Hackteria Global Network
Open Source Biological Art

Hackteria is an international network active since 2009 in the field of Open Source Biological Art. As a community platform hackteria tries to encourage the collaboration of scientists, hackers and artists to combine their experitise, write critical and theoretical reflections, share simple instructions to work with lifescience technologies and cooperate on the organization of workshops, temporary labs, hack-sprints and meetings. Hackteria is a network of people practicing DIY (do-it-yourself) and DIWO (do-it-with-others) biology with an interest in art, design and interdisciplinary cooperation. Hackteria operates on a global scale, and is based on a web platform and a wiki for sharing knowledge, which enable anyone to learn but also test different ways of hacking living systems. Hackteria is not based in a physical space, and its goal is to allow artists, scientists, cooks, farmers, philosophers and hackers to collaborate and test various biohacking and bioart techniques outside the official laboratories and art institutions, basically anywhere in the world.

HUMUS Sapiens, various activities, CH / DE / FI
https://www.hackteria.org/wiki/HUMUS_sapiens

Hackteria Temporary Lab, Garage MCA, Moscow
https://www.hackteria.org/workshops/hackteria-moscow/

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February 2020

International Hackteria Activities – An Overview

What is Hackteria

Overview

Hackteria is a webplatform and collection of Open Source Biological Art Projects instigated in February 2009 by Andy Gracie, Marc Dusseiller and Yashas Shetty, after collaboration during the Interactivos?09 Garage Science at Medialab Prado in Madrid.

There are many similarities between Hackteria and other developing DIY biology inititiatives such as DIYBio (diybio.org and diybio.eu), however Hackteria is unique in the sense that it sets this DIY biological practice also in the field of the arts. Bio-Art is an artform that has been flourishing in the last decade and draws from a wide range of lifescience disciplines, many of which are difficult, time-consuming or problematic for artists to fully access. In response to this inaccessibility, Hackteria develops open source methodologies that make biological and creative practice accessible and economical. The aim of the project is to develop a rich web resource for people interested in or developing projects that involve DIY bioart, open source software and hardware, bioelectronic experimentation and citizen-science practices.

For a short introduction the following movie gives a nice overview of the earlier phase of the hackteria project:

http://hackteria.org/?p=517

(Video produced by Migros Kulturprozent and Christoph Merian Verlag. You can find the full publication on digital brainstorming)

The uniqueness of this initiative lies in the following three points: it's **GLOBAL**-the virtual knowledge-sharing platform allows learning and participation, which is not restricted by physical location. We have performed workshops in more than 20 countries; it's **DIVERSE** –scientists, engineers, artists, philosophers, entrepreneurs, foodies and chefs, academic and citizen initiatives, young and old(er) bring together their interests and expertise; it's **FACE-TO-FACE** – through workshops we engage a wider audience in art festivals, academic institutions, and the general public, through the HackteriaLab immersive format we experiment and develop of new models for knowledge sharing and collaboration building.

Global Community – Local Activities

As a community platform hackteria tries to encourage the collaboration of scientists, hackers and artists to combine their expertise, write critical and theoretical reflections, share simple instructions to work with lifescience technologies and cooperate on the organization of workshops, temporary labs, hack-sprints and meetings. Over the last 10 years Hackteria has been broadening its base of associates and collaborators with the aim of enriching its resources and increasing the possibilities of communication and dissemination. Each of the members has their own individual practice which relates to some aspect of bio-art practice and/or bio-science practice. The network of associates also features a wide and varied skills and experience base. The combination of these skills, knowledge and expertise and resources, gives the Hackteria project a deep and strong foundation with which to generate its projects, workshops and modes of communication and dissemination.

