MAKING ARTISTIC TECHNOLOGY

riat.ac.at

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Content_

Introduction

Hacking is not a new practice, as long as people had to make do, had to get things done, had to find a quick fix or a new solution, hacking was around. It is commonly seen as a bottom-up, grass root approach to technology, and therefore sometimes associated with an aura of rebellion and democratizing decentralization. Yet, most of our products are not produced by highly sophisticated robots, but by people working hands-on, hacking away under quite harmful conditions, yet with ridiculously small income. And because they don't own the patent of what they are manufacturing, those who do own the patent get the main portion of the money we pay for these products. Nevertheless, communities who still share skills on how to produce, manufacture, hack and repair things, even if out of necessity, enjoy a certain form of autonomy and seem to have the longer breath. Communities who hack, come up with new ideas they want to tell others, voluntarily or involuntarily they collaborate and mingle. This also counts for people who might be seen as privileged, because they are artists, culture workers or designers. They seem to have made the choice to live in a precarious situation for the sake of self-realization. I think many of them haven't consciously made that choice, but they do capitalize on the positive effects of hacking too, the sharing platforms, the never ending pool of ideas, the feeling of autonomy, the long breath. Many artists hack and share their new ideas in workshops. Workshops in which people hack together, try out different circuits and practices, concepts and new variations of concepts. It has developed into a unique and ubiquitous format, that can create a satisfying experience. For a variety of reasons, as you can read in the interviews with artists featured in this book. However, learning about hacking practices is not only a way to get knowledgable about how stuff is made, but to cultivate creativity, out of the box thinking, personal expression. Specially in schools it can encourage kids to become inventive and resourceful, gain self-esteem, find something they are passionate about. Most of all it de-mythifies science and technology and makes it something you can do everywhere and fearlessly, self-driven, no matter what others might think. The alienation most of us feel, when they purchase all their goods (from nutrition to furniture to electronic devices) off the shelf in some shop has been discussed by many theorists. This alienation has been identified as the cause of countless

problems in industrialized countries. If you try out the illustrated instructions with a group of friends or colleagues, neighbors or kids, maybe you will get seduced to do more, to make more things by yourself and to find your own way to create technology.

This is why we start to share circuits with this book, start to frame them as artistic practice, that specific people and artists came up with or use in their work. With every instruction comes a short bio of the person who introduces it. If you try something and it does not function immediately, don't get frustrated, let some one else have an eye on it, a pair of fresh eyes can find the bug faster than you think. If we made a mistake in our instructions, please feel free to contact us. After all we love the idea of open source, because it guarantees fast, collective debugging.

Now just a few words to the individual instructions. They are in an intentional order, starting with a simple lemon battery, for people who want to do this from scratch. It offers definitions of electricity and the units volt and ampere and how to use a multimeter. Tutorials on lemon batteries are easy to find online, in case something is not described clear enough in this book. The following instructions are becoming a little more challenging. We added more tools and materials, so that you can build upon the knowledge you gained in the previous instruction. As you will see, we put some emphasis on how to generate electricity with the first two instructions. The third instruction is introducing the use of LEDs

and how to make a switch, but without the need to solder. Since many of you would love to try how to solder, we added a short introduction to soldering to the last instruction, which you can instantly apply in order to make a tiny and simple megaphone. Just beware of inhaling the fume coming from the soldering iron, when you are pregnant. We hope that you will be able to find all the required materials and electronic parts in local shops or by opening old and broken devices. You can salvage loudspeakers for your circuit by, for example, opening the casing of broken computer speakers. You can re-use LEDs that you find in old toys, for example little toy dogs with blinking eyes or broken musical instruments for kids. For the lemon batteries you can take the almost rotten lemon you have got left in your fridge. We would just not recommend to eat fruits or vegetables anymore, after you experimented with them.

Now we hope that you are curios enough to get started and that you will enjoy the wonderous experience of becoming a real hardware hacker!
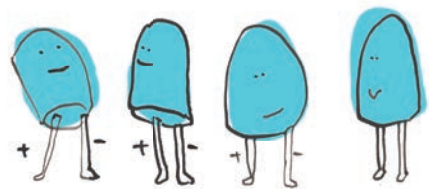
Chapter

1

This chapter briefly introduces you
to some basics that might be useful
when playing with electric circuits.

by Stefanie Wuschitz

Electricity

You can describe electricity through units of volt and ampere - each measure two different things. A volt measures the size of the force that sends the electrons through a circuit. An ampere measures electrical current, counting the number of electrons flowing through a circuit.

If you think of electrons as driftwood floating in a river, volt measures the water's speed, ampere measures the amount of driftwood in the water.

What all electric circuits share is that they entail an anode and a cathode, a plus and a minus pole. Electrons flow from cathode (minus) to anode (plus), while current goes from anode (plus) to cathode (minus).

Electrolyte

Electrolyte is a chemical substance that, when dissolved in water, dissociates into electrically charged particles (ions) and is capable of conducting an electric current. In our bodily fluids, there are principal positively charged ions (cations), and negatively charged ions (anions). Fruit and vegetable juices can also dissociate into electrically charged particles and can conduct an electric current. This means you can use different juices as electrolytes.
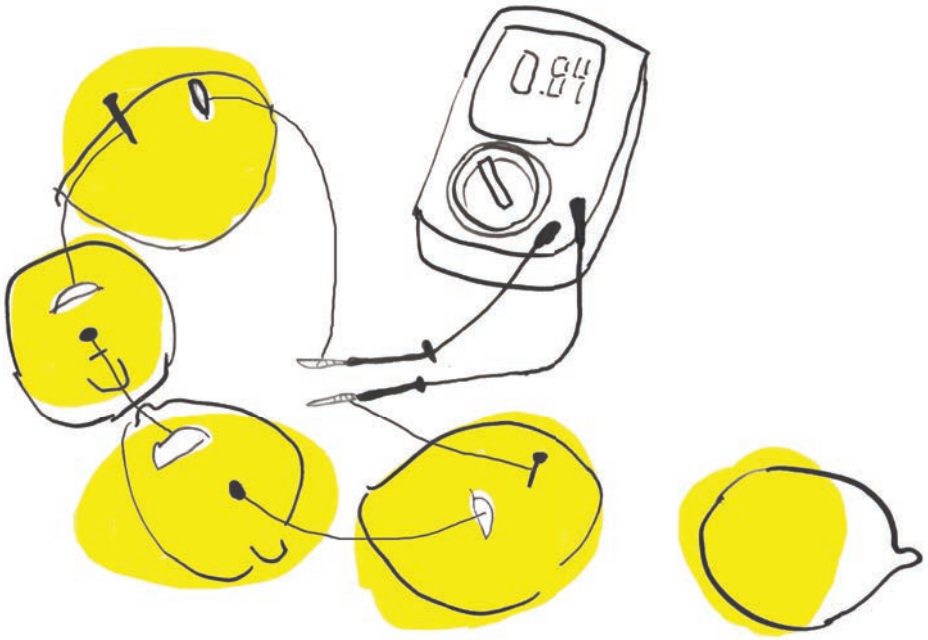
DIY batteries

Take a lemon for example. By pushing a piece of zinc metal (like a galvanized nail) and a piece of copper (like a copper coin) into your lemon, you create electrodes. They make electrically charged particles (ions) move from the more valuable metal to the less valuable metal (from copper to zinc) with a by-product of hydrogen. This is due to a chemical process called reduction. This experiment creates a very simple battery.

The first battery of this kind was invented by Alessandro Volta, around 1800. Once you have attached the zinc metal and copper coin to your lemon you can measure the volt that this battery generates through a measuring tool, called a multimeter*. You can try to connect the shorter leg of an LED with the zinc metal and the longer leg of an LED with the copper and see if the LED lights up.
If you substitute zinc metal and copper
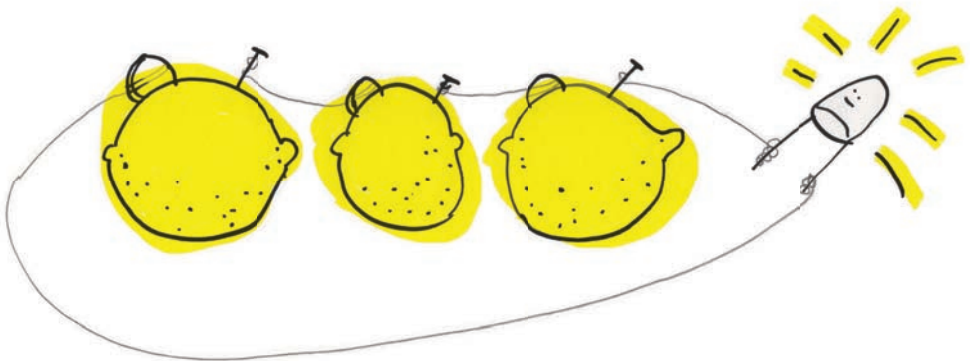
with magnesium and copper, it will make the lemon battery produce a higher voltage.

You can also play with the order of multiple lemon batteries: you can connect their wires in parallel (all zinc wires and all copper wires connected) and they will give you different output than when connected in serial (copper wires connected to the zinc wires of the next lemon which again is connected to the copper of the next and so forth).

This experiment can be done with all kinds of organic materials, like Sauerkraut, potatoes and even trees (e.g. the Ambarella tree). Just make sure you don't eat any of the things you used as a battery.

