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festival for elektronisk kunst og fri teknologi
Strandgaten 223, 5004 Bergen,Norway
+47 90665018 info@piksel.no www.piksel.no

PIKSEL-DNA Seminar
A seminar dealing with DIY Biology and art.

Lydgalleriet, Bergen Norway
16th-20th November 2015

"As we become increasingly part of "living technology" and increasingly aware of its sociocultural implications, diversification of approaches to this polysemic domain to open up broader, transdisciplinary dialogue is imperative." 1

Prof Sally-Jane Norman, University of Sussex

Piksel is an annual festival for artists and developers working with free and open source software, hardware and art. The 12th edition of the Piksel Festival be\O/art at 2014 was devoted to show a series of artistic works, performances and workshops dealing with DIY BioArt. The genre involves creative tinkering with organic tissue, life processes, live organisms and bacteria.

At this year edition Piksel wants to get deeper into the subject hosting the first Bioart Seminar in Bergen. Guest artists, curators and researchers will share their knowledge and experiences through a three days of presentations, workshops and exhibitions.

Parallel activities Bio art workshops and exhibition.
As part of the Piksel Festival 13th edition, a series of DIY bio-art workshops and an exhibition will happen: "Solar Kinetic Sculpture" by Egil Paulsen, "Pikslo_deep_diving / underwater interception of the nordic sea", by Robertina Šebjanič, "R language, a powerfull tool for environmental data analysis" by Christian Mong and "Bio-Vortex (Bio-illuminating the vortex)" by Ben Freeth.

The exhibition will include the works from more than 16 artists.

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SEMINAR THEME. DIY Biology and art.

Biotechnological research is no longer limited to specialist laboratories: a growing community of biologists, amateur enthusiasts and technophiles is experimenting in kitchens, workshops and DIY laboratories. Some people view the democratisation of biotechnology as a threat, others as an opportunity to gain a better understanding of complex scientific interrelationships within society.[1]

All of us have witnessed the media-hype generated by such biotech issues as the human genome, human cloning, and debates over the use of embryonic stem cells. But what often goes unmentioned is that the real generator of radical change in fields like biotech is not genome mapping, cloning, or genetic engineering – it is"bioinformatics." Put simply, bioinformatics is a growing discipline which straddles computer science and molecular biology. Currently,bioinformatics mostly means the use of computer technology to aid in the study of life (that is, new tools for molecular genetics and biomedicine).

This is worth noting because it means that any "alternative" approaches in bioinformatics and uses of biological data, will have to confront issues such as access to information, access to tools, development of skill sets, distribution of knowledge, and the challenges of transdisciplinary work. The main question which is put forth is: How does an individual or group acquire the knowledge, skills, resources, and tools needed to work in a non-orthodox manner in biotech? Not surprisingly, artists have been among the first to explore such questions. But the results are often less than satisfactory, even when art-science collaboration is involved; too often the resulting works operate only at the symbolic or representational level. However, such art-science projects have been instrumental in raising critical and political issues with regard to biotech,suggesting that a new type of serious research can co-exist alongside a critical and political consciousness.

In the same way that open source has contributed to a DIY computer culture and various types of hacker ethics, could the design of innovative bioinformatics software apps, combined with public access to the genome, spawn a DIY biotechculture? At the furthest reaches of the extreme, how might this "open source DNA" movement affect areas such as media art, education, body performance, regenerative medicine, body art, and wet computing?[2]

To deep into these ethical and societal aspects of biotechnology together with the ethics of contemporary art, we invite Nora Sorensen, expert lecturer, PhD thesis "Fringe Interlocutors with Biotechnology, on artists' and other laypersons' use of biotechnologies"; Dr. Marc Duseiller, Doctor of Sciences "Micro- and Nanoengineering the Environment of Cells in Culture", ETH Zürich, Switzerland,

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1 Biotechnology for all, SATW INFO 2/15, August 2015
2 Open Source DNA? Eugene Thacker

