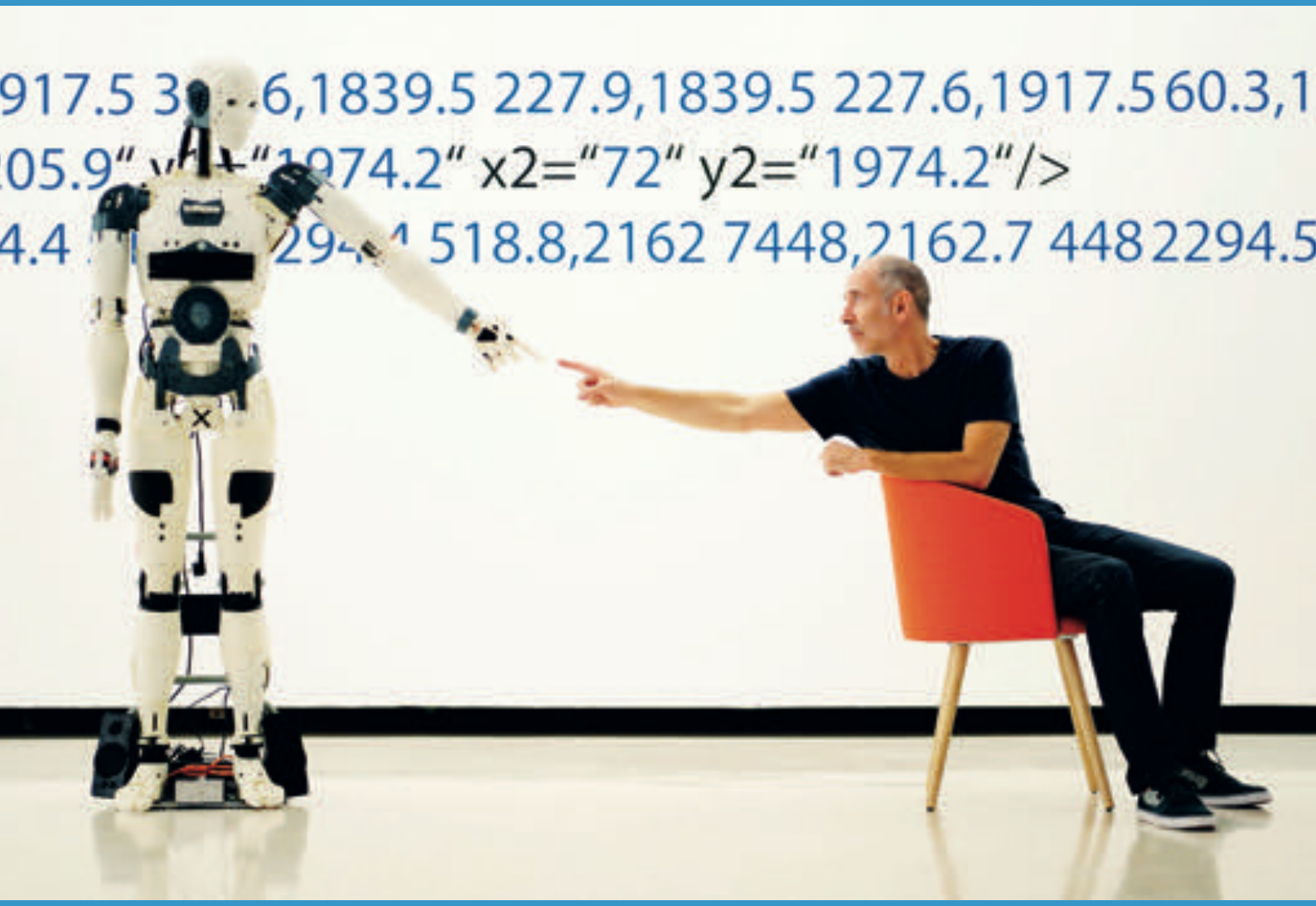
RENAISSANCE 2.0



Maker Faire® Bilbao

LA MACHINE'S MINOTAUR

FOLLOWING ITS MAJOR SUCCESS IN L'ÎLE DE NANTES, THE STREET THEATRE ARTISTIC COMPANY IS INSPIRING THE DREAMS OF ANOTHER CITY WITH ITS GIANT SCULPTURE THE GUARDIAN OF THE TEMPLE

BIG PRINTING

CUT OUT YOUR DESIGNS WHENEVER YOU NEED SOMETHING GREATER THAN YOUR BED

MAKERS VS COVID

THE COMMUNITY, SERVING SOCIETY DURING THE PANDEMIC

WELCOME!

It's finally here. Can you see it? It is the light at the end of the tunnel. Or maybe it's a train coming straight at us. Or even a virtual reality locomotive. Take off your VR glasses and remove the blindfold from your eyes: life is taking place out here!

Thanks to the P2P networks and the maker-hacker-fablab-DIY culture, the emergence of unprecedented new production modes is fostering a historic moment allowing artists, engineers, designers, activists, entrepreneurs and creators in general to influence the technological development of our societies without the need for any major resources. The non-formal knowledge transmission networks comprising this constellation of new spaces provide an early point of access to 21st century skills that sometimes takes the local creative fabric years to obtain. These meeting spaces facilitate an unprecedented dialogue between humanities, the arts, science and technology, as well as a critical reflection on their relationships and interferences.

At Space Open we feel inspired by the uncomfortable position of socially committed art to annex ourselves to different contemporary cultural issues and issues. This allows us to act on them, speeding up their adoption in and extension to other areas. The maker-hacker-fablab-DIY culture methodologies integrated into a cultural context is testament to a decade of innovation in areas such as education, self-employment and social issues. Thanks to the pressure of artists over the last few years, the museum's workshop, which used to be consigned to the backroom, is now right in the showroom, due to the fact that the process is as important as the end result.

Fab Labs and other community spaces focused on art and make-it-yourself philosophy serve as a meeting point for communities that try out new ways to create, make and live together. A critical and public perspective to separation, passed on down from the industrial age, between those who do, who think and who buy.

The maker culture continues to be more alive than ever. DIY did the same during lockdown to get us into the kitchen and make pastries at home, turning the community into the largest manufacturer of PPEs, thanks to the materials and solidarity. We would like to thank everyone who was there in the trenches defending life at all costs, from the bottom of our hearts, you are the best.

This magazine condenses some of the activities held during the 2020 edition. Due to the fact that Maker Faire cannot take place in its normal format until we wave goodbye to coronavirus once and for all, we would like to invite you to step into our world using one particular technology that has been with us for thousands of years and really works to transmit knowledge and emotions: our beloved friend, writing. Here you will find a balanced menu of disciplines and knowledge that bring us closer to brighter futures. You will learn about a new generation of biomaterials that you can use to cook. You will discover the result you can get from combining parametric design and 3D printing. You can walk through the streets of Toulouse alongside The Machine's mythological technological creatures. You will learn tricks for making large-scale 3D prints. You will see how the Internet of Things can be applied in the classroom. And you will be blown away with the possibilities of the photoluminescent display.