TOOLS

*Multimeter

The multimeter helps to measure volt (electric potential), ampere (electric current) and ohm (resistance). If you would like to measure how much volt a battery is charged with, the end of the multimeter black wire needs to touch the cathode and the end of the red multimeter wire needs to touch the anode of the battery. The little wheel enables you to measure signals in different ranges.
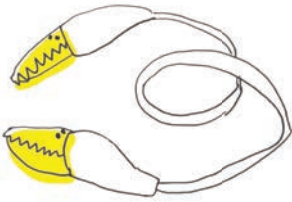
Alligator clips

Alligator clips serve as wires that can be attached and detached from a circuit board quickly, in order to make fast prototype circuits. The clips have little teeth like alligators. It's good to buy a couple of them in different colors.

LED

A light-emitting diode (LED) is a little lamp with two wires, one the anode, one the cathode. If you connect the shorter wire (cathode) to the minus pole of a battery and the longer wire (anode) to the plus pole of a battery it will light up.

Chapter 2

Self Made Solar Cells

by Selena Savic

Estimated time needed to make: 4 hours

Estimated costs: 40 EUR

After a patent by Prof. Michael Grätzel at the EPFL.

SHOPPING LIST:

Chemical store:

TiO2 powder
Distilled water
Ethanol
Conductive glass OR
Stannous Chloride (if you want
to make your own conductive
glass)

Pharmacy:

Betadine
Laxative
Aceton

Supermarket:

Hibiscus tea or berries
red beets washing-up liquid,
transparent!
Spirit vinegar
Candles
Aluminum foil
Toothpaste

Tools, Containers

Digital scale
Mortar and pestle
Heat gun
Water cooker
Bowls
Electric meter
Glue gun (unfortunately, a glue
gun is not going to perfectly
seal the cells; I am searching
for a more durable solution. In
the meantime,it is the easiest
tool to work with.)

POWER!

For any electrical circuit we need power! Therefore our first project will focus on generating a low cost DIY source of electrical power in the form of a solar cell. You can find all necessary parts – such as glass, pigment (TiO2), natural dye, carbon and betadine – in regular stores.

HOW DOES IT WORK?

The solar cell is based on photo excitation. It is a process in which electrons get ‚excited‘ when exposed to the photons of the sunlight. It is a process similar to photosynthesis. The cell is composed of a thin semiconductor film: a porous layer of titanium dioxide nanoparticles, sensitized by dye molecules that absorb sunlight. As in a conventional alkaline battery, an anode (the titanium dioxide) and a cathode (the platinum) are placed on either side of a liquid conductor (the electrolyte).

liquid conductor
(Betadine)

Anode (TiO2 which is dyed
with fruit colour)

Cathode
(Carbon covered)
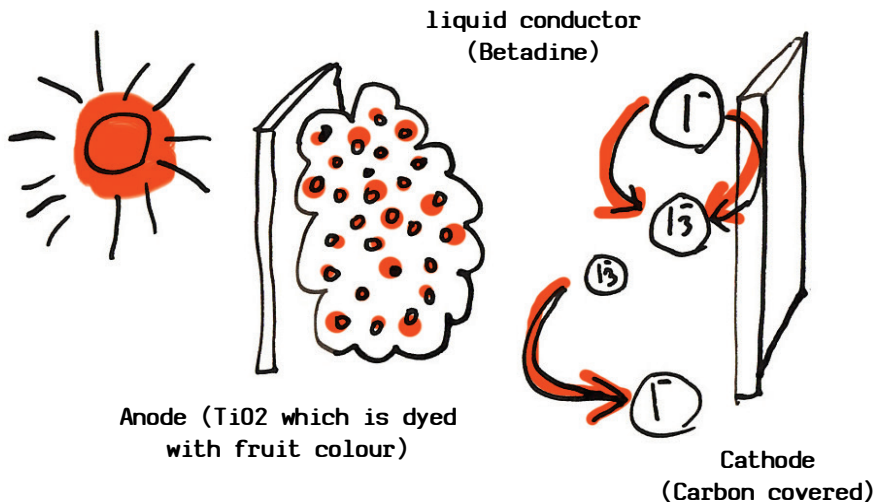
candle fumes can color it black. Be sure to hold the conductive side of the glass above the flame and better move it away from the flame quite often, so it doesn't overheat.

If you don't like playing with fire then just add a layer of graphite on the cathode with a pencil or spray. This way you generate a carbon or graphite layer on the conductive surface of glass sheet number 2. Later you will use glass sheet number 2 to make the positively charged electrode.

2. Natural Dye Solution
Here you can use the juice of hibiscus leaves and purple or red berries.

3. Electrolyte
Betadine or lemon juice serves as an electrolyte.

PARTS:

1. Conductive Glass (two sheets)
The glass we use here is coated with FTO (fluorine doped tin oxide) / ITO (indium tin oxide):

a. Anode
The Anode is our glass sheet number 1 – it will get coated with TiO2 paste.
To make Titanium dioxide paste just apply TiO2 powder plus solution (acetone, Triton X100, distilled water) on the conductive surface of one of your glass sheets.
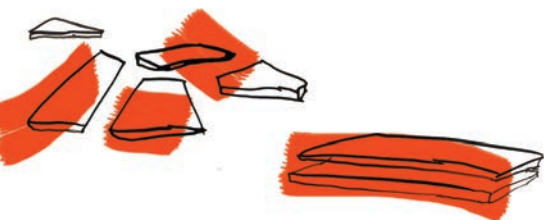
b. Cathode
The cathode – our glass sheet number 2 – gets coated with carbon. You need to hold it over the flame of a candle so the

PREPARE PARTS:

1. Conductive glass
You can buy it or make conductive glass using ordinary window glass, a glass cutter and some stannous chloride powder.

2. TiO2 coating

2.1. For about 15 minutes
Add 10 ml vinegar gradually to 6g Titanium Dioxide, stirring and grinding with a pestle and mortar until it becomes smooth and lump-free. Add one drop of clear dishwashing detergent (Ivory) or a few drops of the Triton X100 surfactant.

2.2. For about 15 minutes
Mix it lightly, and then let it sit for 15 minutes. The mix you obtain should have a smooth consistency, somewhat like latex paint.

* from http://teachers.usd497.org/agleue/Gratzel_solar_cell%20assets/instructions%20for%20making%20the%20gratzel%20cell.htm

2.3. For about 5 minutes
Now mix 3g TiO2 with 10ml solution. The solution is made from 1,25ml acetyl acetone and 2,5ml Triton X-100 (1/5 vol.) in distilled water, 5ml polyethylene glycol 20000 (100g/l) in distilled water and 50ml destilled water plus natural dye (you can experiment with juice from hibiscus leaves, berries, pomegranates etc).

* from HTL Braunauhttp://www.youtube.com/watch?v=qaGrHrLdRhs

2.4. About 15 minutes
Apply a thin layer of the paste to the conductive side of the glass sheet. Leave it to dry. Then bake it in a ceramic oven or use a heat gun. Try to make ‚nests‘ from aluminium to protect the glass from sudden changes in temperature.

3. Electrolyte
Put the two glass sheets together, so that the dyed and carbonized side are touching (that is, the conductive sides of the glass sheets). Turn them so that on either side you have a little space left to later connect an aligator clip.

Then press the glasses together with clips. Hold the cell upright and put a line of betadine on the top side. Leave the cell in this position until all betadine is evenly ‘soaked in‘ through all the surface. If needed, add a little bit more.
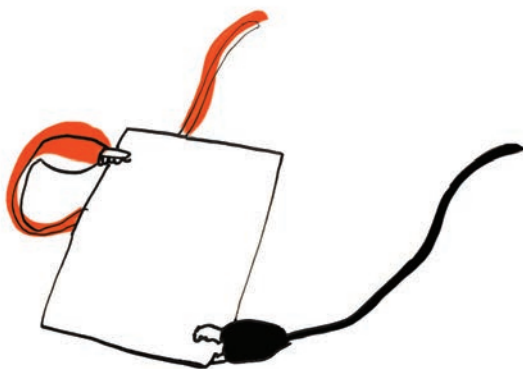
4. Sealing the edges

Once the betadine is evenly distributed inside the cell, it is very important to seal it well. Clean the cell well on all the edges and seal it by using a strong glue or melted tar. If it is not sealed well, betadine from the inside will evaporate quickly and the cell will loose all its power. You can try refilling it later.

Chapter 3

This chapter is about simple switches. By attaching conductive tape and LEDs to a piece of paper you can create an electric circuit that controls light.

This circuit was inspired by Bunnie Huang and Chibitronics.

chibi® tronics

Switches

There are many types of switches, but all of them interrupt the flow of electrons within a circuit. Most of them are used to turn on and off specific functions, such as light, sound or motor movement.

There are momentary pushbuttons that only conduct electricity if you keep them pressed. There are also push-on/push-off switches, for which you press the same button twice to generate two different states. Then there are toggle switches, such as the classic light switch you can find in any apartment. Finally there are rotary switches, through which you can chose between several positions, not only the on or off position.

Our switch is a slide switch- by sliding your finger over the paper you can switch the LED on and off.