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Co-founder of Hackteria | Open Source Biological Art and one of the known exponents of DIY biology; Hege Tapio, director and curator of Article Biennale devoted to the the intersection Art & Science, with a strong focus on art that makes use of and/or comments DNA and NANO technology; Rasa and Raitis Smite, editors of the recent edited books TECHNO-ECOLOGIES II. Media Art Histories (Acoustic Space No. 12) and TALK TO ME. Exploring human-plant communication; Robertina Šebjanič, artist whose research focus towards the field of Living systems (bio-art) and interactive ambient responsive immersive environments, and Christian E. Mong, an ecological advisor for urban development, performs landscape analysis, mapping biological values and assists as approved ecologist in environmental certification (BREEAM NOR), specialised in Bergen area.
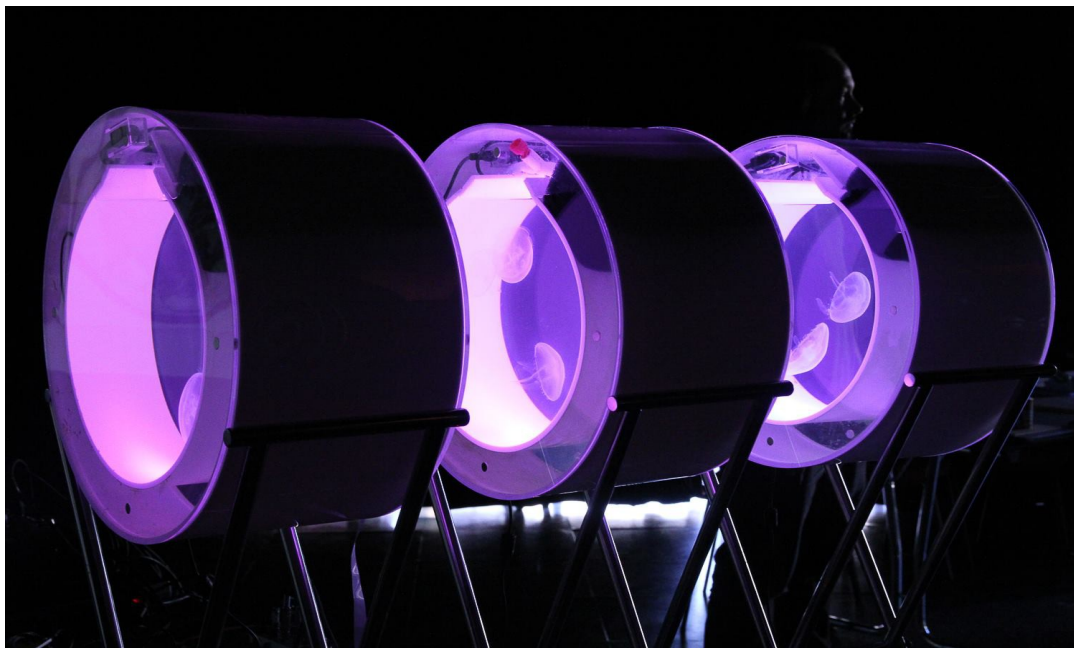
WORKSHOPS

WORKSHOP 1.
Gossip lab – tweeting on a biochip platform
workshop conducted by Mirela Alistar and Rüdiger Trojok (DK)
http://www.bioflux.eu/about.html

Concept
It is not a secret that in synthetic biology laboratories hours of manual work are considered a compulsory part of the experiment. For a simple routine experiment, each of the mentioned tasks is performed at least 10 times. Past decade, a big effort has been done to produce machines (e.g., pipetting robots) that would automate some of the tasks in the lab. However, these machines were developed under the industrial mindset to maximize the throughput of a single task. Thus, these machines are of large size, task-specific, difficult to use (they usually come

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with dedicated drivers and software) and most importantly, extremely expensive.