http://hackteria.org/?cat=3
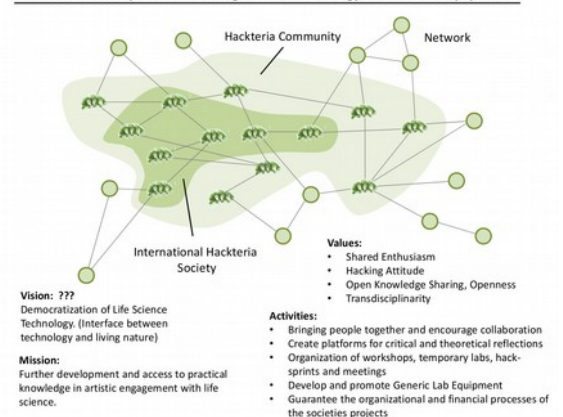
Support

The Hackteria project has been supported by: Bundesamt für Kultur (2009-2010), Migros Kulturprozent (2010 – 2015 & 2019), KulturRaum Schaffhausen (2011-2012 & 2019) Sir Ratan Tata Trust, Shristi, School for Art, Design and Technology and the National Center for Biological Science, India (2009-2013), Pro Helvetia (variously), SEED grant from EPFL (2013-2014), Swiss Contribution to the enlarged European Union (2012-2013), Arts Collaboratory, Hivos/DOEN (2014), Science Booster (2017 & 2018) via WeMakeIt crowd-funding platform, collaborative projects with Hochschule Luzern (2017-2019), various individual project funds and a high degree of enthusiasm and volunteering by all its members.

Core Organizers

Project Team
- **Dr. Marc Dusseiller** (CH), 1975 – Global Ambassador and Coordinator of International Projects
- **Maya Minder** (CH), 1983 – Gasthaus: Fermentation and Bacteria, Artist and Curator
- **Urs Gaudenz** (CH), 1971 – GaudiLabs, Engineer and transdisciplinary researcher

Short Biographies
Hackteria Team Switzerland

Marc Dusseiller, Zürich/Global (CH)

Dr. Marc R. Dusseiller (*1975) is a transdisciplinary researcher, lecturer, cultural facilitator and artist. He performs DIY (do-it-yourself) workshops in lo-fi electronics and synths, hardware hacking for citizen science and DIY microscopy. He was co-organizing Dock18, Room for Mediacultures, diy* festival (Zürich, Switzerland), KIBLIX 2011 (Maribor, Slovenia), workshops for artists, schools and children as the former president (2008-12) of the Swiss Mechatronic Art Society, SGMK. He has worked as guest faculty and mentor at various schools, Srishti Institute of Art, Design and Technology (IN), UCSB (USA) and in Switzerland, FHNW, ZhdK, HEAD, HSLU, ETHZ. In collaboration with Kapelica Gallery, he has started the BioTehna Lab in Ljubljana (2012 - 2013), an open platform for interdisciplinary and artistic research on life sciences. Currently, he is developing means to perform bio- and nanotechnology research and dissemination, Hackteria | Open Source Biological Art, in a DIY / DIWO fashion in kitchens, ateliers and in the Majority World. He is part of the Center for Alternative Coconut Research developing low-cost educational electronic hardware. He was the co-organizer of the different editions of HackteriaLab 2010 - 2017 Zürich, Romainmotier, Bangalore, Yogyakarta and Klöntal and collaborated on the organisation of the Gathering for Open Science Hardware, GOSH! 2016 and 2018, and the BioFabbing Convergence, 2017, in Geneva.

http://hackteria.org/wiki/Dusjagr

Maya Minder, Zürich (CH)

Maya Minder's (b. 1983, lives in Zürich) Gasthaus combines artistic, curatorial, and activist interests into communal culinary events at various locations. For the Klöntal Triennial, she designed the opening dinner and also offers a series of workshops, including a biohacking workshop and a fermentation workshop, over the course of the Triennial's duration. Fermentation repeatedly features as a central aspect of her work, not only literally but also as a metaphor for social ferment, agitation, and incitation to resistance. Minder opposes the structures of food industry by promoting local selforganization, ecological sustainability, and community. She resuscitates traditional food productions methods with a certain relish, saving them from otherwise being forgotten. Her interests span the fields of art, politics, and biohacking, and she often invites other protagonists from these and various other fields to participate in the process of communal exchange. Facilitating interdisciplinary, intercultural dialogue amongst the participants is one of the primary goals of her practice.