TOOLS:

LEDs
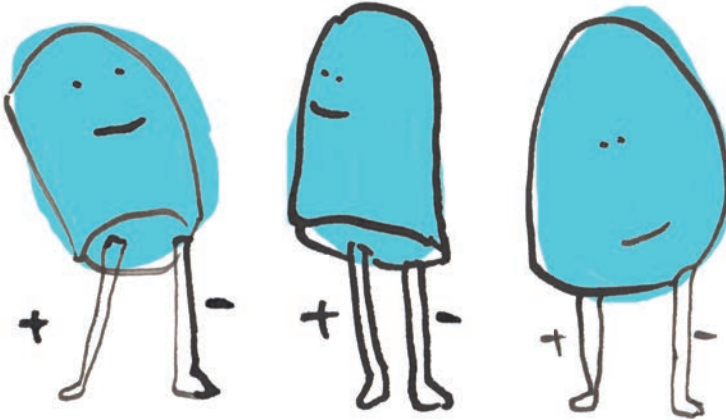
Sticky Conductive Tape

This looks just like a regular tape but it's surface can conduct electricity. You can test it by using your multimeter. Find this sign on the multimeter:

and turn the round rotary switch on your multimeter to this sign. Then touch the tape's surface with both probe tips. If the tape's surface is conductive, your multimeter will beep. This is the signal that it's perfectly conductive. You can order conductive tapes online, or use the once attached to the printed version of this book.

Battery

3V coin cell battery or your self made battery.

A piece of paper

This can be any kind of paper, even used paper.

Scissors

You will need scissors to cut thin stripes from your tape. These nice thin lines will replace wires to create an electric circuit on paper.

After you have cut some stripes off your tape, please take a pen and draw the following lines on your piece of paper:

Fold

+

−

Battery

LED

− +

Blinking Slide Switch

(SWITCH GAP)

(switch connectors)
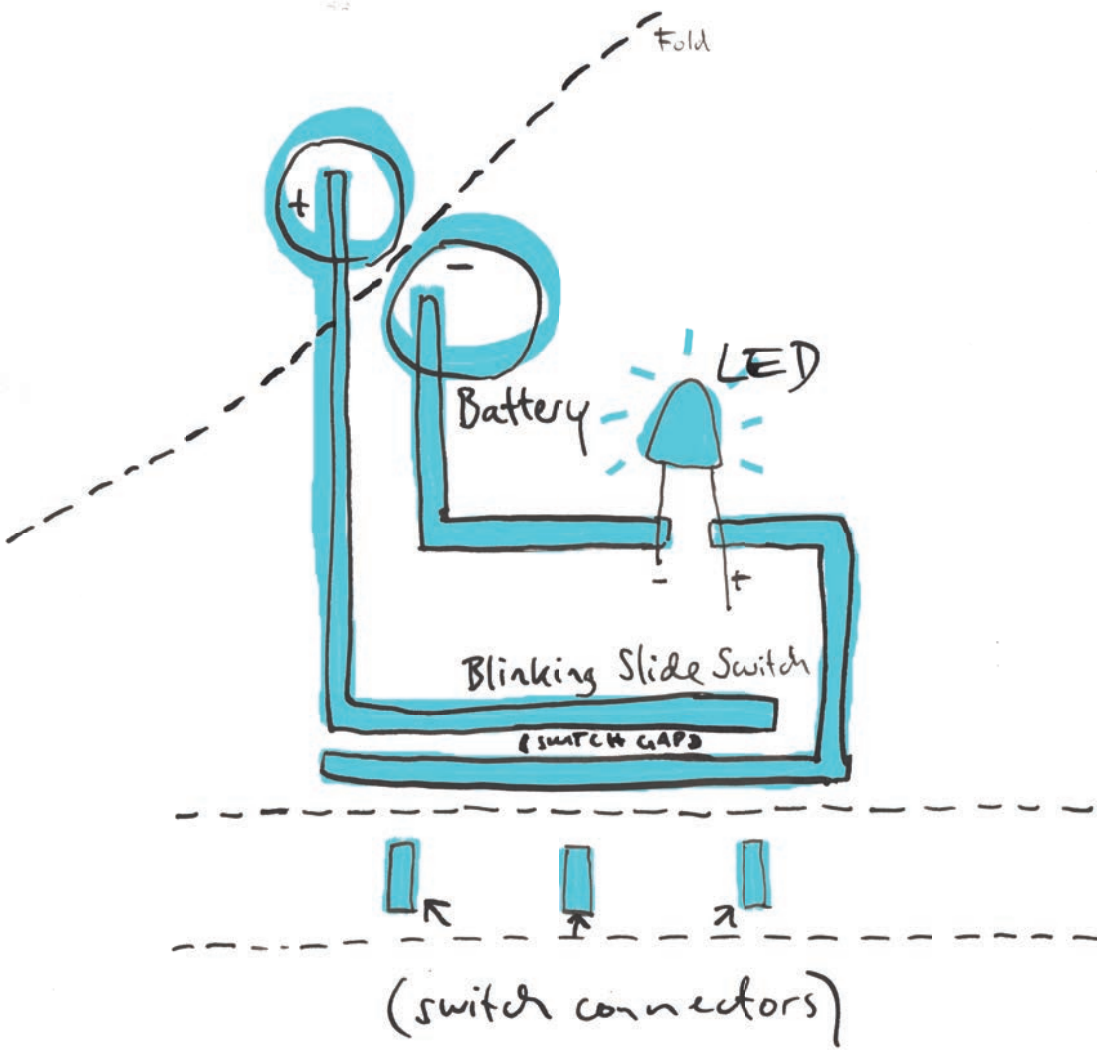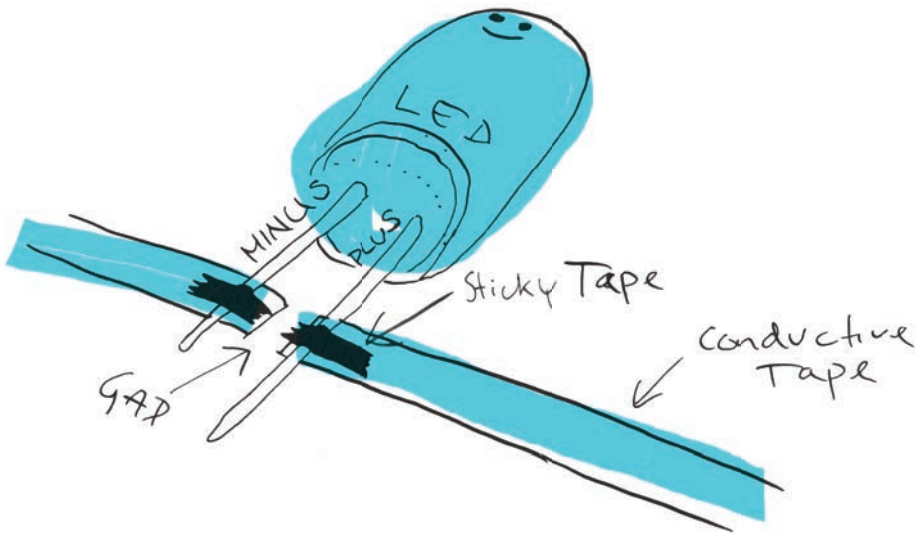
Glue long lines of tape on all the colored surfaces. Glue the minus side of your button battery to the right circle on the drawing. Then fold the corner of the paper so that the plus side of your battery is touched by the left circle. Attach your LED with the shorter leg to minus (left side) and the longer leg to plus (right side). Fixate each leg with a little bit of tape on top of the conductive tape.

Then fold the bottom of the paper along the marked lines to allow the three small vertical pieces of tape to touch the two long horizontal lines of tape.

Blinking Slide Switch
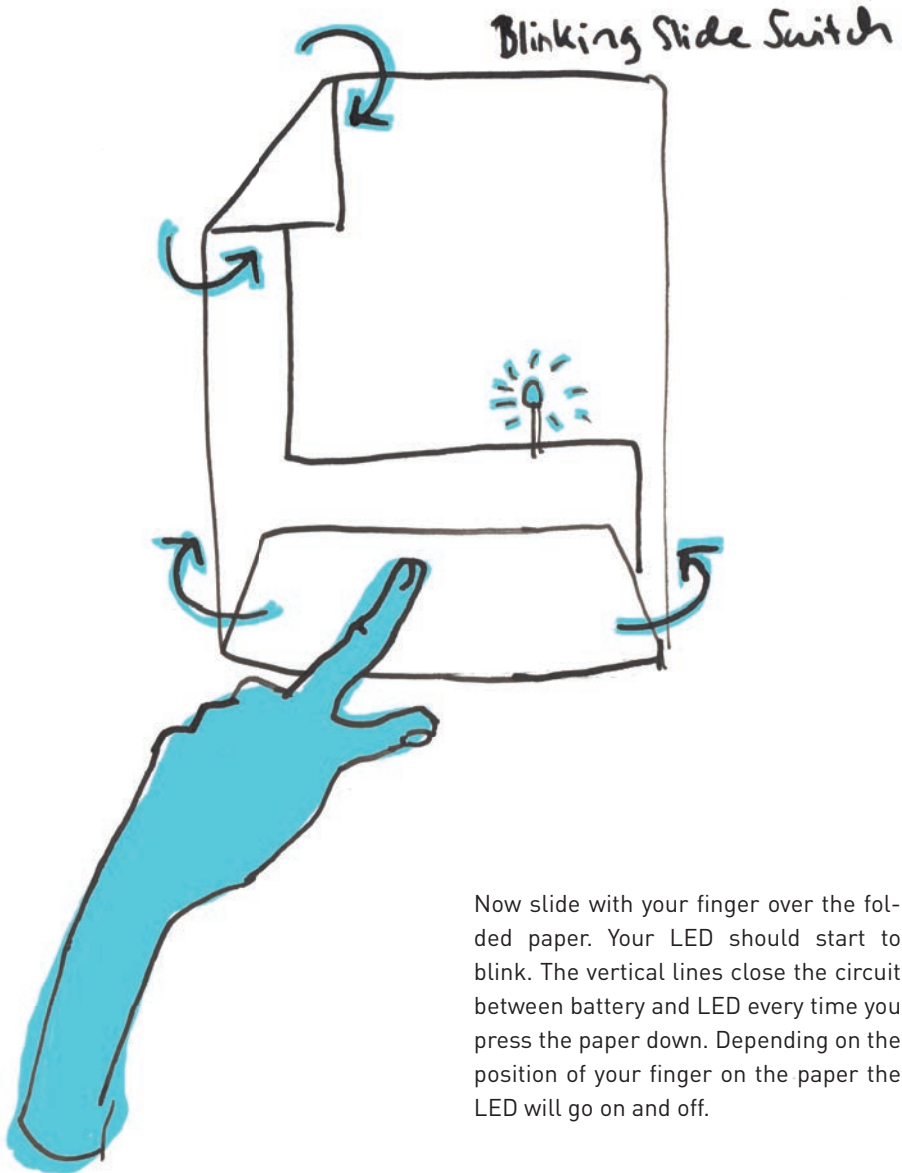
Now slide with your finger over the folded paper. Your LED should start to blink. The vertical lines close the circuit between battery and LED every time you press the paper down. Depending on the position of your finger on the paper the LED will go on and off.