The main challenge in synthetic biology is implementing an automated and integrated workflow, which minimizes the time to result and reduces significantly the likelihood of human error. This challenge can be successfully addressed by integrating microfluidics into the synthetic biology workflow, i.e., by researching and developing the so called lab-on-a-chip devices. The bigger vision of our team is to build a DIY cheap open-source lab-on-a-chip platform that consists of a physical device, wetware applications, a community of users and the software suite the glues everything together. The physical device will be capable of running complex bio-protocols with a specific target in synthetic biology.
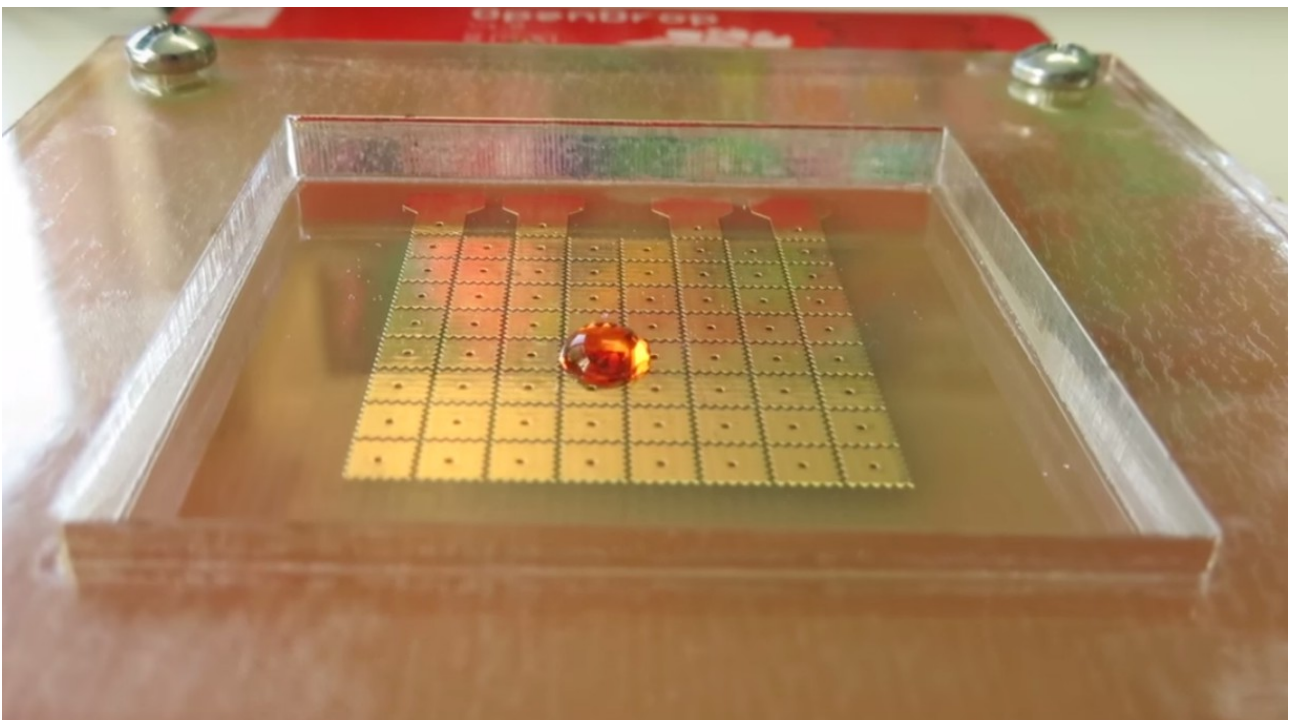
Gossip lab @PikselFest is dedicated to all the lab researchers worldwide. We allow them to gossip, complain and pour their heart out. And we are here to listen to them. However, beware: this might be the last time for such complaints, because we are building a biochip that will integrate and automate all the procedures in the lab. Gossip lab will teach you how to design a biochip. All the designs will be assembled together in a live tweeter board, where people will be able to gossip about anything.

Practical implementation
Miriam and Rüdiger will run a workshop teaching the audience how to do themselves a customised version of a biochip. The participants will learn how to operate the biochip and manipulate the droplets.

First, we will introduce the projects, the concepts and the design constraints.