This year's theme is Renaissance 2.0 and the cover features one of our most beloved robots and its creator during the previous edition of the festival, photographed by Ignacio Pérez. Inmoov was created by Gael Langevin and anyone with a desire, a 3D printer and a lot of patience can recreate it using the designs released by this Parisian sculptor to be a technical asset for everyone.

This does not mean that you have to plant a tree, have kids, write a book or make a robot to live a full life. The maker movement is not about that. Instead, it tries to slowly delve into the technological changes that are on the way or that are already here in order to ensure that everyone can access them and have the right to understand the things around us and to be able to modify them so that they are not mere consumers, but also become doers.

Ongi etorri! Let's fire up the engines.

A NEW GENERATION OF BIOMATERIALS
FROM THE KITCHEN TO THE FACTORY

MATERIOM SHOWS HOW TO MAKE MATERIALS FROM PLENTIFUL BIOMASS SOURCES THAT COULD REPLACE THE PLASTICS THAT END UP POLLUTING OUR OCEANS. THE REVOLUTION BEGINS IN YOUR HOME KITCHEN.

Different profiles and disciplines co-exist under the umbrella of the maker concept that seek specific solutions for the challenge's of our age, sharing knowledge, tools, and experience in terms of collective and distributed solutions. There are many allies willing to tackle the challenge of creating and scaling production of plastic alternatives and new environmentally-respectful materials in the design world.

Connecting disciplines like chemistry, physics, and digital manufacturing, this intersection is bearing witness to how distributed and open-source design is providing alternatives where the factory might be in our very own kitchen, with non-toxic elements and DIY methods.

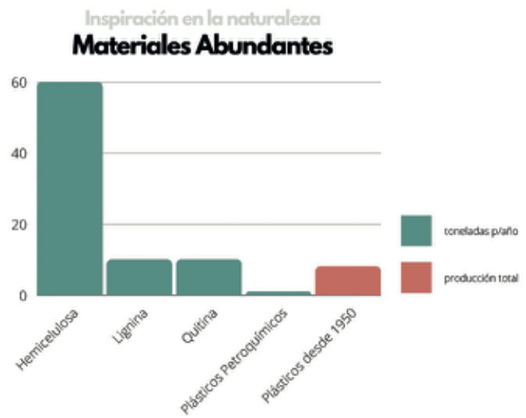
The design world is, in fact, the source of the members of Materiom, a collective born between London and Amsterdam. Its mission is to open the door to everyone to become an active player in the next generation of materials. Materiom works with companies, cities, and communities to support development of natural material supply chains that feed local ecologies and economies.

During its workshop at Maker Faire Bilbao, given by Pilar Bolumburu and Zoe Powell, participants were able to work kitchen-to-kitchen in online format, through a video call, testing several agar-agar and gelatine-based recipes.

"I learned techniques and processes and unlearned my fear of using the kitchen as a test lab, and was able to find useful resources to research further and take the leap toward experimenting on my own," explains one of the participants, summarising the widespread feeling.

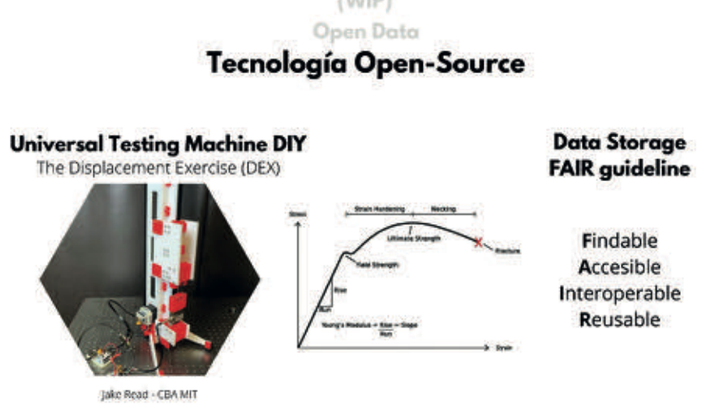
Materiom seeks to provide access to knowledge in order to prepare sustainable materials based on plentiful biomass sources in the area, like cellulose, starch and proteins, natural fibres, common minerals, and clays. The library is accessible and fed by the community, so anyone can send and access recipes developed anywhere around the world.

For an idea of the scale, the image below shows the number of different biopolymers that are naturally created by nature every years. "If compared with petrochemical plastics, this number is much lower, but the problem it creates for us is exponentially more negative. Even the planet continues to generate more hemicellulose (in plants and tree leaves, for example) than all the plastic generated throughout the entire history of humanity," add Zoe and Pilar, who taught the workshop from London in distributed fashion, providing a shopping list to each attendee so they could procure their own local materials that they each adapted to their own tastes and interests. The recipes can be adapted to aspects like local humidity or climate to perfect the result.



Very interesting work is also being conducted around the creation of machines to test the properties of these materials with universal DIY machines, such as the project The Discplacement Exercise by Jake Read at the Center for Bits and Atoms at MIT. These images show several fragments of the presentation given by Materiom before the workshops.

www.materiom.org | @materiom_



ENTREPRENEUR OPPORTUNITIES

This field, full of opportunity, is opening doors to a new generation of entrepreneurs who seek to find economically viable solutions for the challenge of the ecological transition. I have specific examples here:

NOTPLA: Edible algae-based containers, already available in several delivery segments of the UK. This project comes from two design students at the Royal College of Arts of London **https://www.notpla.com**

SULAPAC: Microplastic-free material for packaging, made of wood and natural binding agents. **https://www.sulapac.com/portfolio**

BIOMH: Biomaterials for construction, a field full of opportunity in a sector that intensively consumes resources and requires more sustainable solutions. **https://www.biohm.co.uk**

WHEN PARAMETRIC DESIGN JOINS FORCES WITH 3D PRINTING

Photo: Gianluca Pugliese

At the Maker Faire Bilbao workshop, teams from ControlMad and LowPoly shared key features of this intersection with great innovative potential. To go further in depth, the book Advanced 3D Printing with Grasshopper bears a collection of many key elements

The intersection between parametric design and 3D printing is a field where the democratisation of digital manufacturing opens up many doors with high innovative potential. The book *Advanced 3D Printing with Grasshopper®: Clay and FDM*, written by Diego Cuevas and Gianluca Pugliese, includes certain techniques that, up until now, were only shared orally. This makes it easier for other people who are interested to learn to transform design into a series of curves and trajectories that a 3D printer can turn into a physical object.

The book, which teaches how to create a G-code directly from Grasshopper, without scripts or added plugins, is designed for ceramic materials. However, its lessons can also be applied to FDM 3D printing with

thermoplastics. Both Diego and Gianluca participated in the Maker Faire Bilbao with an online workshop on parametric design and recycled material for 3D printing.