Chapter

4

Create a simple megaphone

storytelling by Stefanie Wuschitz

In this chapter you will use an amplifier chip to build a simple megaphone.

MATERIALS:

(most of this is available at
Conrad, Radio Shack or other
electronic stores in your
neighborhood)

1 board

10-15 wires

Solder

A Soldering iron

Helping hands

An amplifier chip named LM386

**220 uF capacitor 100 uF capa-
citor**

**Rechargeable 9 Volt battery
(or lots of lemon batteries or
solar cells)**

A battery clip

A piezo microphone

**A speaker (you can take the
speaker out of an old speaker
set just by removing the case)**

ABOUT THE INDIVIDUAL PARTS:

Board: This is just a piece of plastic covered in holes, but the holes are coated in conductive material. You can get one for less than 2 EUR.
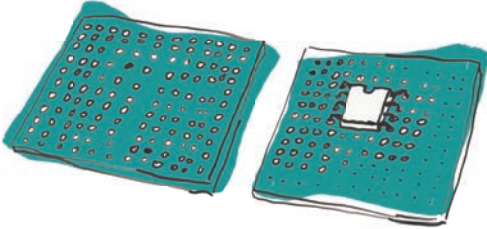
Wires: It's best to get wires in two different colors and cut them into 5 cm pieces.

Solder: You will need to buy this.

Soldering iron: You can borrow this from somewhere.

Helping hands: They make it easier to keep all elements stable while you solder them together, plus you don't burn your fingers!

LM386

Amplifier Chip: This is named LM386, and looks like an insect with a little notch on its head. The leg at the left side of the notch-head is leg number one. Count counter clock wise from leg number one and give each leg a different number.

Capacitor 220µF   Capacitor 100µF
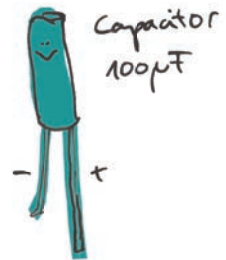
220 uF capacitor and 100 uF capacitor: Capacitors are used to collect electrons and then smoothly release them all at once. They are almost like batteries, but unlike batteries they cannot hold electrons for a long period of time. Instead, they only hold them for a short moment.

Rechargeable 9 Volt battery: You will need to buy this. Alternatively, you can use a lot of lemon batteries in serial or your solar cells instead.

Battery clip: You will need to buy this – it connects the battery with two wires, making it easy to connect to the board.

A piezo microphone: You will need

to buy this too. It is basically a contact mike, like people use to amplify acoustic guitars. If you attach it to a surface, it can pick up very minimal sounds and vibrations.

An old speaker: Just open up the chasing of old speakers.

The chip in our circuit is called LM 386 and it can strengthen any incoming signal. In our case it receives sound input through a small microphone (called a piezo). The 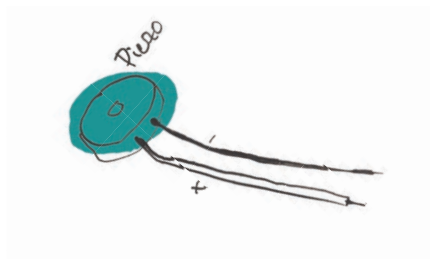LM386 amplifies the sound signal and sends it to your speaker. To make this circuit durable you will solder all the necessary pieces to a board.

SOLDERING

Soldering is the process of joining two metals together so that electrons can travel between them. This means that the connection between the two metals becomes conductive. An example of this is two pieces of wire within an electric circuit. We also require a third substance called a 'solder', which is a kind of glue to make them stick together.

Melt the solder

both mettal pieces touch
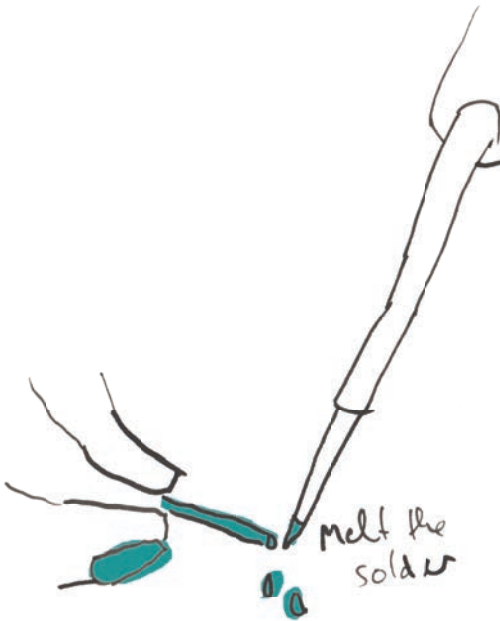
Soldering is not a mechanical process like glueing, it is a chemical process. The two metals or wires you'd like to fuse together will need to touch and get really hot at the same time, and the 'glue' - the solder - must melt between them. Once the melted solder gets cold again it turns hard. The two metal pieces are then stuck together and can conduct electricity.

230

Soldering station
sponge sponge

Take a soldering iron and melt some solder on it. The melting point is around 230ºC (or 460ºF). Take the melted drop of solder off the tip of your soldering iron by rubbing it against a moist sponge. The drops of solder on the sponge will turn into beautiful tiny round pearls. The peak of the soldering iron should now have a silvery surface from the solder.

You can start!

First melt some solder on the tip of the first piece of wire, then melt some solder on the tip of the second piece of wire. Then make them touch and at the same time heat them with the hot tip of your soldering iron. The solder melts, cools down and the two wires are connected. Congratulations.

hot solder iron

Sponge

Wire number 1

Wire number 2
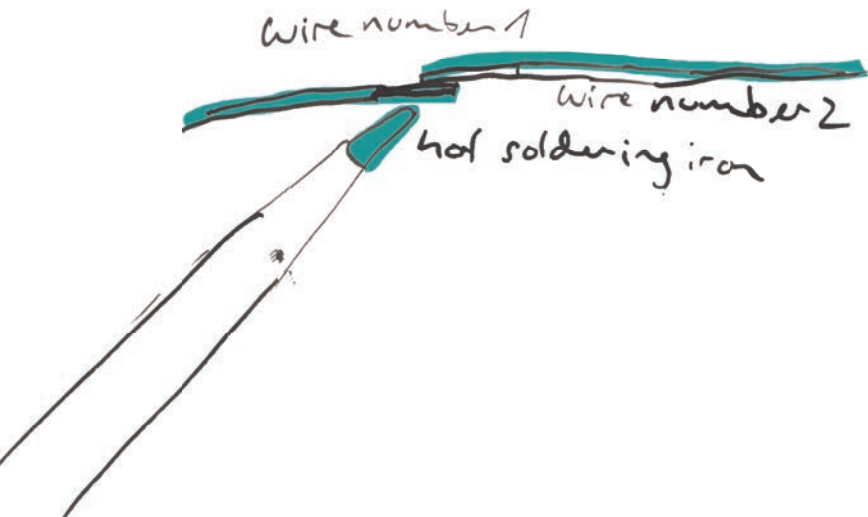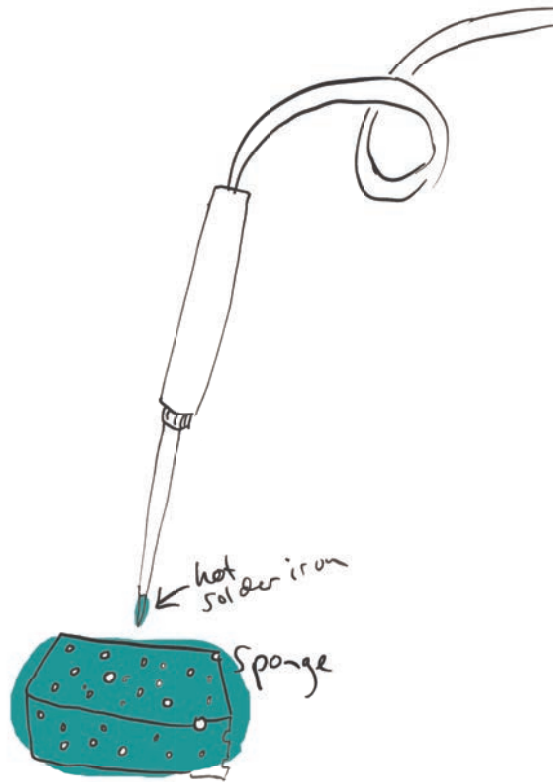
hot soldering iron