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Among others, we will introduce the fluksel concept: a droplet used as a pixel. Then the participants will design the electrodes using a dedicated computer software (i.e., graphic editor) or on a paper using a conductive-ink pen. The design of the electrodes will be printed and etched on a PCB. The resulted PCB will be plugged in to the rest of the circuit.
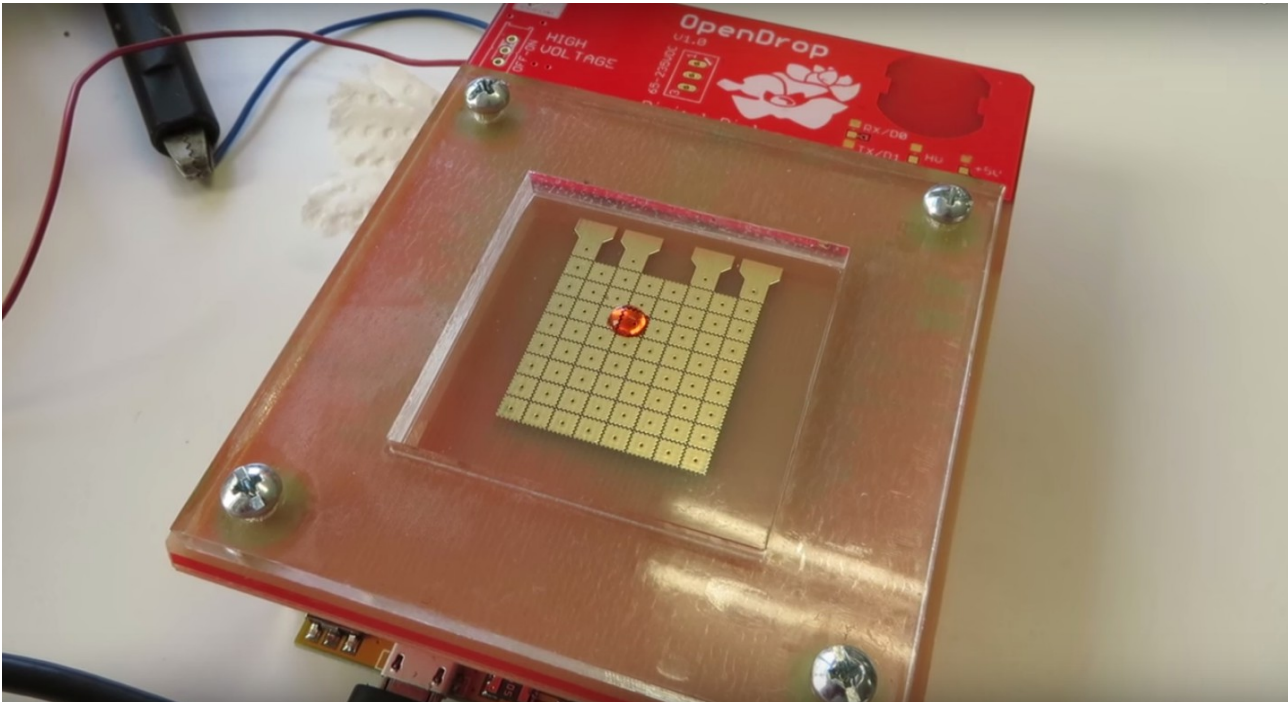
The next step is controlling the droplets on the newly designed PCB. The control is done through Arduino, so the participants can write an Arduino code to control the droplets on their own biochip. For beginners and non-Arduino users, we will provide a much simpler user interface to control the droplets.

Gossip lab – exhibition
The biochips produced during the workshop will be installed in a visible location, where festival participants can randomly pop-in, change the code and display messages using droplets. A live-message boards using fluksels (droplets as pixels).

WORKSHOP 2.
Pikslo_deep_diving / underwater interception of the Nordic sea
conducted by Robertina Šebjanič (SI), Kat Austen (UK/D), Slavko Glamočanin(SI), Gjino Šutić (CRO) and Piksel team (main organiser) and the Marine Institute Bergen

Concept
World seas and oceans are presenting more than 70% of surface of Earth. 97% of

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it is salt water, 2% is fresh water in the form of ice and only the remaining 1% is drinking water, which is distributed around the planet very unevenly.

The exploration of any ecosystem requires detailed study and observation. The ocean is the complex, challenging, and harsh environment on Earth and accessing it requires specially designed tools and technology. It has only been within the last 50 years that technology has advanced to the point that we can examine the ocean in a systematic, scientific, and non invasive way. Our ability to observe the ocean environment and its resident creatures has finally caught up with our imaginations and helping us to understand it also in the ways that we did not imagine them before.

"Already back at the renaissance 1490 Leonardo da Vinci observed how the sound of ships travelled long distances underwater. Seafaring, while not in its infancy, was a "life driven" technology; the power of wind and human muscle generated the only anthropogenic noises in the sea. Over the next 400 years, ocean noise began increasing exponentially" * (from the Soundscape The Journal of Acoustic Ecology) and it started to overtake also the sound scape environment of the animals.

The workshop / project would encourage an inter-relationship between sound, nature, and society, as a starting point for the rethinking of the possible development of nicer sonic environments for the animals living in the world's oceans and sea's. The underwater sound pollution is the reality of recent development and industrialization reflecting on the sea. Especially the upper level of the seas - where there is most of the living in the seas and independent by the level of the sonic pollution in the sea. We would also try to research the deep sea level to understand what is happening there.

A lot of knowledge regarding the seas in Norway we will also use are

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https://www.nodc.noaa.gov/OC5/nordic-seas/ and in collaboration with the Marine Institute Bergen.

Practical implementation of the workshop

During the 5 day work-intensive interdisciplinary research, the four main mentors and collaborators would open the process of the exploration of the context of DIY biology, DIY chemistry and sound. A DIY laboratory in the context of the Piksel festival would be main environment of the development of the workshop. We will spend time out on the field trips to the fjords and surroundings in Bergen and also closely collaborate with the Marine Institute in Bergen to collect needed data. In the DIY laboratory we will work with the material we will gather at the field trips.

