the BHA lab equipment source files and all tuition materials.

Material costs
The material costs depend on which laboratory equipment you would like to construct and what materials you will use. Two weeks in advance of the course you will receive a list with suggested materials for minimal costs.

Additional requirements
On top of these costs you are expected to have access to the following:
• Laptop computer
• Arduino compatible microprocessor (multiple units are recommended if want to keep the machines working independently), you may use cheaper clones like Rxduino, Seeeduino, Funduino, etc. too.
• General kitchen equipment: pressure cooker, microwave, oven, fridge and freezer, plastic (tupperware) containers of various sizes, and access to a supermarket and aquarium store. (A limited set of these tools are available in the Open Wetlab. However it is highly recommended to get your own in order to build a full lab at home.)
• Keep in mind that you need about 100 up to 200 euros of budget for consumables, such as chemicals and tubes too.

Payment
You can register for the BioHack Academy in Amsterdam via: **waag.org/bha**.

Click the red button to pay via Eventbrite. The tuition fee is non-refundable.

Register before 20 December 2017!

For registration at a partner labs please contact the partner lab.

Scholarships
There are two scholarships available for students that are enrolled in a higher education programme (Bachelor or Master). The scholarship reduces the tuition fee to 750 euro (incl. VAT). You will be asked to show your valid student card to be eligible for this fee. Early birds discount applies until Augustus 1st, 2017.

Contact information
If you have any further questions, please e-mail: biohack@waag.org.