At LowPoly, his mother digital manufacturing company, Gianluca Pugliese manufactures all kinds of large-format parts for companies and public and private institutions. One of his latest creations are the pieces included in the exhibition Print3D, at the CosmoCaixa Museum of Science of Barcelona, where a gigantic spiral stairway, 3D-printed motorcycles, and several other surprises help us to understand that digital manufacturing is growing in scope and possibilities in recent years.

At ControlMad, Diego Cuevas and his partners offer practical training on digital manufacturing and parametric design, which can be applied to diverse sectors like architecture, industrial design, rapid prototyping, or jewellery, to name a few.

MYTHICAL MAGIC

BEHIND THE SCENES WITH LA MACHINE'S GIANT MECHANICAL SCULPTURE FROM THE *GUARDIAN OF THE TEMPLE*

WRITTEN BY CALEB KRAFT

THE PEOPLE OF TOULOUSE, FRANCE WENT OUT INTO THE NOVEMBER MORNING TO FIND something very unusual in the street: a 46-foot-tall slumbering Minotaur, crouched and silent, the morning dew glistening off its hand-carved skin and steel bones.

The monster is the star of La Machine's modern interpretation of the classical tale of Ariadne (played by their giant spider, La Princesse). In this version, called The Guardian of the Temple, she is not an agent in the Minotaur's demise, but rather a protector, helping guide him to where he may find peace. Acted out over the course of several days, complete with live orchestral score, the company choreographed the two creatures' passage through the city. Crowds gathered to witness these two animated sculptures tell their tale.

La Machine, led by François Delarozière, calls itself a "street theatre company," but that description obscures the scale on which it operates. Its fantastic, moving creations – spiders, elephants, ants, and herons – tend to be many stories tall. While these are technically puppets, the team melds the most impressive elements of craftsmanship and engineering to build creations unlike anything seen before.

In addition to debuting their latest mechanical masterpiece, the November event celebrated a new Toulouse facility in which to house the colossal creations of La Machine. Typically the sculptures are crated and hidden away between events. Now, they will have a new home in the Halle De La Machine, where they can be on display and interactive year-round.

"I chose the Minotaur as a machine for Toulouse eight years ago," says Delarozière. "Toulouse is an ancient city and its city center, made of narrow, monochrome streets, looks like a labyrinth. Toulouse is also at the door of Spain and the bull is present in the history of the city."

On a 2016 visit to La Machine's workshop in Nantes, France, I got a sneak peek at the then-under-construction Minotaur.

CALEB KRAFT is a senior editor for Make: magazine. He has traveled the world documenting makers and their creations for the global community to enjoy.

MAKER FAIRE BILBAO

Christian Gazzera

"I CHOSE THE MINOTAUR AS A MACHINE FOR TOULOUSE EIGHT YEARS AGO. TOULOUSE IS AN ANCIENT CITY AND ITS CITY CENTER, MADE OF NARROW, MONOCHROME STREETS, LOOKS LIKE A LABYRINTH." – FRANÇOIS DELAROZIÈRE

Mythical Magic

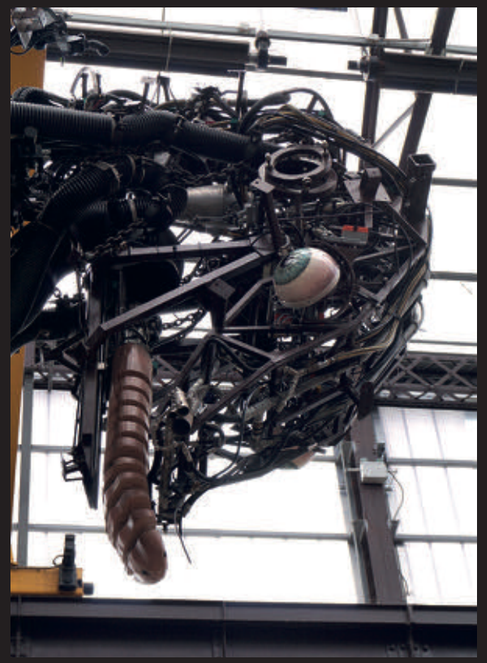
Most of the sculpted body parts were off the steel robotic structure that day, being finalized, finished, and detailed. The mechanical skeleton loomed over us. The sizable structure consists of roughly 50 tons of steel, hydraulic systems, and wood. You can truly feel that mass when it moves around you. Surprisingly, however, the movements are very graceful.

"The most complex part to develop was the exoskeleton," says Delarozière. "That allows the manipulation of the arms." It, along with the rest of the creation, is no simple matter. Like many of their works, the Minotaur is steered not by an individual but by a team of artists, each piloting a separate appendage in unison with the others. They create an impressively cohesive movement, making the beast seem to walk and interact with the crowd.

What really surprised me about all the wooden parts is that they are hand sculpted to get to the final shape. Skilled artisans using power grinders and hand tools do all the finishing touches. The sheer quantity of sculpted parts was stunning, especially when you consider that there are multiples of these (in case something breaks), which is true for all of La Machine's creations.

As a child, I read about the Seven Wonders of the World and thought to myself just how impressive it would have been to witness them while on an epic adventure. As I walked into La Machine's workshop, I was struck with the thought that this is what it must have been like.

As for their next build, it promises to be equally wonderful. "We are currently building a dragon for the city of Calais, the Calais Dragon," says Delarozière. "The beast will measure 25 meters long and weigh 70 tons."



Mythical Magic

The Minotaur's skeleton loomed over us the day we visited as the majority of the body parts were off of the structure.

An early mock-up, where you can see the hand-drawn lines figuring out just how they should segment the body for movement.

François Delarozière, the man behind these constructions, has a wonderful, creative mind. I don't often get star-struck, but I bought one of their concept art books and had him sign it.

"THE MOST COMPLEX PART TO DEVELOP WAS THE EXOSKELETON. THAT ALLOWS THE MANIPULATION OF THE ARMS." – FRANÇOIS DELAROZIÈRE

To control the left arm, a pilot dons this exoskeleton that allows the Minotaur to mimic the motion of the wearer.

Skilled artisans using power grinders and even hand tools to do final shaping.

