FABLAB 1.0

2013-12-21

[I.T.I.S Belluzzi]

ABOUT US

Lorenzo Bertacchi

Nato a Bologna nel 1993
Diplomato all'ITIS O.Belluzzi nel 2012 in Informatica
Developer @ Gecod SRL
Hackathon & internet of things entusiast
Nel tempo libero "Maker"
Vincitore di H-ACK Industry
Vincitore di H-ACK Fashion

ABOUT US

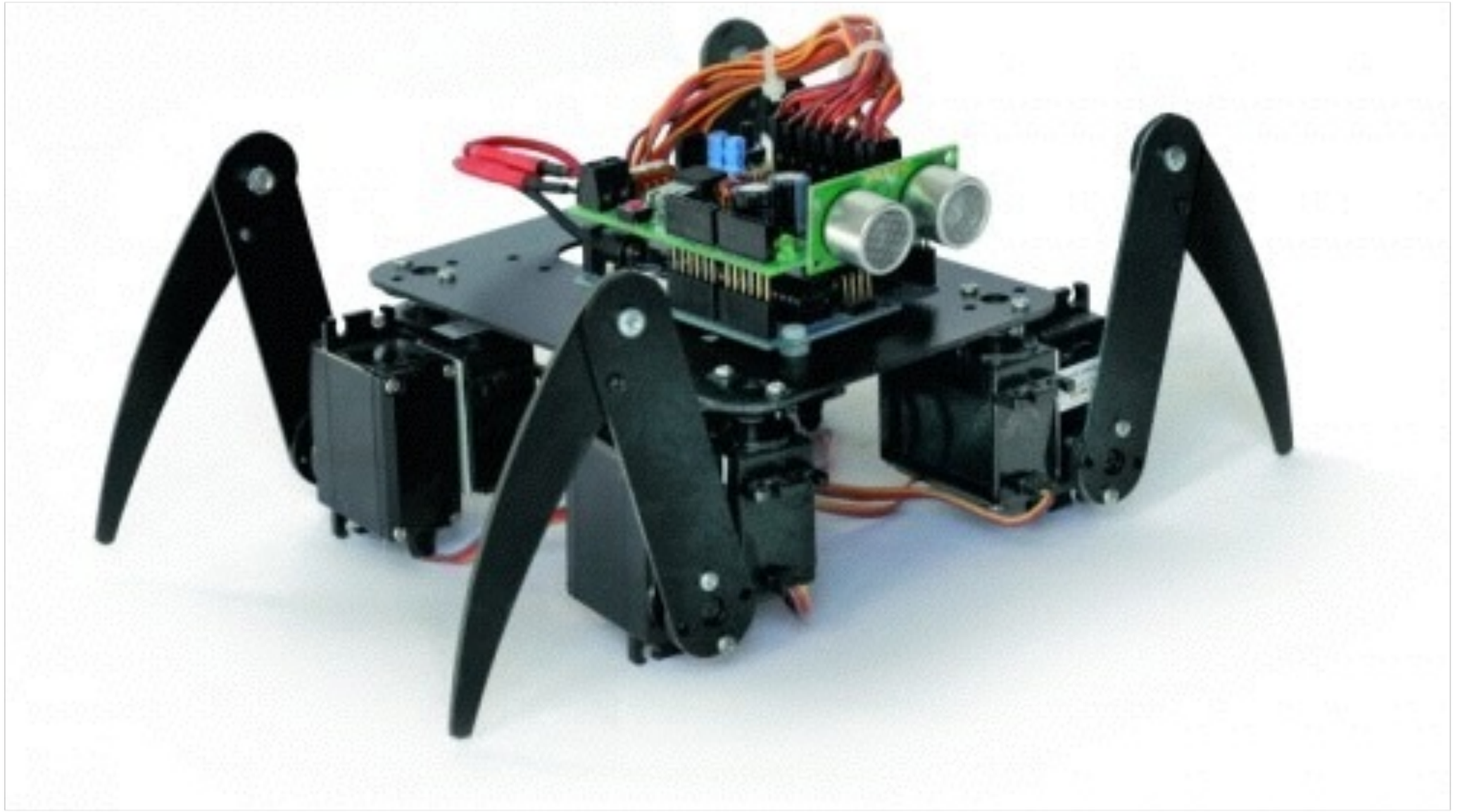
Loris Di Domenico

Nato a Bologna nel 1993
Diplomato all'ITIS O.Belluzzi nel 2012 in informatica
Studente di ingegneria meccanica @ UniBo
Membro del team di formula SAE UniBo Motorsport
Nel tempo libero "Maker"
Vincitore di H-ACK Industry

WHO ARE MAKERS?