Now you can try soldering a wire to a small circuit board. Pull the tip of the wire through a hole in the circuit board. Use the tip of your soldering iron to heat both the wire and the little shiny ring around the hole of the circuit board. Now melt some solder onto the wire inside the ring. The wire should now be connected to the board. Congratulations.
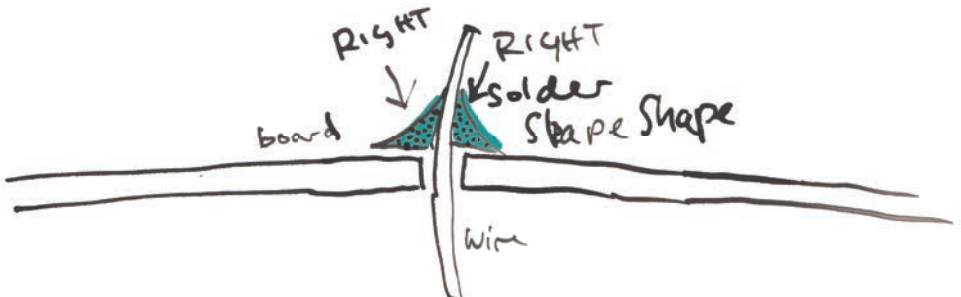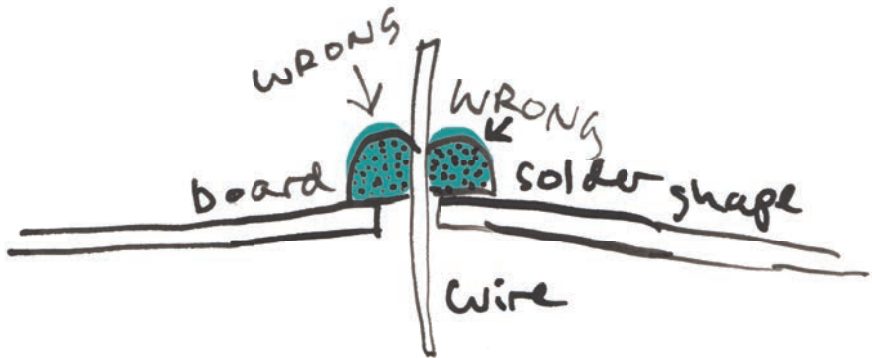
Note: If you are pregnant, you should not solder, because of the toxic fumes.

YOU ARE NOW READY TO START THE CIRCUIT:

Attach the LM386 to the board. Every leg of the chip-insect should go through a hole in the board. Bend their toes once they are pushed through the board, so that the chip stays there. Now solder all legs to the board.

Next you should connect the following wires: The red wire of the battery clip (plus/power) with the chip's leg number 5. You need to push the battery clip's red wire through the hole at the right side of leg number 5.

GAIN ——— 1   8 — GAIN
INPUT ⊖ — 2   7 — BYPASS
INPUT ⊕ — 3   6 — VOLT ⊕
GROUND — 4   5 — OUTPUT
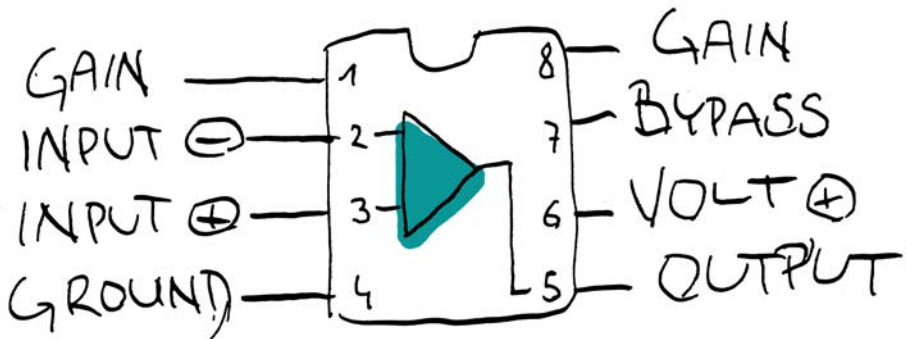
Then you should connect the following wires: Connect the chip's leg number 3 and 4.
Connect the black wire of your battery clip (minus/ground) into the hole next to the chip on the left side.
Connect the minus wire of your piezo and the minus wire of your speaker to the row of holes on the board.
Now connect the piezos red wire (plus / power) with the chip's leg number 2.

INPUT

100nF capacitor

battery

OUTPUT

8V0i

Speaker
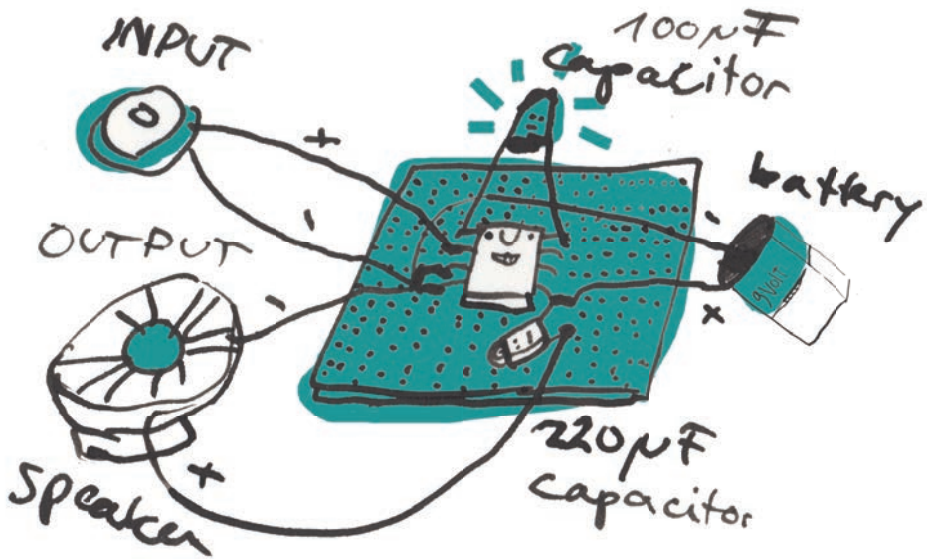
220nF capacitor

The capacitor has a long leg and a short leg, like the LED. The short leg is for minus (ground) and the long leg is plus (power). Connect the 100 uF capacitor with the short leg to the chip's leg number 1 and the capacitor's long leg with the chip's leg number 8.

You're almost done!

Connect the 220 uF capacitor's long leg with the chip's leg number 5. Connect the capacitor's short leg to an empty hole on the board right next to where you connected the red wire (plus/power) of your speaker.

Now plug the battery to the battery chip and talk into the piezo microphone!

YAY!

You are amplified!

Interviews

NINA PRADER
PETER MOOSGAARD
SELENA SAVIC
ULI KUEHN
VICTOR MAZON

interviewed by Stefanie Wuschitz

NINA PRADER

Zine-Core:_File_Under_

Nina Prader is an artist and arts and culture writer based between Berlin and Vienna, pursuing text and image arts and printed matters. Prader hosts the radio show "Paper and Tape" that explores zine culture. Within her Making Artistic Technology workshop, Prader Communicated how post internet culture has changed the relationship of self-publishing to its methods of archiving and communication. The workshop provides a theoretical and practical introduction to zine-values and production as well as creative archiving and browsing methods for your personal or public collection and distribution.

You describe yourself as an art writer, cult writer, and an artist?

Yeah, I consider myself at this point more of an author. But also a maker - working with text and image, content wise. As a researcher, I'm looking at the overarching context of things. I'm interested in how those processes can be changed or how they are situated or located in different histories. In the same way that I feel like I'm a maker of zines or of artist books, I feel a deep need to connect with other communities or other people who are also making artist books, interviewing them and kind of putting them in a cultural narrative or understanding how those narratives have changed - from RIAT world to putting an artist book in a gallery of content, for example.

How would you describe your zineship project?

The zineship is a hub, or a sort of a round robin of all the processes that goes into creating an artist book or book, or into this idea that everyone has the power to have a voice or become an author. My role as an artist there was more of a facilitator with this ship, which, on one hand, had all the materials and tools included into its display method and, on the other hand, was an exhibition and archive space. So it had this idea of being a community garden on wheels in a way.

It seems like your work is very based around this communicative practice

Yeah. I mean I come from painting, but in a way I believe in art in two ways: art that is a product and then art that is a process, which creates moments of in-

terpersonal interaction - I'm fascinated by these moments.

Your project at RIAT, 'filing', is different to what we just discussed about more communicative practice. It's an archiving practice in part. How would you describe the project?

I'm trying to design the foundations for a public open zine library in collaboration with RIAT's open publishing lab. This gesture of creating a system or philosophy of a library is a political and a personal gesture. Ideally, it will be a digital and analogue library.

It's an interesting moment to be working on this kind of project, because this is not the first zine library - there are zine libraries all over the world. Many academies and universities are taking on projects of archiving zine culture, so in a way

it's helping me create something that pays tribute to these cultures, but also to create something different (because maybe the world doesn't need another zine library, you know). I'm very much interested in creating these contexts.