http://www.mayaminder.ch/

Urs Gaudenz (CH)

Urs Gaudenz is an engineer and interdisciplinary scholar working in Lucerne, Switzerland. He was born 1971 in Seattle USA. He got his master in science of Microtechnologoy from the Swiss Federal Institute of Technology, Lausanne. Subsequent to that he attended Post-Graduate programs in international business and innovation-management. In 2016 completed the course of study in the Principles and Applications of Synthetic Biology as directed by Georg Curch, Professor of Genetics at Harward Medical School. He is founder of GaudiLabs, a third space for third culture. He is a founding member and member of the board of Hackteria International Society. He is currently on the faculty of the Lucerne School for Applied Science and Arts. In his professional practice, Urs Gaudenz makes use of various forms of work and expression such as prototype development, open scientific research and collaborative workshops. He is combining his different backgrounds to explore new technological and cultural fields and his works often emerges out of the void in this intersection. Remarkable in his work is the wide span from speculative and futuristic to very functional and applied. He worked with and was inspired by Dr. Marc Dusseiller - dusjagr labs, the Swiss Mechatronic Art Society, the GynePunk, BioDesign for the Real World, Sci | Art NanoLab Summer Institute at UCLA, LifePatch. He was invited to give workshops or exhibit projects at renown institutions and festivals such as Ars Electronica - Projekt Genesis, ISEA - International Symposium on Electronic Art, DOCK18, space for media cultures of the world, Kapelica Gallery / BioTehna, Schloss Werdenberg, N/O/D/E festival, Medialab-Prado Madrid, CYNETART-Festival - Trans-Media-Akademie.

http://www.gaudi.ch/GaudiLabs/

International Hackteria Society

Company Information

Under the name "International Hackteria Society", is an association according to article 60ff of the Swiss Civil Code (ZGB) with seat in Zürich. The association aims to guarantee the organizational and financial processes of the project "Hackteria | Open Source Biological Art". It wants to further development and access to practical knowledge in artistic engagement with the lifesciences. It wants to create platforms for public discussions and invite international artists and scientists for critical and theoretical discourse. The association works as a non-profit organization to reach its aims.

Unter dem Namen «International Hackteria Society» besteht ein Verein im Sinne von Artikel 60 ff. ZGB mit Sitz in Zürich. Der Verein bezweckt die organisatorischen und finanziellen Abläufe des Projektes "Hackteria | Open Source Biological Art" zu garantieren. Er will Entwicklungen und den Zugang zu praktischem Wissen im Bereich der künstlerischen Auseinandersetzung mit den Lebenswissenschaften fördern. Er will Plattformen zur öffentlichen Diskussion schaffen und international Künstler und Wissenschaftler zu einem kritischen und theoretischen Diskurs auffordern. Der Verein arbeitet nicht-profitorientiert um seinen Zweck zu erfüllen.