I **Maker** sono personaggi interessanti: **non** sono nerd, anzi sono dei tipi piuttosto **fighi** che si interessano di tecnologia, design, arte, sostenibilità, modelli di business alternativi

[M.Banzi]



YOU DON'T REALLY OWN IT
IF YOU DON'T OPEN IT

MAKER PHILOSOPHY

THINK

SELL

TOOL UP

SHARE

MAKE

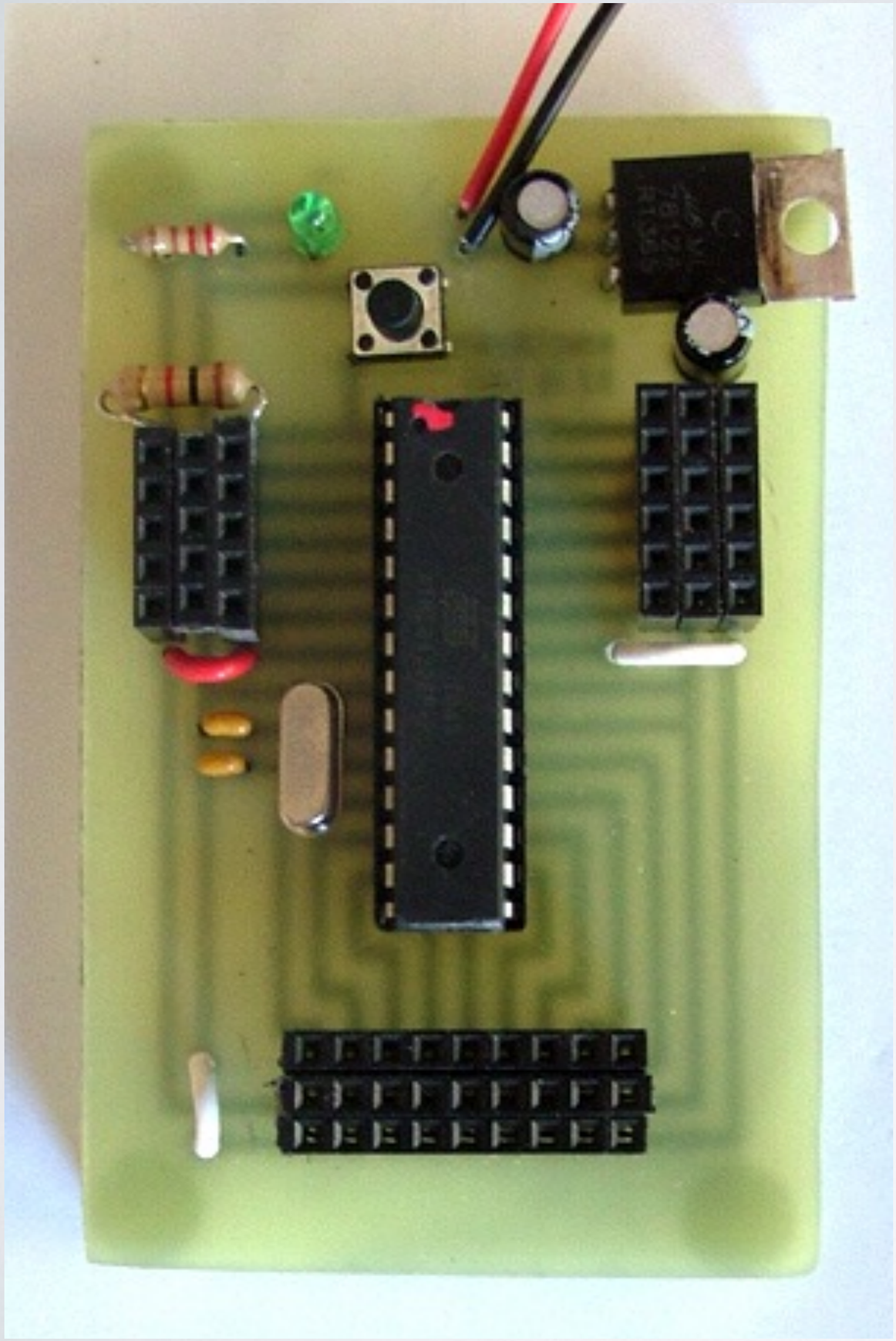
LEARN

PARTECIPATE

PLAY

INVENT

CHANGE THE WORLD



open source hardware

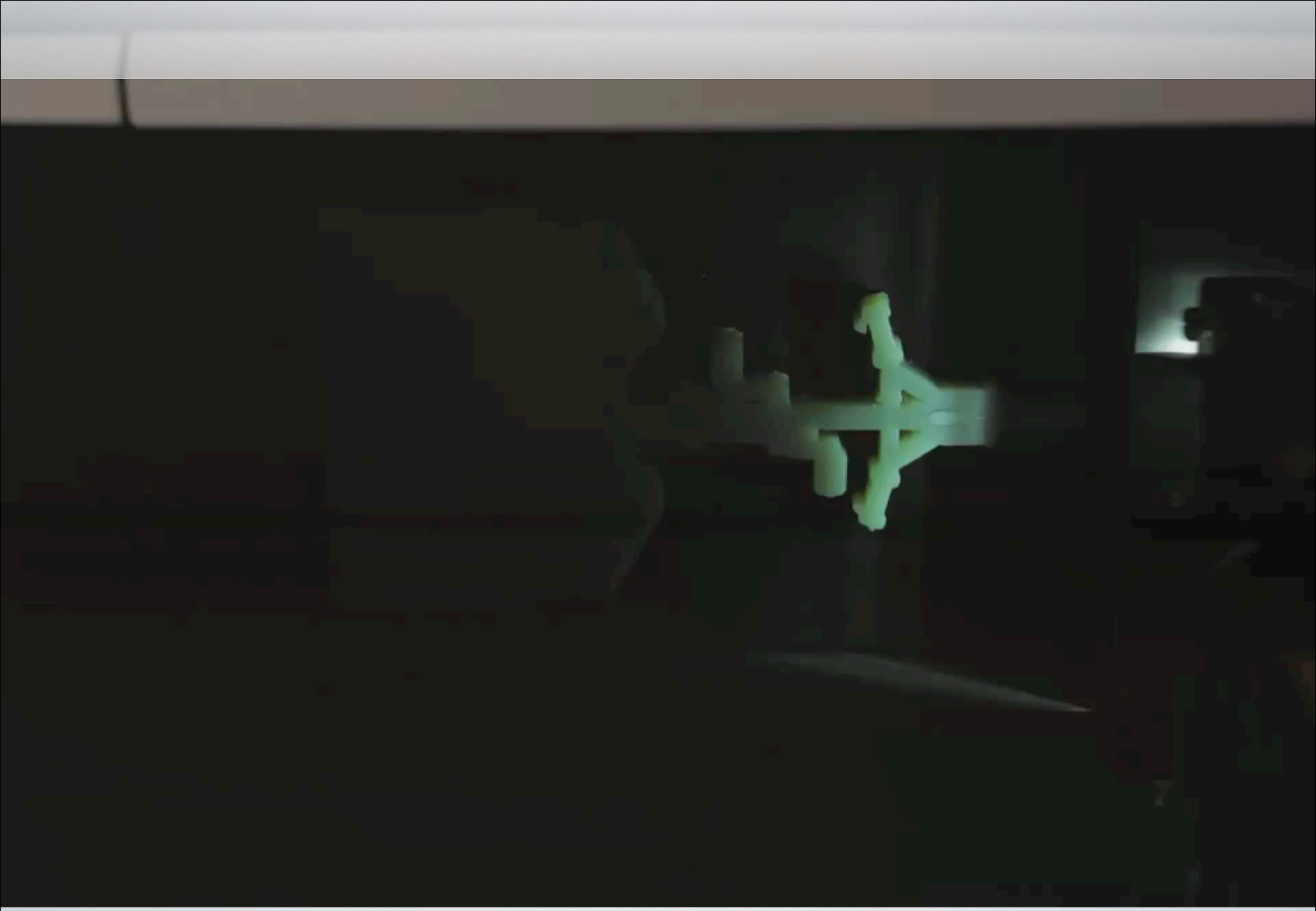
At CERN the open source hardware model is used to improve communications to developers.

At RepRap it's used to spread and collaborate on 3D printer designs.