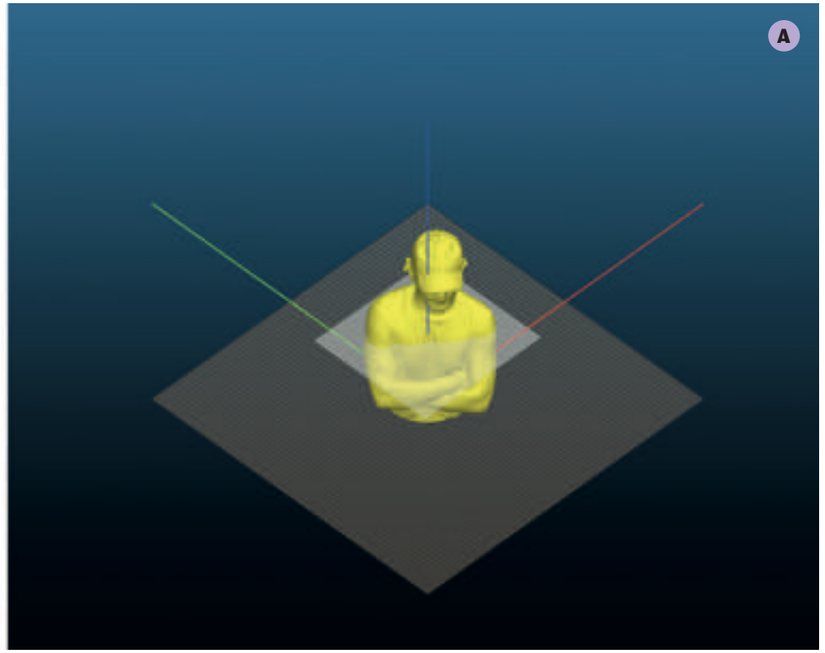
Caleb Kraft, Emmanuel Bourgeau

BIG PRINTING

Chop up your designs when you need something bigger than your bed

Written by Caleb Kraft

James Bruton poses in front of his 12' tall sculpture of himself, made and segmented in Fusion 360.



Sometimes you get a really big idea. An idea so big that, when printed, it will dwarf your 3D printer. This presents a surprisingly common problem — how do you print something bigger than your machine?

There are two main ways of dealing with this:

1. Design your file for printing in small chunks by including alignment features, and not exceeding the size of your printer with each part.

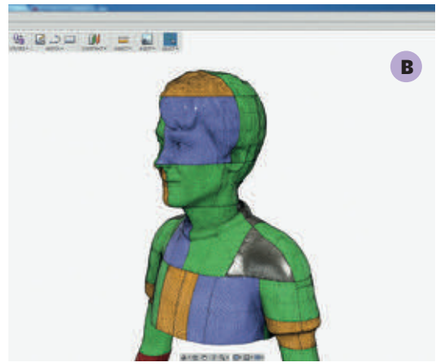
2. Take a file that already exists, and cut it up using various methods to get it down to the sizes you need for later assembly.

In our experience, the second method seems to be the more common approach, and is the one used by collaborative groups like We the Builders (**wethebuilders.com**) and The Great Duck Project (**thegreatduckproject.org**) to create their large scale, crowd-sourced sculptures.

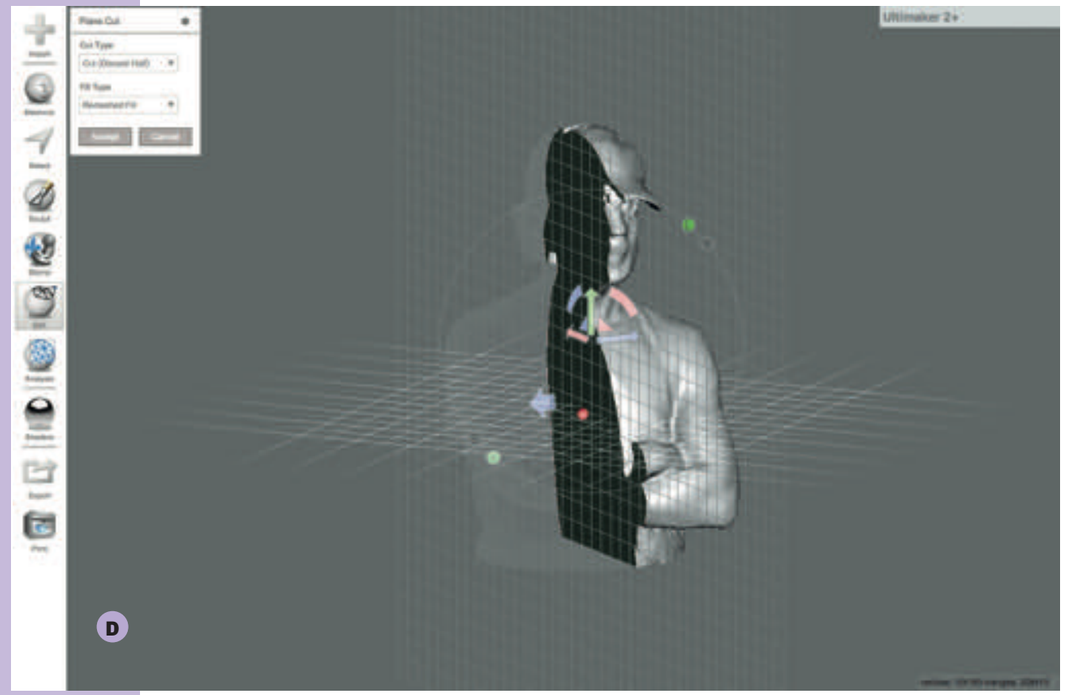
Let's look at a couple options for cutting big things into easy-to-assemble smaller chunks.

Your Slicer

In many slicers for your 3D printer (like Slic3r), there are options to split the model in half on the Z axis, which can allow you a bit of flexibility.



We the Rosies, designed by Jen Schachter and segmented in Netfabb and Meshmixer by Todd Blatt.



D

E The Luban-generated Great Duck Project by Jesse Robinson and Nicholas Iacobelli, made for Maker Faire Westport.

Billz Sharif, Lujie Chen, Jacob Ayers, Mark Matthias

Other programs like Cura allow you to cut a file similarly by manually moving it down into the print bed. This isn't a very flexible approach, but can save you in a pinch, especially if you have time to get creative with a manual solution (Figure A).

YOUR ENGINEERING SOFTWARE OF CHOICE

Pretty much any CAD software is going to have the capability, with some effort required, to split parts (Figure B and C). We've seen it done with clever scripts in OpenScad, and manually in Autodesk Fusion 360 (for instance, on James Bruton's nearly 12' tall, world record sculpture of himself, seen on page 118).
We the Builders utilized Netfabb to manually dissect their projects. This will all take some skill, knowledge, and effort.

MESHMIXER (meshmixer.com)

Good ol' Meshmixer has been around for years and is still a highly recommended tool for simple modifications and model mash-ups. The cutting tool in this package is more powerful than the one found in most slicers and can allow you to get more fine control over chopping up a model. There will still be some manual effort as you'll need to determine every single slice placement and create your own alignment structures (Figure D).

LUBAN (luban3d.com)

The best tool for this currently is Luban. Fairly new to the scene, Luban is capable of splitting your model automatically in various ways, while also automatically adding alignment methods, and even numbering the parts if you need.

The package has many options on how it slices, what alignment method you'd like to use, the size of slices, and more. Then, there are methods of manually determining how things are sliced if, for example, you want a split to happen along a complicated contour (Figure E).