Company Identification Number (UIDG):   CHE-192.885.318

http://hackteria.org/wiki/IHS

Swiss & International Partners

Zukunftslabor CreaLab, Hochschule Luzern, CH

https://blog.hslu.ch/crealab/

SGMK - Swiss Mechatronic Art Society, CH

https://mechatronicart.ch/

Hackuarium – open laboratory for DIY biology, Renens, CH

http://www.hackuarium.ch/

Utopiana, Geneva, CH

https://www.utopiana.ch/

Rethinking Science and Public Particpation, University of Geneva, CH

http://citizensciences.net/

Gesellschaft für mikroBIOMIK, DE

https://mikrobiomik.org/

TeZ's Optofonica Lab, Amsterdam, NL

http://tez.it/

Finish Bioart Society, FI

https://bioartsociety.fi/

Global Open Science Hardware, global

http://openhardware.science/

Karkhana – we design learning experiences, NP

http://www.karkhana.asia/

Dimensionplus TW

http://dimensionplus.co/

Lifepatch - Citizen Initiative in Art, Science and Technology, Yogyakarta, ID

http://lifepatch.org/

(Art)ScienceBLR @ Srishti School for Art, Design & Technology, Bangalore, IN

http://artscienceblr.org/

Selected Projects

Hackteria Labs 2010-2020

Hackteria Labs are concentrated gatherings of people working transdisciplinary who are interested in creative biological fields and any other areas which intrigue the critical interaction across art and science. They have been providing vessels which create international networks and potential collaboration to emerge and flourish. HackteriaLab's main focus always has been on the process of interaction between creative people, between professionals and amateurs, providing a stimulant for collaborative processes; for developing new ideas which connect and embrace the cultural diversities of the participants; and to address societal challenges through experiments with DIWO Culture, with material, technique, and nature through hands-on tinkering, curiosity driven research and never ending inquisitiveness.

HackteriaLab 2014 was held in April 2014, in Yogyakarta, Indonesia. A number of smaller events, workshops, residencies and exhibitions predated the main collaborative lab-phase. It was the fourth edition of an intensive two-week transdisciplinary collaboration amongst international and local artists, hackers, activists, scientists, and designers. HackteriaLab 2014 expanded on ideas and methodologies about BioArt, DIY biology, Appropriate Technology, ArtScience and BioHacking, developed during the previous versions of HackteriaLab 2011 - Romainmotier and HackteriaLab 2010 - Dock18/Zürich in Switzerland and HackteriaLab 2013 - Bangalore in India. Later followed by BioHackRetreat Klöntal in 2017 and ハクテリア 合宿 – Oki Wonder Lab in 2020.

Workshops, workshops, workshops…. Towards a truly transdisciplinary Workshopology

Our main activity over the years has definately been the development of new methodologies for doing workshops and the documentation of them. We have widely interacted with public audiences and learners through sometimes performative engagements, constructivist open-ended learning environments or step-by-step making sessions of DIY laboratory equipment.

Impressions from „Make-Your-Own CRISPR-Babies" at swissnex, San Francisco; and „Wormolution" at 1000 Ecologies, Geneva.

DIY Laboratory Instruments and Open Science Hardware

To start up an independent and open lab it is crucial to get affordable lab equipment (besides having an enthusiastic and open group of people). Most of the tools we use are do it yourself (DIY) and open source and are built from widely available and recycled parts found in consumer products such as DVD drives, webcams, hard disks and pc fans. Building the specific devices further helps to understand the basic principles behind and learn more about the technologies and methods used. The discussions among scientists and engineers in the process of rethinking the devices to make them more accessible are very fruitful and often lead to new and innovative designs.

A more advanced example of an open science hardware project is „OpenDrop", which is part of a bigger ecosystem around digital biology with the aim of making personal lab-automation accessible to more people. Being a community project grown out of the hackteria network activities and the DIYBio movement we have been building on trustful co-operation with all people interested in the project. We also welcomed collaboration with existing business initiatives and academic research projects. The project is developed in parallel on different aspects and disciplines. Technical developments are paralleled by biological application research and community management.

