



biohack academy
waag society

BioHack Academy 4

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 fiddle around? Interested in DIYbio but don't know where to start? Or do you consider yourself creative and innovative and want to work with some biomaterial? Come and join the fourth BioHack Academy!

The age of personal biotechnology is upon us. Engineers have turned biology into a design discipline and it's now upon us to shape its applications. After completing the fourth 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 fourth BioHack Academy: design, build and use your own lab, consists of 10 classes. Step-by-step you will construct the necessary machines to run a biolab. Along the way you will learn how to operate them and put them to use in your own project.

Learn how to grow and extract your own biomaterials exclusively using self-designed and self-fabricated Open Source hardware. Whether it's a new type of bio ink, bio polymer or bio fuel, within just 2,5 months we'll show how you can grow it yourself and share the results with others.

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

Date:
31 January - 4 April 2017

Duration:
10 classes in 10 weeks

Number of participants:
Max. 15

Subjects:
2D & 3D design
Electronics
Programming
Laboratory skills
Build your own lab equipment:

- Sterile hood
- Incubator
- Microscope
- Stirrers
- Pumps
- Thermocycler
- Spectrometer
- Centrifuge

Deadline to enroll:
25 November 2016

waag.org/bha4



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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 citizens 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 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 (aspergillus), 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 Tuesday evenings, will be recorded and posted on the Vimeo Channel so you can replay them at home. They will 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 build your equipment and you will learn how to operate them. Depending on your prior knowledge this may be easy or you may need additional time to improve your skills.

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:



Pieter van Boheemen

Pieter is an all-rounder in digital fabrication and biotechnology, founder of the Dutch Do It Yourself Biology community (DIYBio Amsterdam) and supervisor of the Open Wetlab laboratory for creative biotechnology. He has taught numerous Do It Together Bio workshops to designers, artists, scientists, engineers and hackers of all age groups on the subject of biohacking, biodesign and bio informatics. In the Open Wetlab he turns the experience from his masters degree in Life Science & Technology of the Delft University of Technology into hands-on activities that are easy to understand by anyone. Pieter is a frequent user of open source hardware and creator of all the BHA prototypes.



Xiamyra Daal

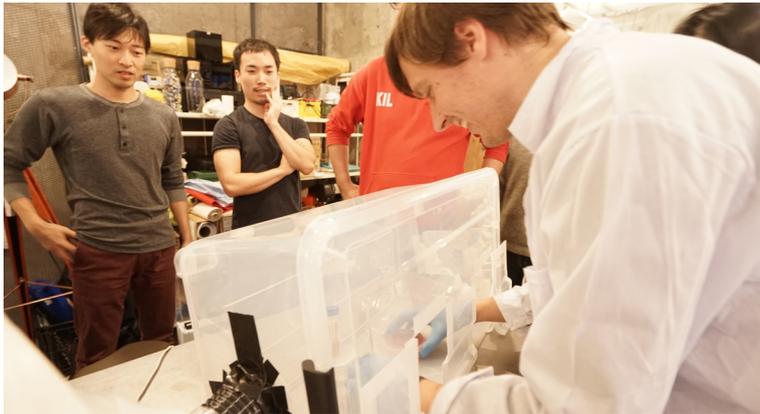
Xiamyra is the concept developer of the Open Wetlab. She now coordinates the Do It Together Bio workshops and guides the Open Wetlab Evenings where she shares her fascination and enthusiasm for biology with everybody. Xiamyra studied Biomedical Sciences in Leiden during which she gained her laboratory experience. Xiamyra loves to make things herself. Currently she is building her own lab at home.



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How we get it done

BioHack Academy graduation



Allowing to learn from each other, all students are required to keep track of their progress on the BioHack Academy Github page. 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

After completing the academy you will receive the 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. Bio has no limits!

Location

Waag Society
Nieuwmarkt 4
1012 CR Amsterdam

Or at one of the partner labs:

- Space10 Copenhagen, Denmark
- Mlab Vilnius, Lithuania
- BioClub Tokyo, Japan
- University of Western Australia Perth, Australia
- Shenzhen Maker Space, China

Possibly more partner labs will follow.

Your tutors:



Nicolò Merendino

Nicolò Merendino works as digital fabrication expert and designer at Fablab Amsterdam. He is running the lab during the open days and contributes to various other projects at the Waag Society.

Nicolò is specialized in using exclusively open-source software to develop designs and to operate the machines at the Fablab. Before joining Waag Society, Nick has been working for years in the development of electronic music instruments and other media art pieces all over Europe.



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. Lucas is also an advisor at DasArts, second phase theatre and performance education.



BHA4 schedule 2017

31 January - 4 April

The BHA4 programme consists of 10 classes. Step by step we construct all the necessary machines you need to run a biolab. Along the way you will learn how to operate them. Each lecture is given the week in advance of the related practicals so that you can fully emerge into the topic.

This schedule is tentative - small changes may occur.