Most people think of an archive as a static dead object, but this requires practice, so what sort of practice are you working with?

Well, on one hand, I feel I have a standard filing system, but then, on the other hand, zines are not your traditional book in the sense that they don't necessarily have an ESPN - they are often very private in nature and distributed in a very different way. There's the possibility of archiving them in maybe a more anarchist way, or in a creative manner... so maybe you file them by their message, or by
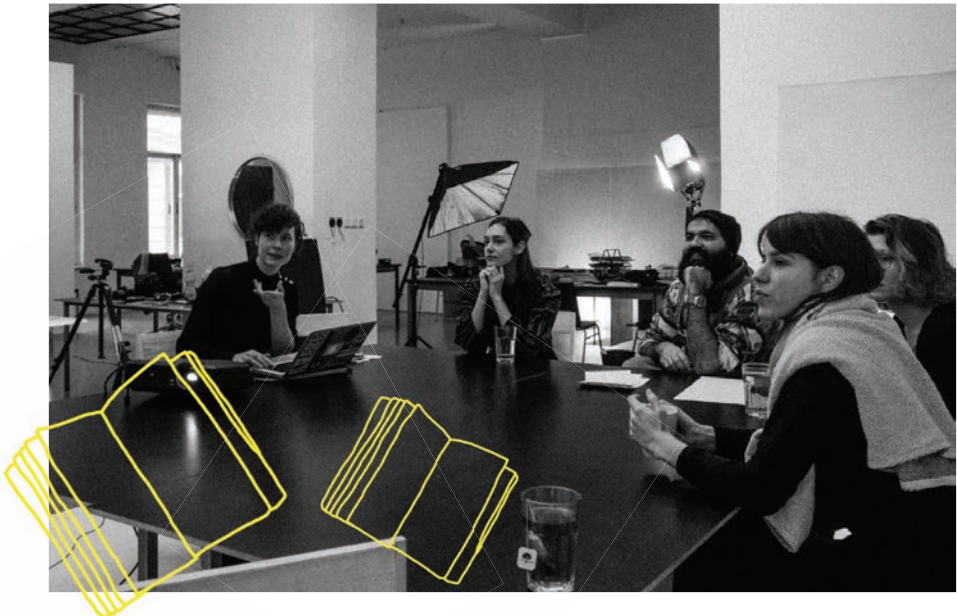
thinking of different ways of maybe exhibiting them, hanging them up. Methods of display as also being a method of archiving. In a way you don't have an authority over these objects, so maybe it's about creating access to a movement.

... but also the distribution of zines are often very personal

Yeah! It's almost like an oral history in paper, and this is also what attracts me to them. It's about these interpersonal moments which is something that I think our time is losing, or are distancing themselves from, with like Tinder and all that jazz.

When you look at publishing practices and new media you see a platformization of communication. It's a limitation of the way that you can communicate something within these sort of tick boxes, these formats, these materials. And this is what was very unique with the zine culture ...you don't think there's a political action within it, but it is. And this is what is interesting about your focus on filing purposes.

Do you see your practice as an activist gesture?

Yeah, yeah, yeah. Absolutely, or also, for example, a lot of zine archives are facilitated by minorities, like a feminist zine archive. And then they're just housed in boxes and there's no real Dewey-decimal system to locate who wrote this.

That doesn't change their value or change their existence. I think that's the precarity of it. Nowadays, there's this need to archive everything to keep these stories alive, but then there's also beauty in maintaining their narratives without putting stamps on them.

Do you think that these authors want their work to be collected within an institution?

No, some of them I think don't want it at all. I mean, a lot of the original zines are purely information based, or about spreading information - they're supposed to stay in circulation, given hand-to-hand. But then again, now the progression is also about the sort of thing where you have a zine release, but you promote it on Facebook as well as maybe distributing a flyer, rather than the zine just acting as its own carrier.

Regarding this idea of hand-to-hand, do you think the archive, as a physical space based around communities and within smaller events, would be something accessible?

I think it's a dialogue in the same way that you have to maybe read a book to be able to talk about a book, maybe someone else needs to tell you about a book before you can even get to that book. So, it's definitely a conversation tool in this way, and maybe the archive is the nervous system for this.

PETER MOOSGAARD

1983* in Horn, Austria, lives and works in Vienna. Graduated in Visual Media // Digital Arts (Mag. art.) in 2012, he first studied Philosophy and Linguistics, later at the University of Applied Arts Vienna, Class Prof. Peter Weibel. He is a member of the international social-activist group Wochen-Klausur since 2007 and co-founded TRAUMAWIEN publishing in 2010. Moosgaard worked as an artist, janitor, journalist, theorist, publisher. He has had exhibitions in Istanbul, Stockholm, Athens, Paris, Amsterdam, Berlin, Munich, Brussels, Basel and many more. His current research focuses on Cargo Cults and Shanzahi as global, postdigital strategies.

Let's start with this scenario: Humankind has gone through a phase of total technologization. After that, humankind has transcended technology and has given it up to itself. How do people live, what kind of technology have they kept in their lives?

I find it funny in either way, in either scenario: in one everything would be automated and technology would be so advanced that it is only able to communicate with itself, leaving humans alone to play like millionaire's children. The other would be that there was an apocalypse and the only thing that remains are strange hardware parts, which nobody knows how to use anymore.

In both scenarios, we would not be in a very primal nature state, instead we would again be in a strange hybrid space where we would still have to deal with technology, capitalism, neo liberalism, techno solutionism, it is already embedded in our minds, in our culture, in our society. In both scenarios, humans are again free to do what they want, but still of course, they are not.

They would measure themselves still with the machines.

Yes. And they would try to communicate with them because they want to connect with them, of course. What would be a scenario that reflects on the one hand this alienation and on the other hand, still gives people a certain agency to connect, either with nature or with tech-

nology? It was always interesting to simply admit how alienated you are actually from technology and capitalism and to allow yourself to be naïve again, because I think it's really out of fashion to be naïve or to call yourself stupid. Everybody has to be pragmatic and self enchained. If you are alienated from all that, then you're allowed to play again, like a child.

Somehow have ownership over it again.

Somehow. In that act of playing you can relate to things. It's on a symbolic level, but on the other hand, everything we are allowed to do under this highly advanced system is to play on a symbolic level.

You were mentioning Robert Pfaller's concept of interpassivity before, who wrote that people delegate being human to machines in order to not have to live themselves. In your project, xeno realism, people kind of take back their life. It's obvious that technology is not functioning to live it for them. The workshop that you gave at RIAT, it was partly taking place in McDonald's? What was that about?

Yeah. I gave two workshops for RIAT, the first, was sort of a post-studio practice where we would use the mall as a sort of studio and also to use to go for a hunt, like a professional shopper. To embrace this consumerism, to not see it in this negative way, but to find materials, which you can afford of course, and then again how you can, in situationist way detour them.
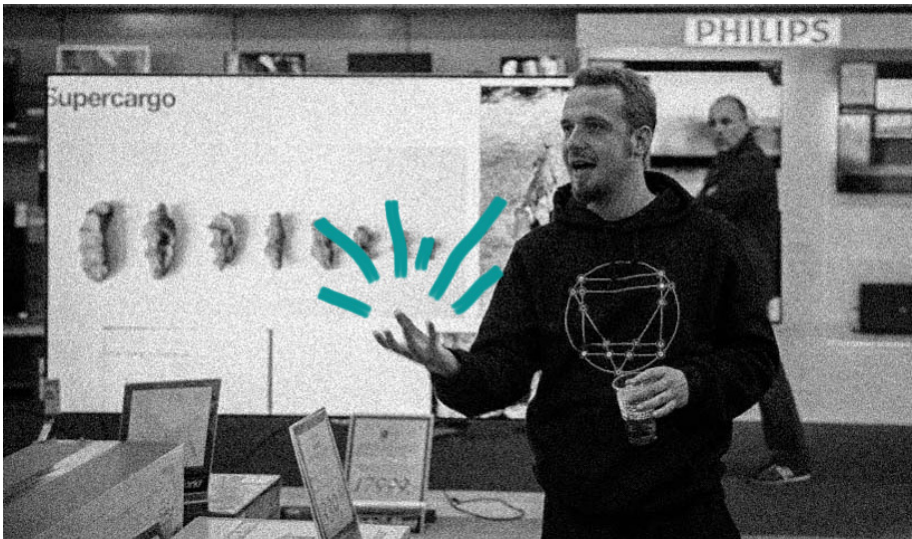
It's embracing it and then sub-verting it?

Yes. Subverting it and also use these capitalist spaces like McDonald's where you have free internet and you can hang around as a place to meet and talk and produce art works. It was provocative, because art and western individualism has this notion of purity - to keep art pure from everything else, as well as to keep your soul as an individual pure from consumerism, which does not work, because again it's this Western opposition. Me against the world or me against capitalism. Art against economy or something. It's interesting to form hybrids and to really embrace these hybrids to cope with our surroundings.

And the other workshop?

The original plan was to build a gas mask out of a coconut. It turned out it doesn't work and you cannot do it. I changed the plan and we reenacted how the coconut comes to Austria to our group. This globalism is a really obscure system where you could not possibly understand the complexity of how your smartphone is produced and arrives to your place. I found it interesting to reenact, replay in an animist way how a coconut arrives at our place and where it is.

I think it's very refreshing that all the other people gave workshops to try to demystify technology and make tech literacy available and you gave up completely on the concept and you just substituted.