ATTACHING YOUR PARTS

After you get all the parts printed, you're going to have to make it all stick together. For the most part, cyanoacrylate (aka super glue) will work wonders. However, if you happen to be using a material such as Nylon or TPU you may have to experiment with other methods such as using a two-part epoxy that remains slightly more flexible.

Billz Sharif's Joker, dissected by Luban software (top) and assembled.

Large-scale triceratops print by Luban founder Lujie Chen.

MAKERS VS COVID

"I hope you live interesting times," says a Chinese proverb that is a perfect fit for trying to see something positive in all the sadness and negativity brought about by the COVID-19 pandemic. One of the most positive aspects has certainly been how our society has burst into solidarity, with all kinds of support for people in the front line of fire. Tablets to help communicate with loved ones, cloth masks, robes, protective visors, and even prototypes for respirators to bolster the lack of commercial equipment at a critical time in the pandemic's first wave, when we still had yet to learn many things and were still rubbing our eyes, thinking that the dystopia we were experiencing was not a television series, but our actual lives.

The photo you can see with this text is from a morning in March 2020. Mertxe, a doctor at a health centre in Bilbao, found out through colleagues that we were distributing protective visors and almost immediately drove over, without changing her clothes, because every minute counted. We want to remember how those days brought out the best in us. We want to pay tribute to the hundreds of people who helped make the maker community into the greatest PPE factory in the world from one day to the next, either by designing, manufacturing, donating material, distributing visors, or by calling to inform that a nursing home or hospital needed material.

To everyone who helped, our most heartfelt thanks.
You were on the right side of history.

List of acknowledgements:
Fundación Orange
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Bilbao Arte
Errealkubo
Covid Euskadi
Coronavirus Makers
Fab Lab Network
Make Magazine + 5-6 More names
Hemen

CONNECTED OBJECTS, FLIPPED CLASSROOMS

This course can open many doors for you. Researchers César García and Diego Casado share a series of online tutorials to learn to create objects that can collect data from their environment with Arduino Nano 33 IOT.

The concept of the Internet of Things has been with us for many years now. People started using the term in the previous decade to refer to the growing trend of how IT's computing capacity was moving to all sorts of physical, everyday objects around us. The network that these objects, sensors, thermostats, household appliances, public lighting, and traffic signals form would bring the number of computers in our daily life to numbers never before seen in the history of humanity. Like with any other change in technological cycle, this brings with it many possibilities of understanding the world with data from sensors and new actuators to solve complex problems. However, it also brings a new series of challenges and dangers in terms of privacy, security, or accessing these new sources of knowledge.

During the course at Maker Faire Bilbao, Cesar García, researcher and promoter of the channel La Hora Maker, and Diego Casado, researcher and professor at Deusto University, joined forces to create an experience that used an online format to test methodologies that prioritise the quality of collective work's time. Known as Flipped Classroom, this format consists of directly uploading courses so that everyone can go at their own pace, looking at the classroom content and digesting each technical step to make connected objects.

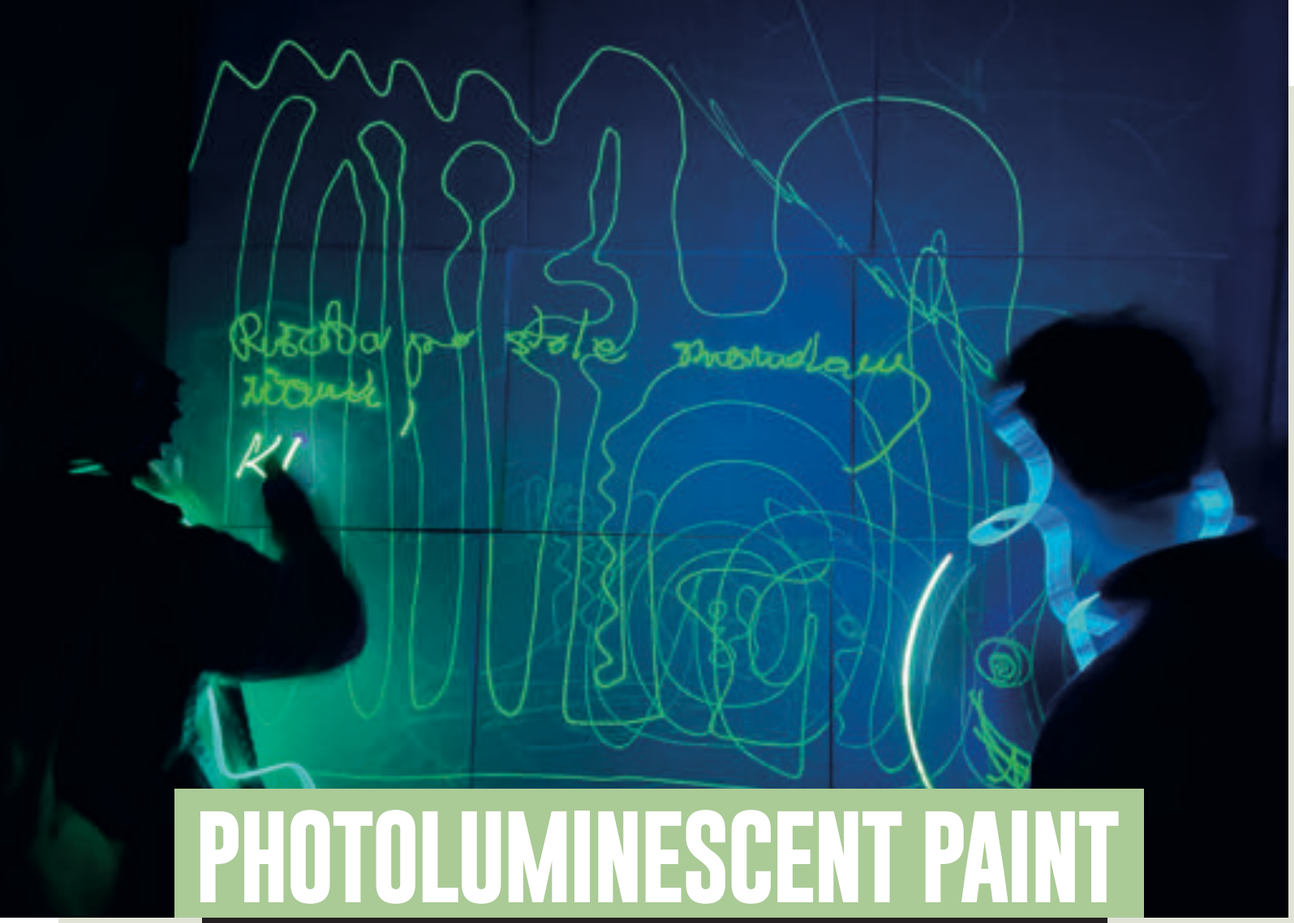
Participants learned to use the Arduino Nano 33 IOT to measure acceleration, ,humidity, temperature, and more, to then capture data through Blynk, an IoT platform compatible with multiple kinds of hardware that includes mobile applications, private clouds, device management, data analysis, and machine learning.