3D PRINTING

EVERYTHING CAN BE AN OBJECT

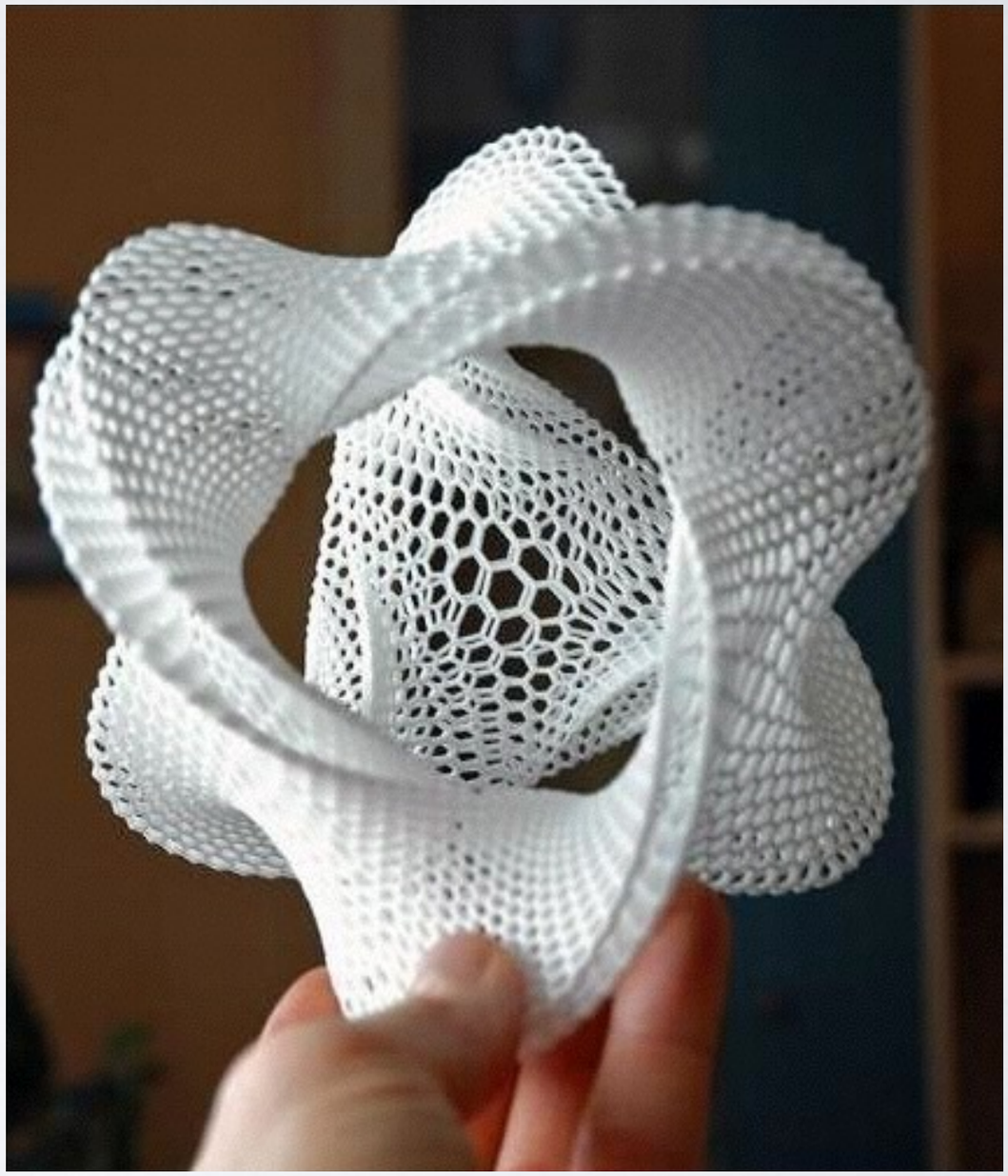
VIDEO



GIMME THE 3RD DIMENSION

3D printer creates a **solid object** by building up successive layers of material.

The ink of the printer can be **plastic**, **clay**, **metal** and even **chocolate.**