Exactly. It's a really radical way to admit how little you can know, I completely gave it up. If I have got a highly technological tool, I don't try to understand it anymore, but lick it like an animal or a child and see how it tastes. It's sort of a primitivism as a way to find a connection no matter how stupid it might seem. We agreed on one narrative about where coconuts grows, probably somewhere in Thailand? Then we came up with a very spontaneous con-fabulation, purely speculative. Still it was a story that everybody could comprehend and identify with. If it's true or not that's another question.

The other workshop at McDonald's, did you document what people bought in the mall?

Yes, I gave everybody some Euros and they went shopping and they produced archaic weapons from the materials they bought, like bow and arrow, axes and shoes and stuff like that.

Is there anything else you want to add to your approach to workshops?

Peter: Yes. I find workshops really interesting under the assumption that people are getting more alienated from society and technology, as everything is getting more automated. Another impli-

cation of this automation is that it cuts down on human interaction. You don't ask for your way but you type it into your app. I find workshops a really interesting way for the future to meet, to talk and to do something, even if it is in a childlike play or as a way of a ritual, because I think all this is taken away by the digital ideology - concerning the ritual and actual doing something in reality.

Machines do everything repetitive.

The human also has an urge to do something repetitive, it gives security and it's calming together with other people. I like to think of the workshop as a pre-enactment of something that could happen in the future, be it like a imaginary community, as you said, or like a ritual where you would meet around the campfire. In times of a-temporality where linear time doesn't exist anymore, you can see a small society, like a cult or like a workshop as a seed of something that could happen in the future. It just depends on how it can be collectivized.

SELENA SAVIC

Selena Savic is a researcher and artist with a background in architecture (Dipl. Ing. Arch., University of Belgrade 2006). After completing her Masters degree at the Networked Media department of the Piet Zwart Institute in Rotterdam, NL she received support from the Gamefonds funding scheme (NL), to continue development of her with a critical artistic game "Eat It! City Simulator". Following a period of independent practice, Savic pursued academic research, completing her doctoral thesis "Space, people, networks" in December 2015 in the framework of the IST/EPFL Joint Doctoral Initiative, generously supported by the FCT funding. At EPFL, Savic worked as a doctoral assistant at the MediaxDesign Laboratory. She is currently a Postdoc fellow at TU Vienna.

You gave a couple of workshops on how to make solar cells. What's your experience with this circuit?

My intention was to see how much electricity we can produce from found materials such as broken glass and fruit juice. This method seems always very easy and friendly, but it, again, requires more or less a lab situation where you have access to tools that can give precise and reliable results (such as to reach a certain temperature or grind certain materials down to nano particles). Nevertheless, we were able to produce some electricity and that was what we were interested in.

And for how long could you generate that kind of voltage?

It depends mostly on the way you can seal the cells. There is this liquid which acts as electrolyte. The cells are made from anode and cathode electrodes, which are then connected through this electrolyte. When this liquid evaporates or oxidizes, then the cell will not work anymore. So, we never had them for more than a few hours, or maybe a day. It's really a proof of concept rather than a technology to be used reliably or sold.

And could you extend it to have many cells in parallel?

Sure. The workshop situation is not only about teaching people a simple skill, but also about engaging a lot of people on a common task. At workshops, we were

able to produce up to 50 cells. We could reach five volts power, in Vienna I think, which is the best results we had.

Did people find out new ways while they were exploring with you?

Yes, I think this is also something which is a benefit of a workshop. People had better ideas how to seal cells. Also, given the large number of cells, you're able to try different techniques. Things can go wrong, and there you learn what you should or should not do.

Your background is actually in architecture theory? Does it influence the way you produce things and make things?

Well, my background is in architecture practice rather than theory, but I do now work at the department of architecture theory where I don't, obviously, design buildings. When you engage with deep theoretical reflections, you first devote your energy to this; thus, you probably produce less than if you were a full-time maker. But I don't like to think theory and practice are in a way opposed to each other or mutually exclusive. It's something that I really work against and feel deeply against. I believe that, yes, I could probably do more practical work, for which I find much less time now. This is the reality, but it helps me also think through things that should be made or not. I don't think that all our ideas are necessarily made. You know, we have lots of bad ideas which we can understand by making or by thinking and reading more about the world.

It's not like a circle that one creates the other?

Well, you can say that deep reflection helps you think through concepts that you want to realize or not. I think it really is a circle. You think and then you make something; you think about that and you think about the world; you change what you made; You change what you think by making; you may change what you make by thinking.

If you teach at university, is it an environment that inspires you or is it more easy to move in independent off spaces to teach and organize workshops? Or is it hard to compare?

Yeah. I think it´s hard to compare. I like both. I really enjoy the workshops that are an opportunity to somehow have non-hierarchical relationship with people. At solar workshops, we were really friends, and we made things together. And at the university, of course, this relationship doesn´t work because I give students grades. I cannot pretend that they are my friends. I nevertheless think it is very useful for people to go through this evaluation process where you basically try to achieve something and somebody else tells you whether or not they think you have achieved it. The fact that somebody is recognized as a kind of authority or a witness of one´s knowledge, and that you as a student are able to successfully deal with this helps you in life. You learn a lot. If you, as a young person, don´t recognize anything as a witness of your knowledge, then who is your knowledge for? I think it is useful to have a witness.

Giving an account of something.

Yeah, exactly. You can say that a MOOC is very efficient because you only have to record it once; but, there is really no social contract in doing an online course. When you have 20 students, they come and in only one semester they learn a lot, and they are obliged to submit a paper in the end. If you have this same kind of students at an online course, I´m not sure about how much they would do in a semester without technocratic control mechanisms… and if nobody tells them in the end: „Well, you know, really, individually, you paper needs this and that adjustment.“ If they just go through it and listen to something and write something, what is learned? I don´t know. I think there are different things to be learned – some require understanding and memorizing protocols, mechanisms, the way things are done. Other things require more reflection and feedback. Both are necessary to form a productive individual. And both can be transmitted at a workshop as well as at the university. The difference in what you pay, or what certificate you get makes a more clear distinction between these environment. And I think these things matter less.

ULI KUEHN

Ulrich Kühn works as a sculptor, media artist, musician. He regularly holds lectures at the University of Applied Arts Vienna and is working at the border between music, media art, performance and experimental digital film production - specifically real-time visualization and interactivity with open source technologies.

What's the best way to learn how to do electric circuits?

I think a project is the best way to learn electronics. A project where you have no clue how to use any of the tools. The exhibition starts next week, and you truly need a nice ambient light, so you will learn how to solder the LEDs.

How do you deal with bugs or errors? Do you determine your artistic output, or do you work until they are gone?

I think it's like the great painter, Bob Ross, told us, „There are no mistakes, only funny little incidents." When I do music, I really need the bugs, I need errors in the production line. I don't need a perfect sound, I need a certain sound with a certain character. The character can be badly recorded or with errors in the codecs - where you hear the wrong data – so you've got some kind of glitch art. Glitch art is really important and it's only based on errors.

Do you do your artwork also in this studio here?

Yeah, definitely. For example, here is the hypercycle. It's built in here. And this is some neo-pixel controlled via Pure Data. Normally I'll do my artwork in the night. I need it calm and silent and not so bright.

Do you think that there's difference in how you approach DIY-making and electronic art depending if you were raised as female or male?

I'm sorry to say this, but I think there is a difference. I think we're all trying to be equal, to raise our kids equally. But it was okay for a boy to play computer and electronics, and it wouldn't be okay if they were a girl. I think it's also not only good that they were allowed to play computer all day, all night long. But it was less a problem than for girls. That was thirty years ago, in my childhood.

So if there would have been a girl, her mom would have come and said "Please help cooking"

Yeah, I think in my situation it was quite special. I have strange parents and we are three boys. So we especially got dolls, a dollhouse and a stroller. They tried to be not so male-dominated. I was raised on the countryside and art education there was totally separated into boys and girls. It was called ‚technical craftsmanship', but it was only visited by boys, and ‚textiles' was only visited by girls. I really believe it was still a macho thing, that boys could not crochet or use a sewing machine. I was 32 when I learned to use the sewing machine. Then I got really into the do-it-yourself stuff because I don't like to go shopping. My own pullovers and jeans, they were the real reason why I had to learn this.

I think it's more difficult to do sewing than to do soldering, right?

Definitely. Because you have to know all this technical stuff. How it's working, how to use it. And it's a lot of empowerment to repair or make your own clothes.

What is the most common reason why people don't finish their projects when you work with students?

I think the challenge is really to find a way to combine technology and art. If you just make another LED lamp, it's just another LED lamp. After you finish your LED lamp, you realize, „Okay, it's not really an art thing I just created." I think what we are doing in electronic workshops is so basic knowledge, it's like learning to

talk. It's not like... Are we talking English or German? No, it's really like learning how to use our mouth, whatever comes out. I think, as you said, electronics are easier than sewing. That's just so true. You just have to learn a few tools. How to read a circuit. How to solder. And with the help of the internet, you are nearly finished, if you have the time and the will.

So, what would you like to work on next? What's your next project?

I learn to control a small flying toy drone with Arduino. I found a way to control the drone via Arduino, via a violin or a cello. So, Pure Data interprets the pitch and the volume. I want to form an orchestra that's only playing music to let the drone fly. It generates another way of notation or musical needs, the composition starts and ends because of the helicopter and because of the struggling or the it's equilibration. It's a comment to Stockhausen, I really want to build music that needs a certain sound. You have got no way to choose, no random.