	Week 1	Week 2	Week 3
<i>Lecture topics</i>	History of biohacking Safety & ethics 3D design in Sketchup	Documentation (Github) Bio art / designed Analog electronics	Biomaterials Coding Arduino Digital Electronics
<i>Device build</i>	Sterile hood	Stirrer	Incubator
<i>Practicals</i>	Fablab and Wetlab tour 3D design Principles of electronics	Cultivating microbes	Isolating microbes

	Week 4	Week 5	Week 6
<i>Lecture topics</i>	Optics Liquid culturing	Genetics Biosensing	Midterm participants presentations
<i>Device build</i>	Microscope	Thermocycler & Gelbox	n.a.
<i>Practicals</i>	Microscopy Cell staining	DNA extraction DNA profiling	Design your own project

	Week 7	Week 8	Week 9
<i>Lecture topics</i>	Bioethics	Processing Bioinformatics	Guest speaker
<i>Device build</i>	Centrifuge	Spectrometer	Pumps
<i>Practicals</i>	Field research P2P reviewing	PyMol Iodine Clock Reaction	Grown your own certificate Work on 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.

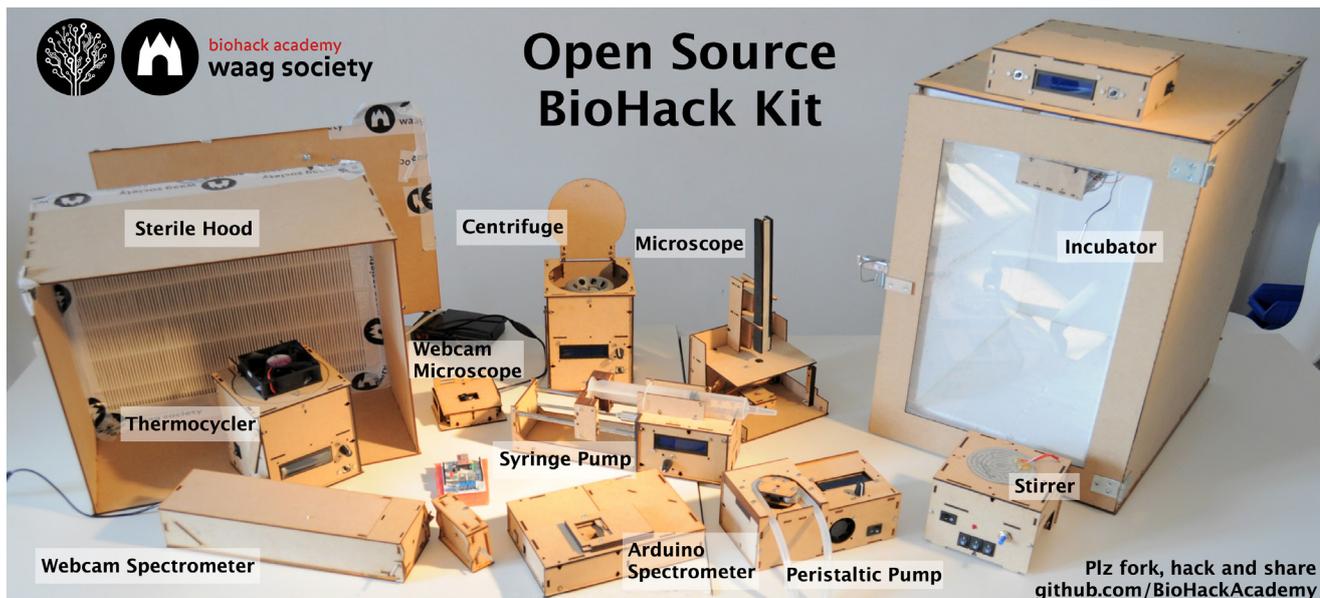


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Equipment & skills

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, just an inventive and creative attitude. We're not going to build the lab for you, you will have to do that yourself with the help of the instructors and the other participants.

Skills you will learn:

- Molecular biology
- Microbiology
- 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





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Practical information

Costs, payment and location

Location

You can follow the BHA4 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. This edition partner labs will be available in: Space10 Copenhagen, Denmark; Mlab Vilnius, Lithuania; BioClub Tokyo, Japan; University of Western Australia Perth, Australia Shenzhen Maker Space, China and possibly more. 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 good as possible.

Costs

The costs are build up 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 4 tuition fee: 2,000 Euro.
Expected material costs: ± 500 Euro (when building all equipment).

Tuition fee

The tuition fee includes two full days of guidance by two instructors per week, two days access to the Amsterdam Open Wetlab and Fablab facilities per week, 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. In order to spend the least amount of money, you will sometimes need to scavenge parts through second hand market places like Ebay. It is up to you to upgrade and spend a bit more money on your bio lab to the extend you prefer.

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 Rxdino, Seeedino, Fundino, 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 and pay for the BioHack Academy in Amsterdam via Eventbrite: <http://waag.org/bha4>. The tuition fee is non-refundable. Register before the 25th of November! For registration at a partner lab 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 600 euro (incl. VAT). You will be asked to show your valid student card to be eligible for this fee.

Contact information

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