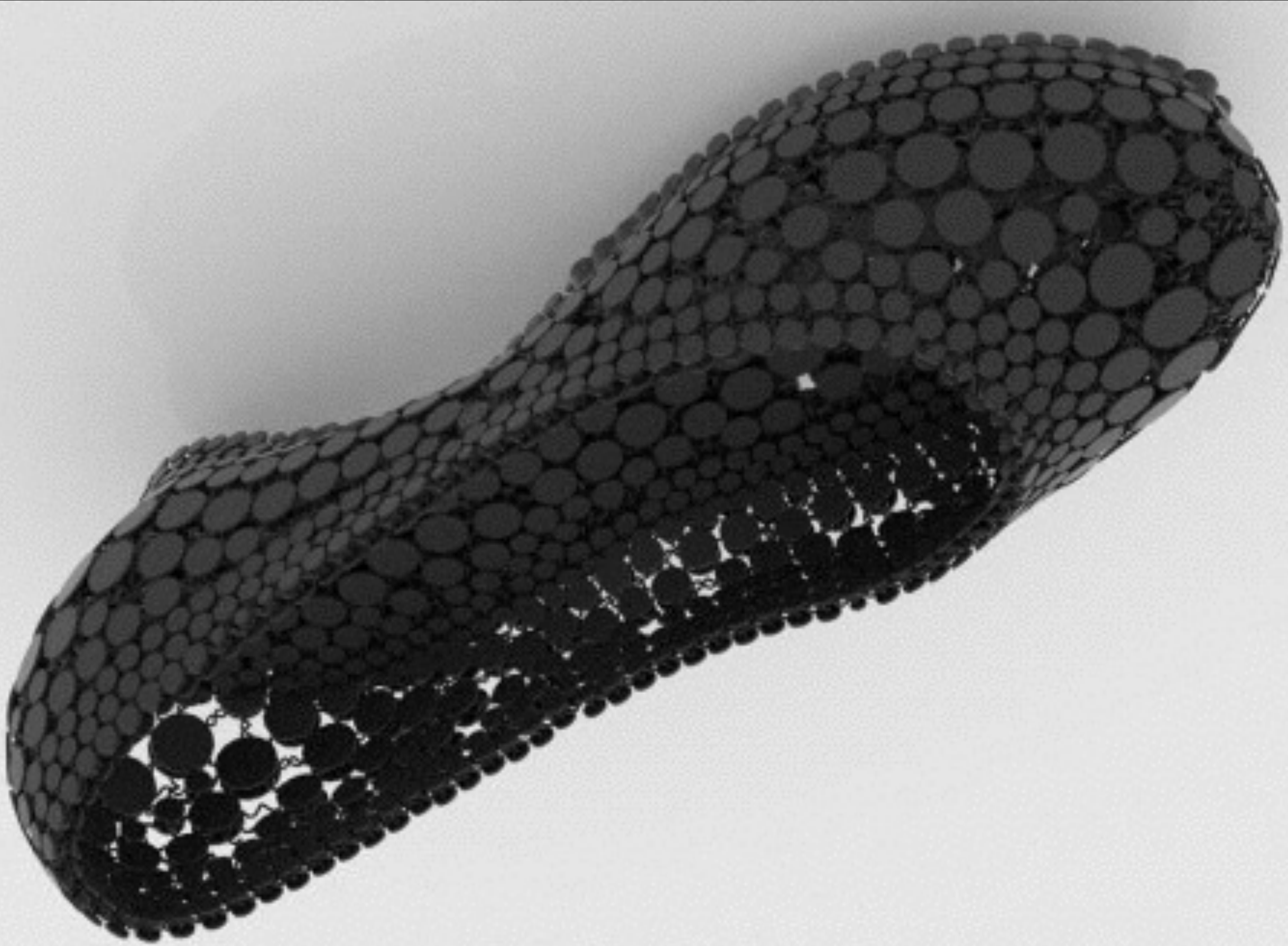


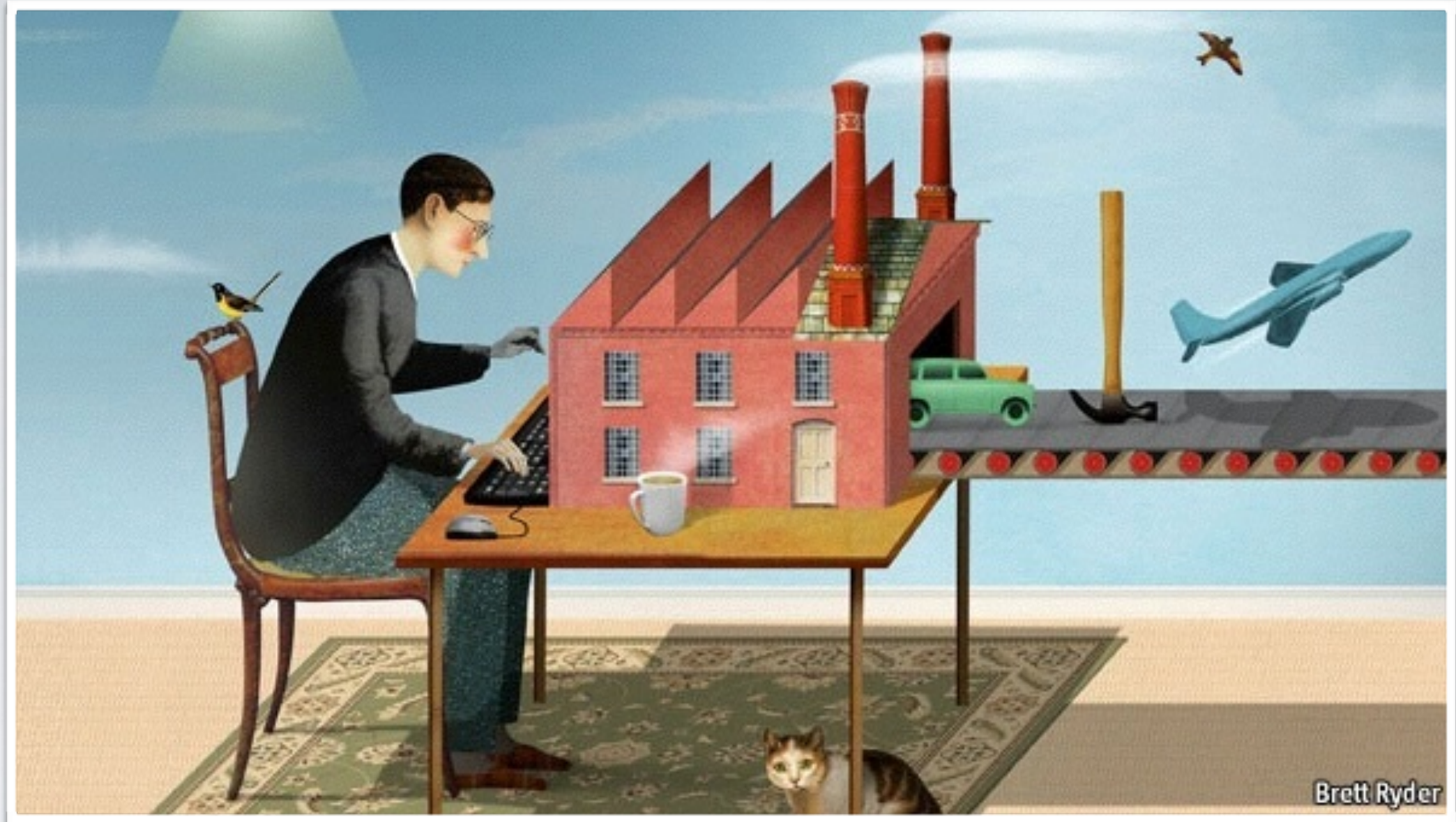
YOU CAN BUILD

EVERYTHING

YOU WANT

The limit is your imagination





THE THIRD INDUSTRIAL REVOLUTION

The Economist

The digitisation of manufacturing will transform the way goods are made and change the politics of jobs too

Manufacturing

The third industrial revolution

The digitisation of manufacturing will transform the way goods are made—and change the politics of jobs too