IÑAKI:
"I've got a drawer full of robots. This is an opportunity to keep learning and making progress."

All these courses are available on the YouTube channel La Hora Maker.
https://www.youtube.com/c/LaHoraMaker/videos

- First steps with Arduino Nano 33 IOT
- Simple programme structure
- Measuring acceleration
- Measure temperature and humidity
- How to connect the Nano 33 to our WiFi
- Remotely controlling our Arduino
- Connecting to the Blynk cloud platform
- Store and view historical data
- Using Neopixel RGB LEDs
- Connect Arduino to an API
- View weather with Nano 33 and Neopixels

MAKER FAIRE BILBAO



PHOTOLUMINESCENT PAINT

THANK YOU, MR EINSTEIN

The artist E1000 shares his method to create your own photoluminescent wall where you can paint with light.

While remembered by collective memory for his theory of relativity, physicist Albert Einstein did not win the Nobel Prize for his space-time theories, but for his contributions to the photoelectric effect. With this concept, Einstein's work at the time showed the emission of photoelectrons that occurs when electromagnetic radiation enters in contact with certain types of materials.

This is exactly what happens in this experiment, which allows us to create a new medium where we can paint with ultraviolet light as if it were a brush, leave our shadows printed on the wall, or even an image projected with a projector or a mobile phone screen.

The artist E1000 share his recipe with us to create large-sized walls and canvases to play with lights and shadows and see an excellent example of Einstein's theories turned into a tool for creative expression.

STEPS TO FOLLOW:

1) Primer

With the lacquer rollers, apply 3/4 coats of multi-surface primer, leaving a 12h period between coats.

2) Paint

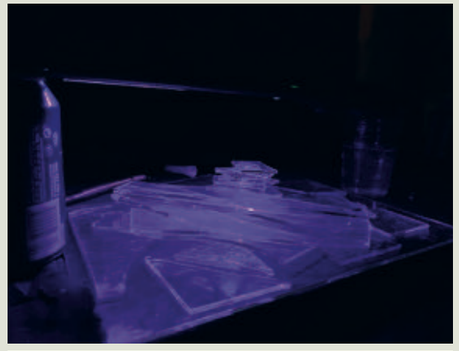
Once the primer is entirely dry, use a smooth or lacquer roller to apply another 3/4 coats of acrylic photoluminescent paint. Try to always stroke in the same direction and pay attention to where the pigment goes. You can use the blacklight in the darkness to do this.

3) Flexible latex

To make more flexible, you can finish with a flexible latex layer and make the paint better adapt to the textile surface.

4) Draw with luminescence

Prepare the canvas or surface by stretching taught. With different lights, you can create silhouettes if you leave the paint for a while and you can diffract the light, making textured or polygonal stained glass.



MATERIALS:

- Surface to paint (preferably not porous), like a non-microperforated tarp, canvas, wall...

- Multi-surface primer.

- Acrylic photoluminescent paint. For our wall, we used Mongay 72300 paint. Pigments may also be purchased from different online distributors to make a mixture.

- Flexible latex.

- Lacquer rollers.

- Short-nap rollers.

- Trays.

- Ultraviolet lights.

BIOLOGY AS ONE OF THE FINE ARTS

VANESSA LORENZO EXPLORES NEW POSSIBLE FUTURES IN THE INTERSECTION BETWEEN LIFE SCIENCES AND SPECULATIVE DESIGN. AT HER WORKSHOP, ATTENDEES MANUFACTURED THEIR OWN BIOREACTORS TO CULTIVATE SPIRULINA, A SUPERFOOD WHICH CAN BOTH BE CREATED IN-SITU AND CAPTURES CO2 FROM THE ATMOSPHERE.

Vanessa Lorenzo's work leads us to constantly reframe what it means to be contemporary. Does it just mean seeing fracture points, pointing them out and looking for guilty parties, resigning ourselves to live in an inevitable dystopia? Or does it mean we are able to formulate alternative, light-filled futures in the collective imaginary through critical dialogue between science, art, and technology?

From cyberpunk to solarpunk, or even hopepunk, according to the most optimistic, Vanessa Lorenzo preaches by example with her artistic career. An artist trained in industrial design, from Biscay and residing in Lausanne, Switzerland, her work seeks to connect the dots between technology and nature through the human body and stories that act as a mirror for the dilemmas of our age. In Switzerland, collaborations between artists and scientific institutions like CERN are normal, encouraged through different European Commission support programmes.

"Hopepunk says, "No, I don't accept that. Go fuck yourself: The glass is half-full." YEAH, we're all a messy mix of good and bad, flaws and virtues. We've all been mean and petty and cruel, but (and here's the important part) we've also been soft and forgiving and KIND. Hopepunk says that kindness and softness doesn't equal weakness, and that in this world of brutal cynicism and nihilism, being kind is a political act. An act of *rebellion*."

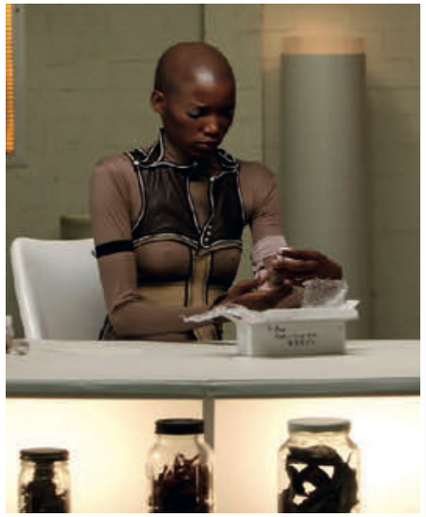
Alexandra Rowland. The opposite of grimdark is hopepunk. Pass it on.

During Maker Faire Bilbao, Vanessa shared a do-it-yourself kit with participants to cultivate Spirulina, an algae considered a superfood of the future, not only because of its nutritional properties, but also because of its effectiveness in capturing Co2. With an Arduino Nano, air pump, and white LED, the kit creates a perfect ecosystem to cultivate this algae in a beautiful object that acts as the living environment for this organism.

If you would like more information, please Vanessa's Github with all the information from the workshop so you can reproduce it with elements you can find locally or online.