WORKSHOP 3.
Solar kinetic sculptures conducted by
conducted by Egil Paulsen (Oslo, Norway)

Nature gives way to speciation depending on the building blocks it can offer. Only by the decades, enormous amounts of plastic, silicon and metals has been dug up, refined, and put into circulation. Kinetic sculptures: solar cells, dc motors, melted plastic, infrared heating lamps, table.

Egil Paulsen works with installation, computer art, and video. He has a Bachelor degree from Bergen National Academy of the Arts where he was enrolled under Department of Fine Art. His works include Solar Sculptures, Ultrasonic Vision, WiFi-Shamanism, and a newly completed face tracking installation done for a big mask exhibition at Rubin Museum of Art in NY.

Http://egilpaulsen.com

WORKSHOP 4.
"R language, a powerfull tool for environmental data analysis" by Christian Mong

It is important to categorize landscapes in a meaningful way compared to annex - that way you landscape types against one another. What can we build and how we should not build? Which any buffer zones, we must plan in? The most valuable landscapes may have different qualities and be vulnerable to various forms of

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influence, and that you emphasize is often dependent on the local context and the type of annex which is responsible. Landscapes have different value for agriculture; quality of soil, site quality in forests and grazing conditions in outlying areas are different valuations can be used on cultural landscapes. Landscapes can also be assessed by how much carbon stored in organic meterials as standing forests and soils or peat lands.
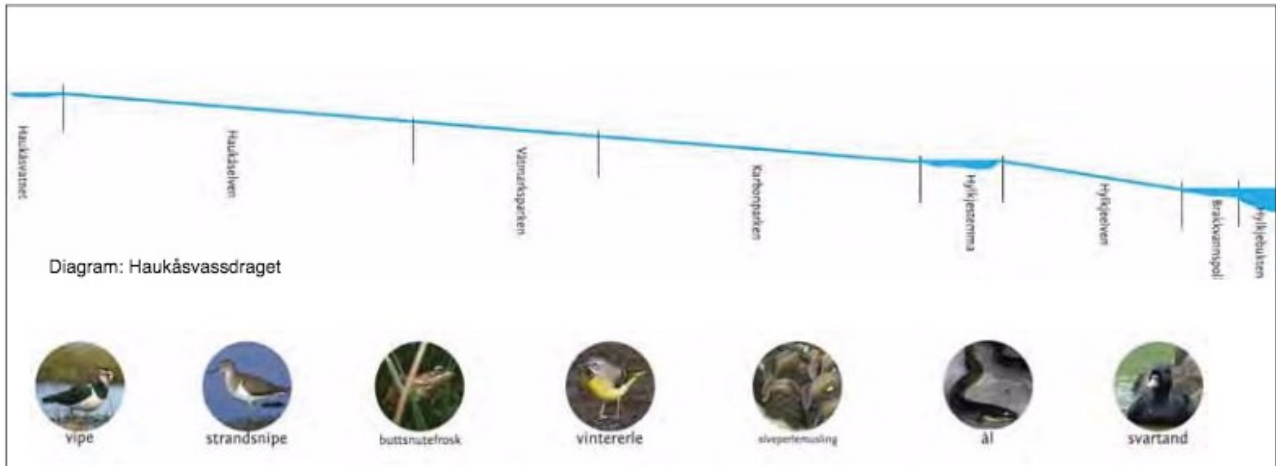
Biologists often use a section of nature as it is professionally consensus and sharing all landscapes in Norway into vegetation types based on prevailing plant species. Directorate for Nature Management has taken this vegetation type section and picked out those of them who are vulnerable. These are called habitats.

The purpose of this course is to teach how the R statistical environment can be applied to biological data analysis. After this course, the students will be able to use R for analyzing diverse data types from very different biological experiments. The topics will introduce the theoretical aspects of the introduced methodologies, and after that, assignments and activities will provide opportunities to explore the practical ways of performing the analyses

You will learn how to use R for performing statistical analysis relevant for molecular biologists. You will learn how to perform simple sequence analysis with R. You will

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get an essential overview of biological network analysis and the highly popular enrichment analysis of gene lists.