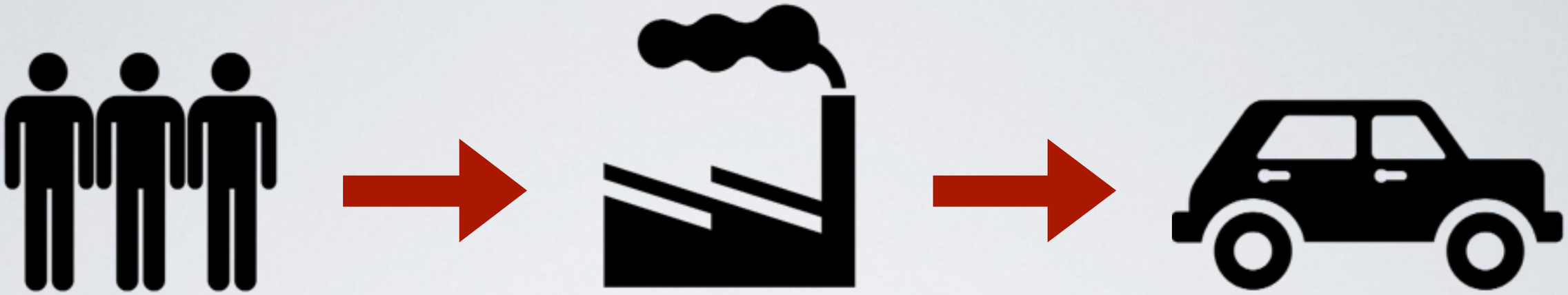
Apr 21st 2012 | From the print edition

Like 13k Tweet 3,623

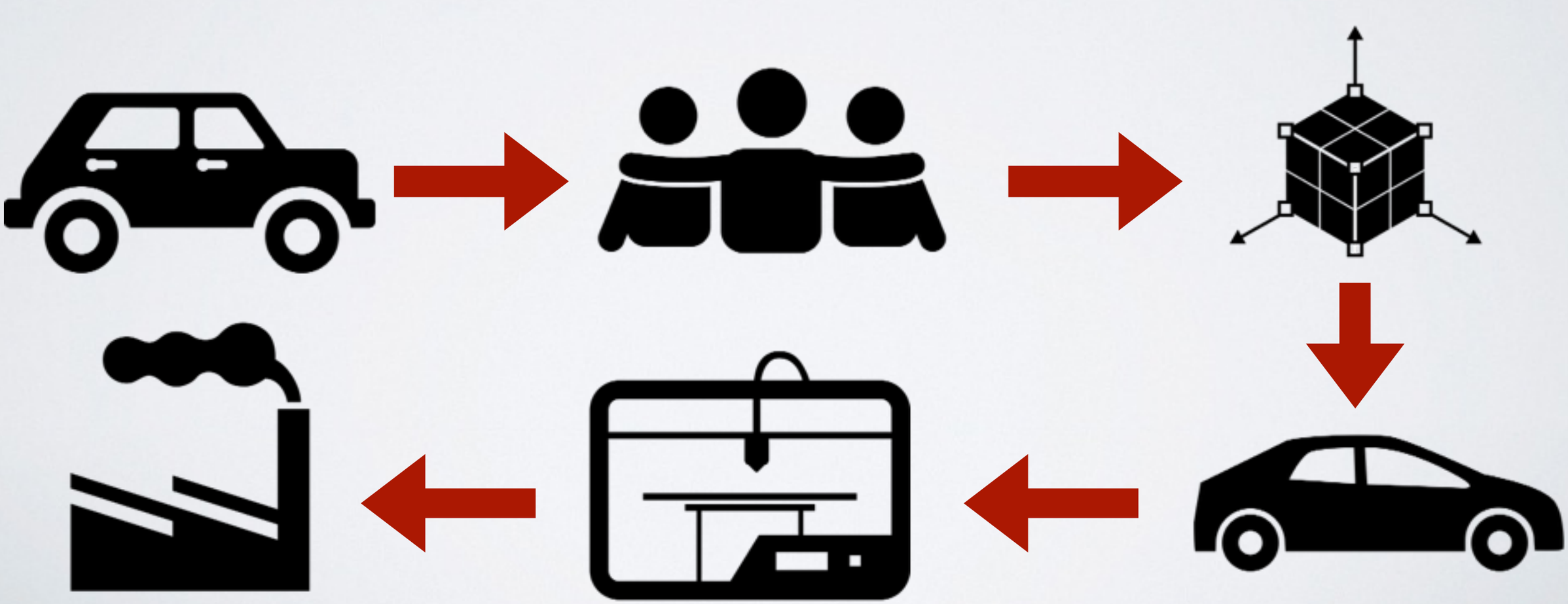
THE first industrial revolution began in Britain in the late 18th century, with the mechanisation of the textile industry. Tasks previously done laboriously by hand in hundreds of weavers' cottages were brought together in a single cotton mill, and the factory was born. The second industrial revolution came in the early 20th century, when Henry Ford mastered the moving assembly line and ushered in the age of mass production. The first two industrial revolutions made people richer and more urban. Now a third revolution is under way. Manufacturing is going digital. As this week's special report argues, this could change not just business, but much else besides.

A number of remarkable technologies are converging: clever software, novel materials, more dexterous robots, new processes (notably three-dimensional printing) and a whole range of web-based services. The factory of the past was based on cranking out zillions of identical products: Ford famously said that car-buyers could have any colour they liked, as

The second industrial revolution (H.Ford model)



The third industrial revolution (Maker movement)



UNO STRATO DOPO L'ALTRO. Questa macchina, al Wake Forest Institute, sta producendo il prototipo di un rene. Una volta che l'organo è stato progettato, la stampa impiega solo sette ore.