Co-Organisation of (Un-)Conferences

For various larger international events we have been collaborating with partners from research universities, businesses and other independant networks to co-organize gatherings and un-conferences. In 2017 we have co-initiated the „BioFabbing Convergence: Fabrications and Fabulations", together with the group „Rethinking Science and Public Participation" from University of Geneva, CERN's Citizen Cyberlab and Hackuarium, the regional and only biohackerspace in Switzerland. Our role to connect such partially academic and local events to our larger global network of activists, artists and independant researchers, and our experience in practically organizing and managing cultural events was very important to the success of our endeavours.
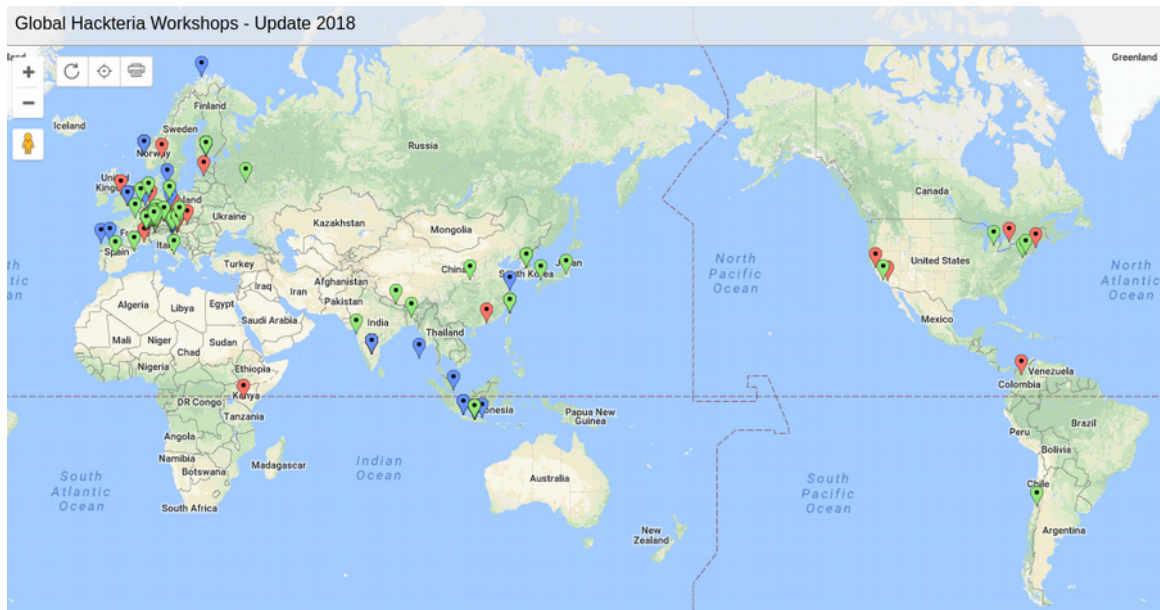

An even larger network has grown since our collaboration to initiate the first Gathering of Open Science Hardware, held in 2016 in Geneva, which brought together researchers, makers, educators and open science enthusiasts to share experiences and collaborate on writing a manifesto and roadmap making Open Science Hardware ubiquitous by 2025. We have been part of the team for the different editions to follow in Santiago de Chile 2017 and coorganized GOSH 2018 in Shenzhen, China, together with partners from Public Lab, University of Cambridge, Our-Sci, CERN Citizen Cyberlab and openFIESTA, Tsinghua University.

Appendix I: More than 150 Workshops... a global success story 2009 – 2019

See the interactive map online: http://batchgeo.com/map/bd9c05d9de1d9e204123e78c284d40c4