WORKSHOP 5.
Bio-VortexBio-Illuminating the Vortex
conducted by Ben Freeth

"Some things, though they are not in their nature fire, nor any species of fire, yet seem to produce light" - Aristotle 4th Century BCE[1]
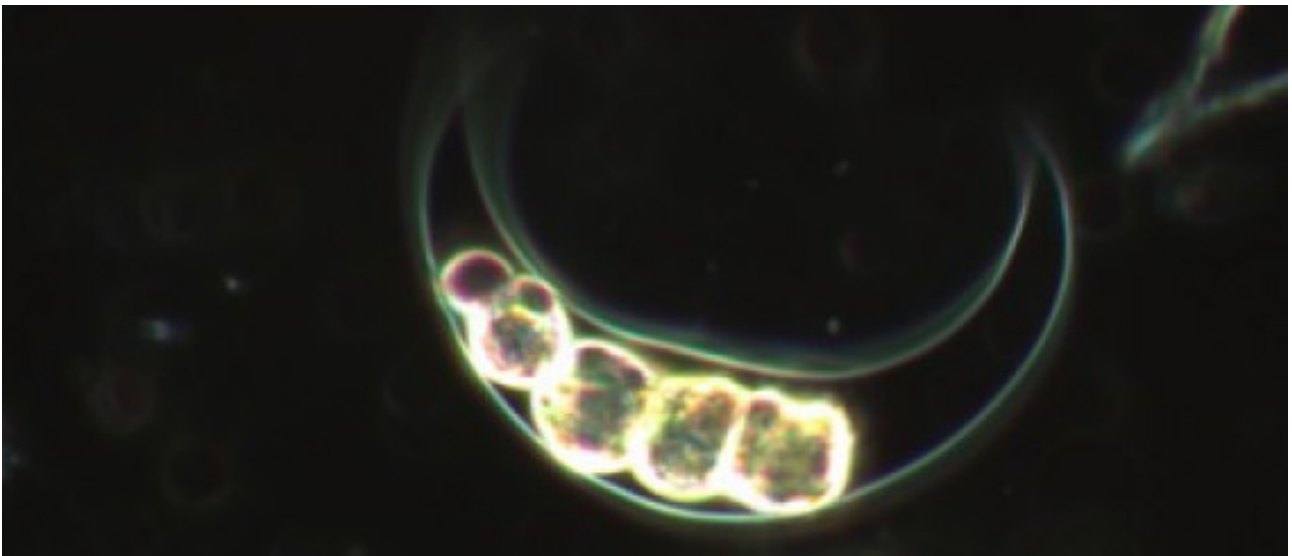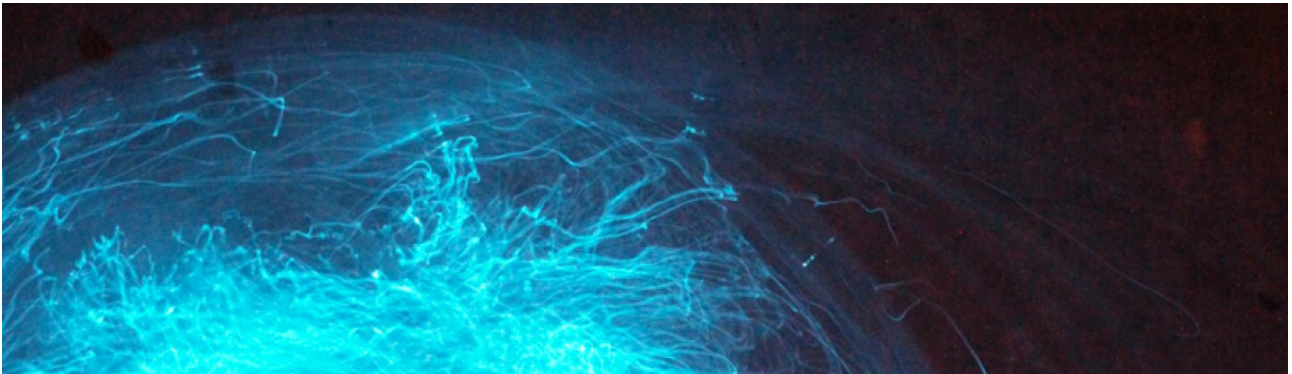

// Overview
Bio-Vortex (Bio-Illuminating the Vortex) envi-sions a hybrid musical instrument, part living part electromechanical. this assemblage works with the natural metabolism of bioluminescent algae as a technical system interfaced with open source / diy lab equipment (magnetic stirrers), light detecting and sound generating electronics, to rewrite the future of the musical instrument. Human and non-human collaborations span the history of technological development (for example, Russian "Space Dogs" like Belka and Strelka). What does it mean to collaborate with algae when per-forming music? Bioluminescent algae fatigue - what happens when a musical instrument gets "tired"? Additional to the sunlight needed to power them, algae require dietry supplements: What connection develops between instrument and player when you have to feed / nuture your instrument? What does it mean for sustainable practice when your instru-ment draws its own power from the sun?[2]

// Background – Bioluminescence
Bioluminescence is the chemical reaction of light emitted by a living organism and is mostly ob-served in aquatic environments. Bioluminescence has been independently evolving on a continous basis; almost 30 independent systems exist. How-ever, they all involve a chemical exergonic reaction (release of energy)