+INFO: https://github.com/Vlorenzolana

AMAIA: "I WORK IN THE ALGAE SECTOR. I WANT TO MAKE MY OWN SPIRULINA LAMPS"

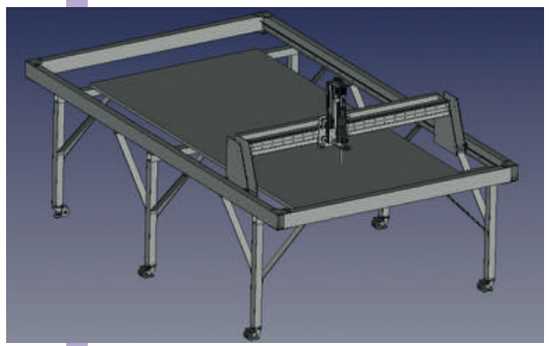


JONE: "I'M A BIOLOGY TEACHER AND I WOULD LIKE TO BE ABLE TO APPLY THIS KNOWLEDGE IN THE CLASSROOM"

AGUSTÍN: "I'M AN ORNAMENTAL PLANT AGRICULTURAL ENGINEER. THIS IS THE FIRST TIME I HAVE WORKED WITH SPIRULINA"

SAIOA: "GROWING MY OWN SPIRULINA WOULD ALLOW ME TO ADAPT IT TO MY IRON NEEDS"

MACHINES FOR SHARING



Ferdinand Meier, resident maker of our support programme for the creation of open knowledge, designed a machine that costs ten times less than its commercial equivalent.

Ferdinand Meier is a German mechanical engineer who has spent years with the idea of finding ways to democratise access to one of the most expensive machines in digital Fab Labs' inventory, joined by a network created by MIT in Cambridge, Massachusetts.

The mechanical engineering school in Munich where he studied is one of the great international focal points of knowledge in the field, the source of German wealth through sectors like the automobile.

His years of research and prototyping culminated with this full-metal machine, manufactured with local materials (the Basque Country is the Silicon Valley of metal for a reason), at a cost of hardly 2,000 euros. A machine with the same features and size (3x2 metres, with the capacity to mill standard 2.5m x 1.2 m boards would cost over 20,000 euros).

All blueprints and instructions to manufacture it are available on Ferdinand Meier's GitLab.

https://feadi.gitlab.io/cnc_bilbao/

It is thanks to people like him that technologies are democratising and lowering in price until becoming affordable, just like 3D printers.

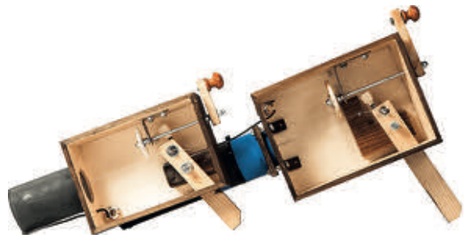
After years working on designing BMW motors, Ferdinand became a Fab Guru who provided support to some of the most important Fab Labs in the European network, like in Barcelona, Lisbon, or currently, Kamp Limpfort, Germany. In this edition, he participated by giving a workshop in collaboration with Japi Contonente on the creative use of milling machines for all kinds of projects, from architecture to industrial design, just to name a few applications.

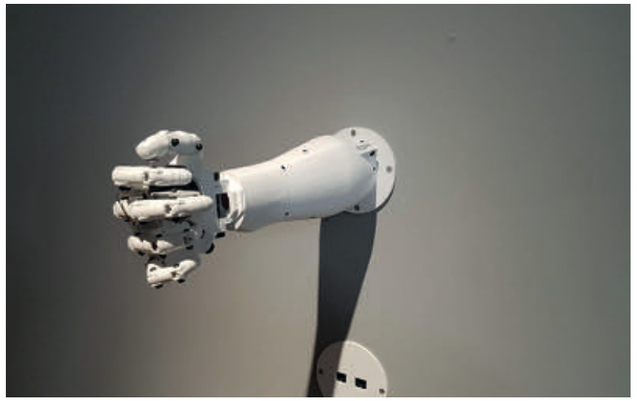
LUTHERIA EXPERIMENTAL

Jonathan Garcia Lana, Tunipanea, is one of Bilbao's artists with the greatest international visibility of his generation. His work in recovering and reusing elements from the "garbage jungle" we live our lives immersed in our cities to create musical instruments has led him to travel halfway around the world to give workshops where he also teaches the foundation of electronics and sound. In his participation in Maker Faire 2020, for a weekend, participants were able to learn to build an electromagnetic device based on a simple blueprint with a series of materials. Thus, in addition to leaving with their own creation, several people welded for the first time and learned how to make a circuit.

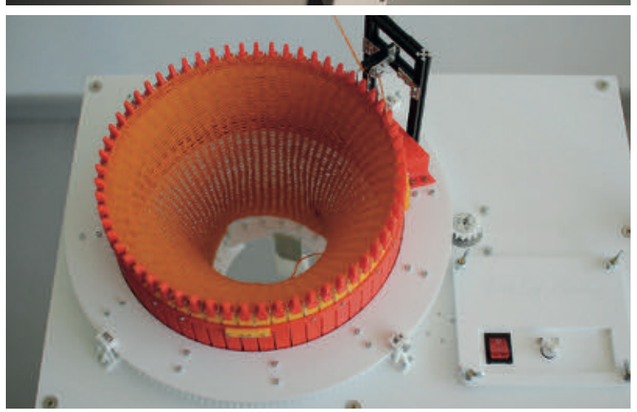
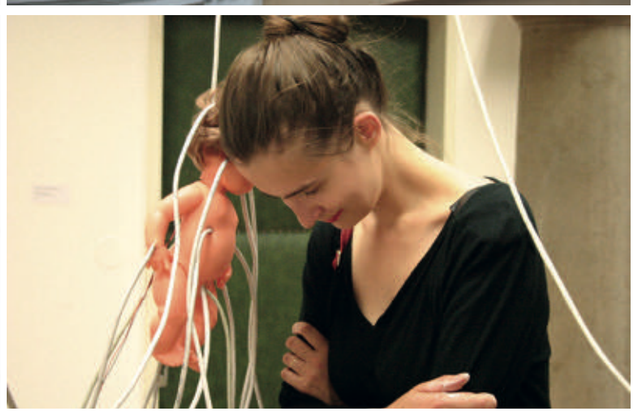
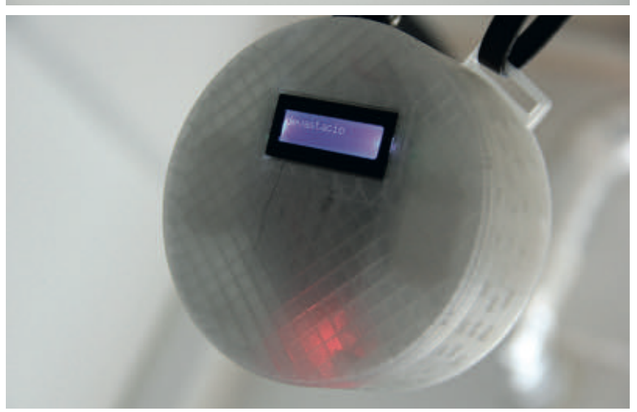
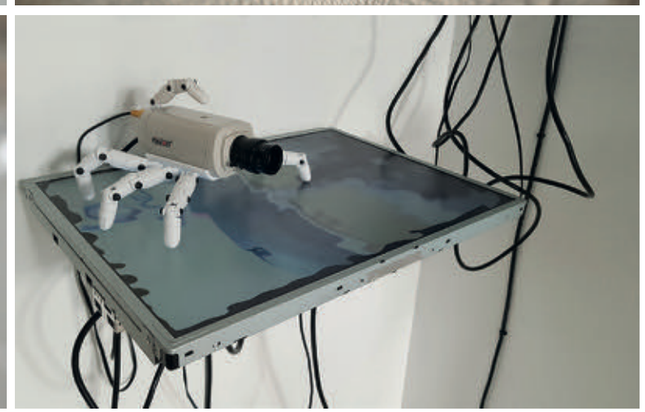
In recent years, Tunipanea has devoted a great deal of time to a dream trip he had: to create a library to loan out his experimental instruments to musicians, artists, and the general curious public. The project is called Lutiteka, launched with the support of Bilbao Ekintza through the programme Bilbao International Art District, and has over one hundred experimental instruments (automatons, stringed and membrane instruments, and many more).