Global Hackteria Workshops - Update 2018

See a full list on our shared spreadsheet online

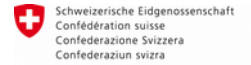|	A	B	C	D	E
1		**Hackteria Workshops**	**City**	**Country**	**Date**
2					
3		Humus sapiens Talk, 36C3, Chaos Communication Congress, Leipzig	Leipzig	Germany	2019-12-29
4		DIY Microscope Workshop – BAFU Kadertagung	Thun	Switzerland	2019-11-27
5		Talk - International Conference on Science & Technology ODA	Seoul	South Korea	2019-11-29
6		WHAT IS/NOT WORKING */ Sesi konversasi mengenal kerja bersama	Yogyakarta	Indonesia	2019-10-23
7		"Wormolution" Hackteria Temoorary Autonomous Laboratory	Geneva	Switzerland	2019-09-12
8		BioElectronics and BioMaterials @ Institut Seni Indonesia	Yogyakarta	Indonesia	2019-08-07
9		Humus Sapiens - Biotopia	München	Germany	2019-05-26
10		BadLab-DIYordye	Bern	Switzerland	2019-05-24
11		Scoby, Shit and Humus, Mo Museum	Vilnius	Lithuania	2019-05-04
12		Super-natural imaging	Luzern	Switzerland	2019-04-05
13		Biopunk: Feed Food Fermentation	Zurich	Switzerland	2019-03-31
14		Humus Sapiens at Seed and Soil Conference Centre Culturel Swiss	Paris	France	2019-03-08
15		Make Your Own CRISPR-Babies	San Francisco	USA	2019-02-22
16		Humus Sapiens at Marie Curie Association Conference	Wien	Austria	2019-02-21
17		Scoby Shit and Humus, TopLab Berlin	Berlin	Germany	2019-01-18
18		The Odin Biohack 101 Class @ gasigaso kitchen	Zurich	Switzerland	2019-01-09
19		reSeq meeting - kickoff for wemakeit	Luzern	Switzerland	2019-01-08
20	2019				
21		"the first Open BioLab of Switzerland" setting up at Fablab HSLU	Luzern	Switzerland	2018-12-18
22		Chrisper-Chäsli Workshop @ Food Culture Days	Vevey	Switzerland	2018-11-17
23		Utopiana mini Residency	Geneva	Switzerland	2018-11-11
24		Off Ground Fly High - Playaround 10	Taipei	Taiwan	2018-10-21
25		Humus Sapiens - Zentrum für Umwelt und Kultur (Benediktbeuren)	Benediktbeuren	Germany	2018-10-16
26		GOSH Public day @ X-Factory, with Exhibition	Shenzhen	China	2018-10-12
27		GOSH 2018 - Shenzhen	Shenzhen	China	2018-10-10
28		HUMUS (sapiens) - TOP project space	Berlin	Germany	2018-10-07
29		Humus Sapiens on Tour - Wagenhalle	Stuttgart	Germany	2018-09-26
30		Humus Sapiens on Tour - PlastiTwist	Luzern	Switzerland	2018-09-23
31		Humus Sapiens on Tour - FieldNotes	Kilpisjärvi	Finland	2018-09-10
32		UGM Workshop, Open Science Hardware and DIY hacking	Yogyakarta	Indonesia	2018-08-10
33		Good Goferment	Yogyakarta	Indonesia	2018-07-27

Appendix II: Fundings received since 2009

Swiss Funding

International Funding

Crowdfunding

Appendix III: Media and Press Selection

Press Coverage Overview

See full press coverage on the Hackteria website

Bastler, Bakterien und Beerensaft, *Sonntagszeitung 1. Oktober 2017, Anke Fossgreen*

Download full article

Wer als Hobby mit Bakterien oder DNA hantieren möchte, benötigt eine Grundausstattung. Freizeitforscher bauen sich ihre Laborgeräte selber, bestellen ausrangierte Versionen über Ebay oder improvisieren. Beispielsweise kann ein Dampfkochtopf zum Sterilisieren verwendet werden oder ein umgebauter Reiskocher. Ein günstiges Mikroskop lässt sich aus einer Webcam basteln. Ein einfaches Experiment ist, die eigene DNA aus der Mundschleimhaut zu extrahieren. Man benötigt: Spucke, Spülmittel, Kontaktlinsenreiniger, Salz und hochprozentigen Rum. Wer hingegen Bakterien verändern möchte, braucht molekularbiologisches Zubehör, etwa Enzyme, die DNA zerschneiden oder eventuell eigens hergestellte Gensequenzen, die Firmen auf Bestellung zusammensetzen. Wichtig ist, dass Mensch, Tier und Umwelt nicht durch das Experiment gefährdet werden, eine Anforderung von Gentechnik- und Umweltschutzgesetz. Wer seine Versuche und das Heimlabor bei der Kontaktstelle Biotechnologie des Bundes anmeldet, kann legal loslegen. Tipps und Anleitungen liefern die Biohacker.