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with oxygen.3

// Background – Vortex

In fluid dynamics, a vortex is a region, in a fluid medium, in which the flow is mostly rotating on an axis line, the vortical flow that occurs either on a straight-axis or a curved axis. Much of the bioluminescence observed on the ocean surface is from the unicelular marine algae of dinoflagellates (From the Greek dinos "whirling", and Latin "flagellum", whip) . they are protists that live mainly in seawater, obtain energy from sun-light during the day and at night produce flashes of bright blue light in response to movement within the water. Each flask of algae contains tens of thou-sands of cells which bioluminesce in response to mechanical stimuli from the magnetic stirrer.

// Musical Instrument

Description: A basic version takes place in a darkened room, a magnetic stirrer with speed control is used to generate a vortex within a !ask containing a liquid culture of bio-luminescent algae. "e vortex within the fiask flashes bright blue sparks of light. through curiosity driven exploration a person with a hand-held "light" detecting and sonifying device explores the bioluminescent vortex to create musical com-positions. Controlling the rate of "magetic stir" allows control of when the instrument plays. "e algae generate their energy from sunlight. the in-strument uses a solar panel to charge batteries pow-ering the stirrer motor and other electronics. "is is a truely sustainable device.8 // Bio-Vortex Version 2.0A more complicated version encapsulates the com-ponents in a single device. It is a tube

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with the mag-netic stirrer built into the base. A reservoir for the algae. A cap contains the electronics for generating sound. An array of LDR's on the side of the !ask convert bioluminescence to sound. A solar planel recharges batteries for the electromechanical parts.9

// Light Sonification
Bioluminescence, in efect, voltage controls all of these electronic components to produce sound. the design is easy to build e.g. by participants in a taught workshop.

INVITED LECTURES BIOS

Marc Dusseiller (CH)
Dr. Marc R. Dusseiller is a transdisciplinary scholar, lecturer for micro- and nanotechnology, cultural facilitator and artist. He works in an integral way to combine science, art and education. 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 formerpresident (2008-12) of the Swiss Mechatronic Art Society, SGMK. 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) ina DIY fashion in kitchens, ateliers and in developing countries. He was the co-organizer of the different editions of HackteriaLab2010 - 2014 Zürich, Romainmotier, Bangalore and Yogyakarta.

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Mirela Alistar (DK): She has received her PhD in computer engineering from the Technical University of Denmark in 2014. Since 2010, she has been working on developing Computer-Aided Design tools for digital microfluidic biochips. Her main research interests are in the area of system-level design of embedded systems, with a special focus on digital microfluidics for biomedical applications. As part of Biologigaragen (the biohacking space in Copenhagen), Miriam is supporting open-access/open-source research and she has organized citizen-science events, where she disseminates to the public with the aim of involving them into creating more knowledge.
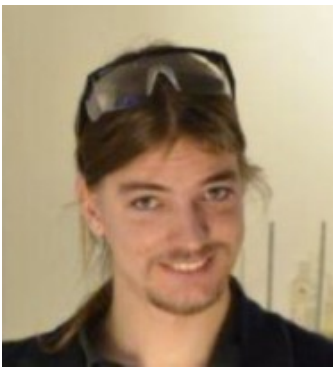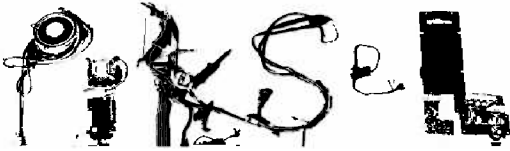

Rüdiger Trojok (DK): Diplom Biologist, studied systems and synthetic biology at the Universities of Potsdam, Copenhagen (DTU) and Freiburg. During his thesis he invented a novel contraceptive method based on genetically altered lactic acid bacteria. He worked as a freelance consultant for the office for Technology Assessment by the German Parliament on biohacking and synthetic biology. Since 2014 he works for the Institute for Technology Assessment and Systems Analysis at the Karlsruhe Institute for Technology on the EU program Synenergene. He is currently establishing a citizen science biolab in Berlin, and is supporting open-source biotechnology projects related to public life, politics and the arts.

Hege Tapio (NO)
Hege Tapio is an artist, curator, art consultant and one of the founders of i/o/lab. Last year she was incharge of curating the Article biennal. Tapio has for years worked with a special interest in the field bioart. She helped to organize the first Nordic Master Class in bioart in cooperation with SymbioticA and has produced the

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first public electronic art installations in Stavanger, consisting of a handmade LED matrix.