Do you think Maker Culture has taken a different development here in German-speaking countries compared to the US?

I only have a bit of an insight in the South American way of do-it-yourself, and it was quite similar to Austria in my experience. I still don't believe that the people in Europe or Austria do it because it's a nice hipster thing, and I still believe and hope that it's a way against total user-friendly capitalism. For me, it's a

way to fight capitalism, to get out of the buying system, which is totally useless. A lot of people still do it because they are poor. It's really a way to feel powerful and if you have your skills you're never poor, in a way. In Chile people worked with totally the same tools, they also used Pure Data, we used the same circuits, it really seemed like a worldwide development, we were pulling on one string.

So, that culture that evolves around these maker communities, do you think that they are like countercultures to mainstream culture?

I hope it's counterculture. No, to be true. If you look at TV series like Big Bang Theory, I think the pop culture tries to get this nerdy image into a selling point. Everything has to be cool and nice and have a good beard. A big shift was when Elon Musk got the new boyfriend of Amber Heard and her last boyfriend was Johnny Depp. I think, this is a shift in society we should not forget.

VICTOR MAZON

A conversation on locative audio, design and pedagogics of open technologies.

Can you tell a little bit about your research on low frequencies?

Moving out of the city into the mountains or isolated places, reveals a hidden natural space, where I go to capture and record natural phenomena. Tectonics, the Aurora Borealis or different wavelengths on very low frequencies of the electromagnetic spectrum: as spherics, tweeks and whistlers coming from outside and inside the earth. They are getting reflected in the ionosphere and then the signal gets redirected back towards the surface of the earth. It travels for thousands of kilometers to bounce back on the magnetosphere. It is a different part of the spectrum than high-frequency receivers, called natural radio, its behavior differs from human-made microwaves like GPS, Bluetooth or WIFI signals. When you are in the city center, micro and radio waves get the loudest and mask the natural radio, so it's necessary to move to a natural isolated place.

You were developing special receivers for these signals?

I´ve been researching on and designing those two kind of receivers, as one was becoming alive in urban areas, where there is lots of wireless human machine communication, where the natural radio gets masked by the strength of this human activity. I´m interested in developing different tools to capture these electromagnetic soundscapes and document these activities; from natural radio to human-made radio, which both seem absent in our perception.

What I'm trying to address in my personal research relates to the non-visible. I intent to develop perception and create installations, multiples or performances with those results.

In the last years I have mainly worked with light and sound, wavelengths that we cannot see or perceive through our senses. The eyes dominate most of our perception and how we appreciate the world. Through these technologies, we can experience, analyze and study our environment.

Should we embrace this kind of technology as extension of our bodies and our perception?

Technology offers us a lot of possibilities, but at the same time, it's important to know that you gain something, but you lose something. I mean that they don't come free of charge. It is important to find a balance between what you gain and what you loose, as the abuse of commercial gadgets creates dependencies. They are very sophisticated and designed to seduce us. If you do not use it in a considerate manner, all this constant flow of information and upgraded technology, can make you easily loose your free will and your focus or make you dependent and unproductive. Even if we are constantly online, we feel more and more alone. Many people publish a lot personal content to platforms for users they don´t know at all. This is distracting us from our most proximate reality, in which we live in, and precisely this permanent connection is what makes us lonely beings. Zygmunt Bauman wrote: "We are lonely in permanent contact".

I think the interesting part about the do-it-yourself or the open technologies might be your close connection to the community and the development, which enables you to perceive and involve yourself in different stages and on different layers in the development of this technology. In contrast to a closed product, where you become a user/consumer.

What role do workshops play in your art practice?

In the workshops I've been involved in during the last fifteen years, the emphasis was not on the technology itself, but

rather on allowing you to experience certain concepts and gain knowledge about them. An example would be the workshops covering radio waves and non-regulated transmitters for low range community radio. Here the importance lies not in the HF transistors, variable capacitors and resistors involved in the circuit, but rather the question what the impact of a community radio might be? Or when and through which platforms it becomes tactical or illegal to share information? How was radio used in the 50s to the 60s, when radio was broadcasted mainly from universities? What will happen with the FM broadcast after the analog shutdown if it's not interesting anymore for the commercial market?

What is your methodology when developing your work?

My work deals with sound, but my brain works visually. When I'm trying to find a strategy to present some information or to discuss a topic, I always work with graphics or maps. When I'm researching or designing electronics, these graphics allow me to remember how they work, and for some complex terms I usually make drawings. Or I relate the concepts to the ones I studied, which mostly come from the field of art. In my drawings I many times connect the concepts of the designs to specific moments in art history. I enjoyed my art history classes lot: how information was transferred from oral communication to drawings on caves to printmaking. These simplifications of humans and animals are what

motivates me in each project.

Normally in a project, I start with collecting sketches and drawings, creating a database of papers, data sheets, visual documentation and then I scan all these different materials. As I´m using CAD software, I vectorize the images and modify them, and adapt them to the designs. I see it as an evolution of my speciality on fine arts which is lithography and engraving. In the end my main interest lies in printing memories into materials. When I was making lithography, I was using a stone that was much older than me, printed with a lot of stories, but then I needed to erase it. I had to refine and polish it in order to create my designs, to be able to print it on paper, through the use of acids and erosion. It has a very close connection on how our memory works and how we store stories in our brain - through moments that motivated us, seduced us or made us feel things. This also happened when I started to work with sound, from a very visual perspective. I was using contact microphones and recorded the friction between different materials. The results were specific editions or multiples on tapes, later also on vinyls, through a custom lathe cut machine.

Do you produce everything by yourself in your lab?

Today, I still make the electronic designs and the etching of the pcb´s in my own lab, but for the workshops I use industrial production. The cost of industrial production for pcb´s in short runs has been lowered so I can get much more precision and the designs work more efficient. Within a workshop environment it's been more easy to debug and predict what will happen. This offers a better experience to the participants and a finished device that will prevail for a longer time.

Andrew Newman

Andrew Newman is an artist and researcher based between Sydney and Vienna. His performative art practice poetically utilises methodologies from the communication sciences to examine value construction in contemporary culture. Newman is editor of the journal for research cultures (JRC) and is currently investigating immaterial economics as a PhD candidate at the National Institute for Experimental Arts in Sydney. He has been a director of Runway Journal for Australian Experimental Art since the first online issue Prototype launched in 2013. Newman is head of the ‚Austria Australia Arts Alliance‘ which creates an exchange of experimental art positions between Austrian and Australian researchers and artists.

Chibitronics / Jie Qi / Bunnie Huang

Chibitronics is an evolution of Jie Qi's passion for combining technology and art through making electronics using paper craft. The circuit stickers were developed as part of her PhD research at the MIT Media Lab. Together with Andrew "bunnie" Huang and Patricia Ng, Jie's research has evolved into the Chibitronics toolkits. We hope to share this new way of learning circuits and creating artwork, so that everyone can become technology creators!

Claudia Niculescu

Claudia Niculescu is an art historian and graphic designer based in Vienna. 2015 she finished her degree in Art History at the Univerisy of Vienna and is currently studing graphic design at »Die Graphische«. Her work mainly focuses on illustration, patterns and typography.

Matthias Tarasiewicz

MatthiasTarasiewicz is active as a digital bricoleur, project manager, researcher and technology theorist and works in the fields of artistic technologies, open hardware and cryptocurrencies. He currently is board chair of the Research Institute for Arts and Technology in Vienna, Austria and board member of the Open Source Hardware Association (USA). Tarasiewicz has led research projects including Artistic Technology Research with the University of Applied Arts Vienna, Making Artistic Technology and AXIOM - Open Hardware Cinema. His publications include Faceless: Re-inventing Privacy Through Subversive Media Strategies (2017), Openism: Conversations in Open Hardware (2016) and Coded Cultures (2011).

Nils Gabriel

Nils Gabriel is an artist, coder and designer based in Vienna, Austria. He develops extended publications utilising 'old tech' and 'next tech' and designs hybrid and experimental media formats by researching on media archaeology and alternative publishing methods.

Selena Savic

Selena Savic is a researcher and artist with a background in architecture (Dipl. Ing. Arch., University of Belgrade 2006). After completing her Masters degree at the Networked Media department of the Piet Zwart Institute in Rotterdam, NL she received support from the Gamefonds funding scheme (NL), to continue development of her with a critical artistic game "Eat It! City Simulator". Following a period of independent practice, Savic pursued academic research, completing her doctoral thesis "Space, people, networks" in December 2015 in the framework of the IST/EPFL Joint Doctoral Initiative, generously supported by the FCT funding. At EPFL, Savic worked as a doctoral assistant at the MediaxDesign Laboratory. She is currently a Postdoc fellow at TU Vienna.

Stefanie Wuschitz

Stefanie Wuschitz works at the intersection of art, research and technology, with a particular focus on feminism, open source technology and peer production. 2006 She graduated from the University of Applied Arts Vienna (Transmediale Kunst) with honors. 2008 she completed her Masters at TISCH School of the Arts at NYU (US) and became Digital Art Fellow at Umeå University (SE). 2009 she founded the feminist hackerspace and collective Miss Baltazar's Laboratory. In 2014 she finished her PhD with the title 'Feminist Hackerspaces. A Research on Feminist Space Collectives in Open Culture' at the Vienna University of Technology. She is involved in several international art-based research projects.