Die Entdeckung der Amateure, *Neue Züricher Zeitung NZZ, 4. December 2015, by Angelika Jacobs*

Download full article

Elfenbeinturm war gestern: Die Wissenschaft öffnet sich zunehmend der Bevölkerung und lädt Interessierte zum Mitforschen ein. Ein Statusverlust für Berufsforscher – oder eine Chance auf eine demokratischere Wissenschaft?

Auch Marc Dusseiller benutzt nicht gern den Begriff «Bürgerwissenschaft». «Auch jeder, der an einer Hochschule arbeitet, ist ein Bürger.» Lieber spricht er von «unabhängiger Forschung». Der ausgebildete Nanotechnologe lehrt zwar noch an Hochschulen, forscht aber nur noch – eben: unabhängig. Für das Netzwerk Hackteria reist er um die Welt und bietet Do-it-yourself Wissenschafts-Workshops an, in denen er mit den Teilnehmern Laborgeräte mit einfachsten Mitteln baut. Einer seiner Klassiker: ein Mikroskop aus einer Webcam basteln. Durch solche Tüfteleien wolle er die Wissenschaft und ihre Geräte entmystifizieren, sagt Dusseiller. «Es herrscht dieses generelle Denken, Wissenschaft sei etwas, das nicht jeder könne.» Dieses Denken sei auch in den letzten Jahrzehnten von den Hochschulen und Medien gefördert worden. In seinen Workshops möchte er es durchbrechen und Amateuren einen Einstieg in die Forschung ermöglichen.

Die Frage bleibt, ob dabei eine Hochschule beteiligt sein muss. Dass auch abseits der Universitäten erfolgreiche Projekte entstehen können, zeigen der «Christmas Bird Count» und andere Unternehmungen. Eine wahrhaft demokratische Forschung muss sich letztlich wohl auch von den Hochschulen lösen.

Die Forscherpiraten kommen ins Museum, *Schaffhauser Nachrichten, 11. June 2014, Saskia Baumgartner*

Bei Hackteria vermischt sich Biologie mit Kunst. Am nächsten Wochenende geben beteiligte Forscher und Kreative im Museum zu Allerheiligen einen Einblick darin.

Interdisziplinärer Ansatz

Aber was wollen die Hackteria-Organisatoren nun erreichen – ein modernes Biologie-Projekt schaffen oder Kunst machen? «Wir wollen erst einmal, dass Menschen aufhören, in solchen Boxen zu denken», sagt Dusseiller. «Wir machen nicht nur Kunst, und wir machen nicht nur Wissenschaft, wir wollen Grenzen aufbrechen.» Interdisziplinarität ist das Stichwort.

Lokale Themen

Gerne werden zu den Veranstaltungen auch lokale Künstler und Wissenschaftler geladen, und man setzt sich mit den Themen vor Ort auseinander. Beim HackteriaLab in Indonesien etwa waren die dortige Wasserverschmutzung und der Vulkanismus Thema – in der Nähe Yogyakartas gibt es mehrere aktive Vulkane, erst im Februar hat wieder eine Aschewolke die Stadt überzogen. Zumindest der Randen wird bei der Hackteria-Veranstaltung in Schaffhausen auch Thema sein. Dieser soll bei einem Klangspaziergang – einer akustischen Entdeckungsreise – erkundet werden.