Robertina Šebjanič (SI)
She is member of Hackteria Network, Ljudmila, UR Institute and Theremidi orchestra. Her art – research focus is since several years oriented towards the project developed in the field of Living systems (bio-art), AV performances, noise/sound art, installations and interactive ambiental responsive immersive environments.

Christian Mong (NO) - http://www.økolog.no
Christian E. Mong is an ecological advisor for urban development, from overarching urban and landscape planning right down to planning and design of green space and gardens. I can also perform landscape analysis, mapping biological values and assist as approved ecologist in environmental certification (BREEAM NOR).

Nora S. Vaage (NO)
Nora S. Vaage is an art historian, art critic and inter-disciplinary researcher at the

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Centre for the Study of the Sciences and the Humanities at the University of Bergen, Norway. She is working on her PhD dissertation on artists who make living artworks using the tools of biotechnology. Nora is a lecturer in art theory and the ethics of images, and has held seminars on quality, visual culture and visual rhetoric at the University of Bergen.

Rasa Smite (LV)
Rasa Smite is the co-founder of Riga internet radio OZONE (1997). She is editor of the publication on new media culture and net audio - The Acoustic.Space (since 1998) and co-founder of the international net.broadcasters network and mailing list XCHANGE (1997), which received an Award of Distinction in the PRIX Ars Electronica '98, Linz, Austria.

Rasa Smite is one of initiators and organiser of the Acoustic Space Lab - international symposium on sound art, radio waves and satellite technologies, which took place in Ventspils International Radio Astronomy Center in Irbene, Latvia. She is involved in various European media culture initiatives. E-LAB is a co-founder of the ECB - European Cultural Backbone, the coalition of European media art centres. Since 1999 she is also actively involved in developing cultural exchange and networks in the field of new media culture within the Baltic Sea and North-East European regions. She is co-initiator and co-founder of the Baltic/Nordic media art network - NICE [Network Interface for Cultural Exchange], co-ordinator of the Baltic Sea Media Space Workshop during the Temporary Media Lab project, Kiasma Museum, Helsinki (1999), [NICE] Network meeting in Riga (2000) and organiser of the [NICE] Training programme in New Media Cultural Management in Riga (2001).

Rasa Smite (together with Raitis Smits and Jaanis Garancs) are the initiators and founders of the Electronic arts and media centre E-LAB (1996) and The Center for New Media Culture RIXC (2000) in Riga. E-LAB (now RIXC) is the organiser of the annual international new media culture festivals "Art+Communication" in Riga (since 1996).

Raitis Smits (LV)
Raitis Smits is artist, curator and innovator in science and emerging media technologies and founder of RIXC - a Riga based artist collective and center for new media culture (http://rixc.org), curator of Art+Communication festivals, and co-editor of Acoustic Space - a peer-reviewed journal.

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Raitis Smits also lecture at universities, conferences and festivals in Latvia and Europe on contemporary media art theories and practices. Raitis Smits is an Assistant Professor at the Latvian Academy of Arts, and he will defend his PhD thesis on "New Media Art. The problematics of preservation and representation" in March 2015.

Ben Freeth (UK)
Ben Freeth is an artist, musician,researcher and educator based in the North East of England who works, exhibits, and publishes internationally. His current practice uses various types of data (both real time and logged including location, environmental, and biological) as a medium for creative expression. He works with themes including response to place and internal physical state within the context of the city, response to archival collections, collective experience and data materialities.

Through the application of curiosity driven exploration and digital tools, including custom electronics, sensors, actuators, microcontrollers, data loggers, custom software, lidar scanners and 3D printers, these responses take the form of data sonifications, prototypes, workshops, installations, instruments, wearables, networked musical performances and 3D visualisations.

Ben teaches physical computing for creative application on the Creative Practice Masters Course at Newcastle University.
His research focuses on workshop based explorations of data, digital technological production, philosophical investigations of technology, an aesthetic contextualization of audience and collective experience, historical accounts of art and technology, and critical reflections on contemporary digital art. Recent work has been published at Designing Interactive Systems 2014, Vancouver, Canada.

He also runs Unpitch at Culture Lab, Newcastle University a series of on going events showcasing experimental music and sound art involving custom software and electronics.

Past work has included creating digital musical instruments for Microsoft Research Cambridge with their open source microcontroller platform .NET Gadgeteer, working as a Research Associate with Digital Interaction, Computing Science,

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Newcastle University, and producing digital art commissions for Durham Brass Festival, Newcastle Council Arts Development Team and Digital City, Middlesbrough.