For further information, please see the artist's webpage *https://tunipanea.com*







UNPRECISE ROBOTS,

Behind every technology released by Cultura Maker, **each fantasy machine that** suddenly becomes accessible to all, like 3D printers, **or each creative programming software** like Processing or Open FrameWorks, **what you find are people**. People with all kinds of profiles who spent the time to understand something, study it, decode it, demystify it, and translate it into instruction manuals that anyone can use to replicate their discovery.

The ideas that **Varvara Guljajeva** and **Mar Canet** have tend to be so other-worldly that they end up creating their **own software and hardware tools** to make them a reality. They are part of **a new generation of New Media artists that is more luminous, open, and generous with their knowledge**, set on **using their talent to create new tools, aesthetics, and narratives** that broaden the **virtuous cycle** of the **digital revolution to other fields**.

Google included them in a selection of **the best interactive artists in the world** under its project **DevArt**. They are a part of this ***little citizen army*** that is making open knowledge travel **unexplored paths**. As such, they both returned last December for Maker Faire Bilbao to give a practical workshop on using robotics in artistic contexts. This is where the name comes from (un)preci(s)e robots.

ART & TECH

When not with their daughter, Nora, or exhibiting at the Barbican Centre of London, or creating the largest human tower in the world, or turning their wishes into butterflies or leaving Sao Paolo wide-eyed, turning the façade of one of its most emblematic buildings into a gigantic metronome, **Mar and Varvara make time to prototype the future**.

They are **leading movers** in making **knitting** another **discipline in digital manufacturing,** along with 3D printing, laser cutting, and CNC lathes. **They were pioneers, hacking the Brother knitting machine** to adapt it to the digital age with the Knitic project. Their software has served new developments like Gerard Rubio's connecting the machine to a helmet that detects brain activity to lay the foundation for the first mind-machine collaborations along with Sebastian Mealla...and they are still going. Since then, they have gone even further in depth, working on a circular knitting machine model that anyone can manufacture by downloading the designs and software on **Github** (programmer Facebook).

Varvara prefers the electronic part of the projects and their entailed philosophical issues, while Mar is a genius in creative programming, a specialist in breathing life into machines with software, the soul of the machines.

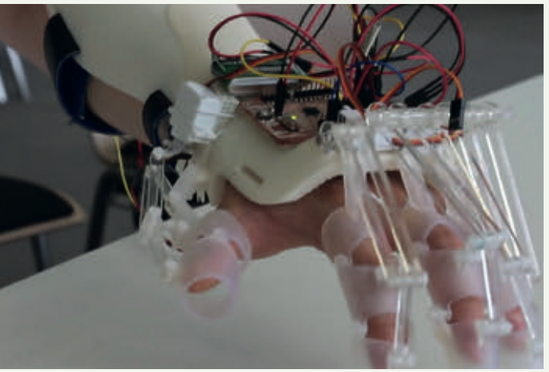
SOFT ROBOTICS:

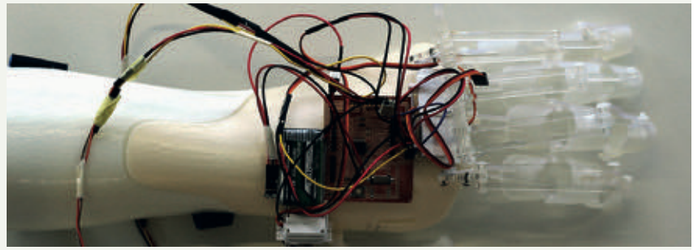
The rigid materials normally used for robotics have limitations in certain situations when greater flexibility, adaptability, or finesse is required. For this reason, an up-and-coming branch has taken the spotlight in recent years. It seeks to use soft materials and pneumatic or hydraulic systems as an alternative to regular electric-motor systems to guarantee flexibility and safety in contact with fragile parts or living beings.

This discipline is called Soft Robotics and has great potential to develop in upcoming years. Adriana Cabrera, a specialist in this field that combines digital manufacturing, design, and biomechanics at Fab Lab Kamp-Lintfort, Rhine Waal University of Applied Sciences in Germany, is also instructor in the Fabricademy global programme. Adriana conducted a workshop in this regard at Maker Faire Bilbao 2020. Adriana's most complete project in the field is Myorthotics, her final project at Fab Academy in 2017.

"I studied industrial design and interaction. I was always interested in textiles in reinterpreting materials in a new way," states Adriana Cabrera, who immediately saw the potential in this discipline to make devices applied to people (called assistive devices).

The workshop consisted of using materials that would fit in a 10 x 10 cm box that participants received in their homes.





List of workshop materials:

1 protoboard
1 Arduino Nano
1 mini USB cord
1 Transistor
1 MOSFET
2 Diode
2 10K resistor
1 metal rod
4 cable ties
2 alligator clips
5 shrunken pipes
1 PVC3*5mm 200mm pipe
1 transparent silicone 3*5mm 200mm pipe
1 transparent silicone 3*4mm 200mm pipe
1 black latex 3*5mm 200mm pipe
1 natural latex 3*5mm 200mm pipe
1 natural latex 6*58m 200mm pipe
1 x200 McKibben muscle pipe
5 jumper cables x 5 males
3 jumper cables x 5 males females
1 manual air pump
1 thermal transfer film vinyl 170mm x 500mm
1 grey Flock thermal transfer film vinyl 170mm x 500mm
2 parchment papers

For further information, please see the group https://wikifactory.com/+softrobots

Adriana Cabrera is part of the teaching team in the Fabricademy programme. Promoted by the Fab Labs network, it democratises access to use of different technologies with great innovative potential in cultural and creative industry sectors, like fashion design. For further information on Fabricademy, please visit their webpage.

https://textile-academy.org/

Maker Faire® Bilbao