Hackteria: An example of neomodern activism. *Leonardo Electronic Almanac, Vol 20.1, 2014, Boris Magrini*

http://ojs.gold.ac.uk/index.php/lea/article/view/11

As a platform for knowledge sharing and artistic exploration, Hackteria constitutes a network of artists and researchers that merge the use of biotechnologies with hacking and do-it-yourself strategies. Its process-oriented and performative approaches, opposing to the materialistic imperatives of the art market, lean to the tradition of political art. In the present paper, I am arguing that Hackteria embodies what could be considered a neomodern activism, other recent examples of which are emerging within the new media art field. Instead of rejecting new controversial technologies, they propose a vision of a society that is moved forward by a more democratic use and discussion of these technologies. The activities of Hackteria are examined through the presentation of a bio-lab created in Ljubljana.
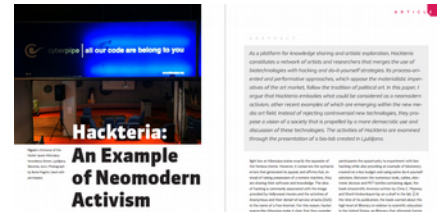
The events organized by Hackteria are rooted in a long tradition of media art, as well as process-oriented and performative approaches. Performative art is not equivalent to process-oriented art; as Andreas Broeckmann correctly pointed out, "it only makes sense to speak of process-orientation in cases where the evolving process itself is a main factor of the aesthetic experience of the work." [4] Nonetheless, neither performative nor process-oriented art focus on the creation of a finite product, a distinctive trait of the activities run by Hackteria. Furthermore, the BioTehna project, for example, share both performative, interactive and process-oriented qualities, for it is not the lab as such that is meaningful to the artistic intent of the group but rather the process involved in building and running it.

Innovation regimes based on collaborative and global tinkering: Synthetic biology and nanotechnology in the hackerspaces, *Technology in Society, October 2013, Denisa Kera*

http://www.sciencedirect.com/science/article/pii/S0160791X13000638

Typically nanotechnology and synthetic biology are discussed in terms of novel life forms and materials created in laboratories, or by novel convergences of technologies (ICTs and biological protocols) and science paradigms (engineering and biology) they initiated. Equally inspiring is their ability to generate novel institutions and global communities around emergent sciences, which radicalize the forms of public engagement and ethical deliberation. We are starting to witness alternative (iGEM competitions) and almost underground R&D engagements with Synthetic Biology (DIYbio movement), which inspired the emerging bottom-up involvements in nanotechnologies in projects, such as the NanoSmanoLab in Slovenia. These bottom-up involvements use tinkering and design as models for both research and public engagement. They democratize science and initiate a type of grassroots "science diplomacy", supporting research in developing countries. We will discuss several recent examples, which demonstrate these novel networks ("Gene gun" project by Rüdiger Trojok from the Copenhagen based hackerspace, Labitat.dk, the "Bioluminescence Project" by Patrik D'haeseleer from Biocurious biotech hackerspace in Sunnyvale, CA, and the "Biodesign for the real world" project by members of the Hackteria.org). They all use design prototypes to enable collaborative and global tinkering, in which science and community are brought together in open biology laboratories and DIYbio hackerspaces, such as Hackteria.org or Biocurious. In these projects research protocols encompass broader innovative, social and ethical norms. Hackerspaces represent a unique opportunity for a more inclusive, experimental, and participatory policy that supports both public and global involvements in emergent scientific fields.

The Art of Open and Free Science, *MCD #68, 2012, Ed. A. Delfanti, Interview S. Tocchetti*

https://www.hackteria.org/media/interview-in-mcd68/

Could you explain what is Open Source Biological Art and how it relates to DIY biology?

Whether it is a wiki or a workshop or both doesn't really matter, what is essential is to enable people to collaborate and shaer knowle edge and instructions. Open Source Biological Art enables people to perform complex scientific protocols without the support of an official institution. We believe that it is important to enable more people to feel confident in working with living systems in order for creative and new ideas to emerge. When applied to science and art, it can create a new type of public participation and understanding of both domains.

What is your view on the future of citizen science?

My hope is that if more people are making things with their hands and have this direct and everyday experience with scientific protocols, we can demystify science and open the whole decision making process to more people and opinions. I think this is the future society, where I want to live, a place where tinkerers and lay people find new and unexpected uses and functions of technologies and scientific knowledge, where they hack it and adapt it to their dreams and lives and don't wait for some big corporation or government to decide what is good or safe for them.