2025 IL CUORE VA IN STAMPA

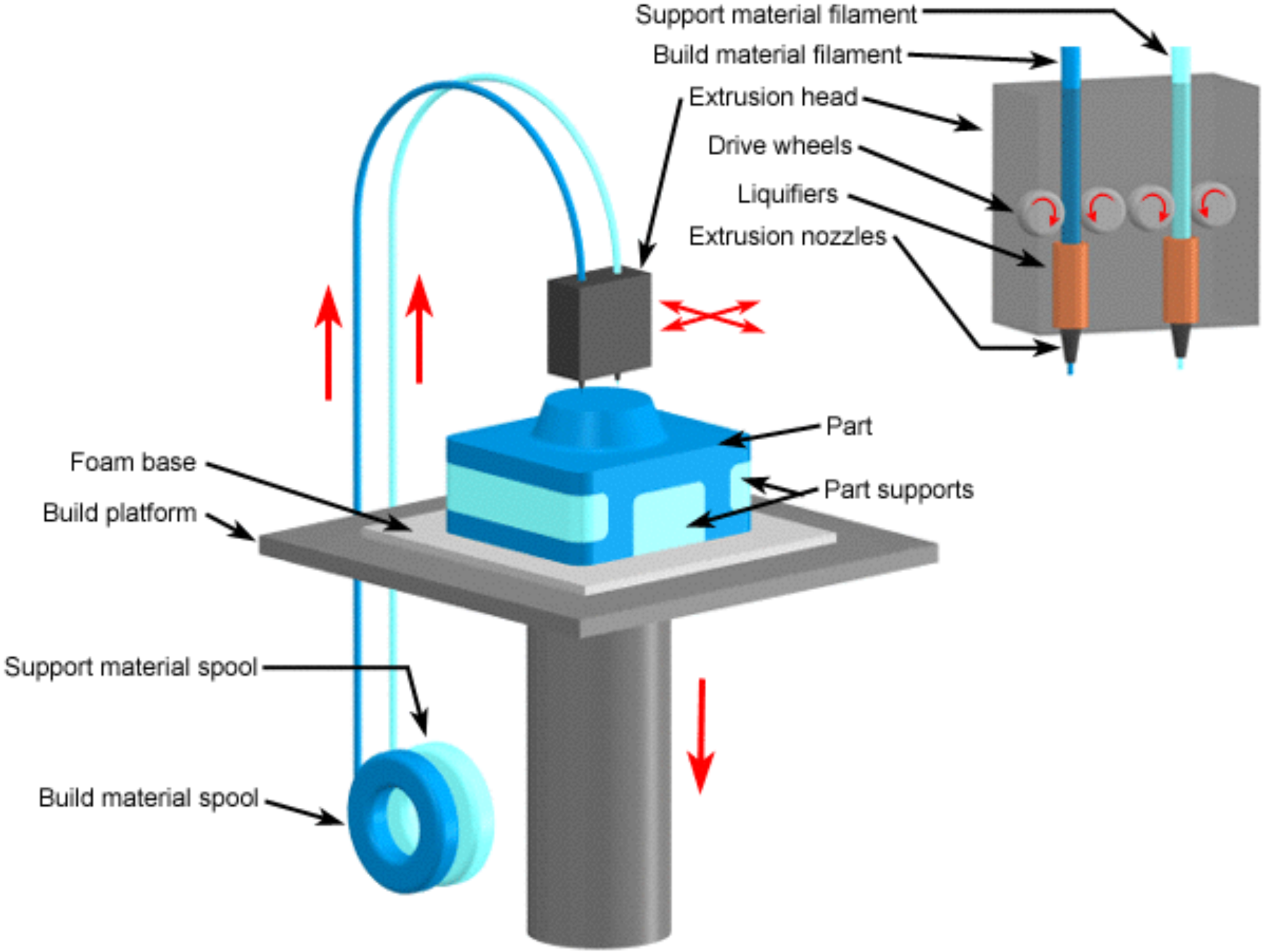
Con un inchiostro di cellule e proteine, le stampanti 3D già realizzano organi interi. È questo il futuro dei trapianti?

Wake Forest Institute for Regenerative Medicine

3D PRINTING METHODS

- SLA (Stereolithography)
- **FDM (Fused Deposition Modeling)**
- SLS (Selective Laser Sintering)
- PolyJet photopolymer
- **Syringe Extrusion**
- Other method

HOW IT WORKS?



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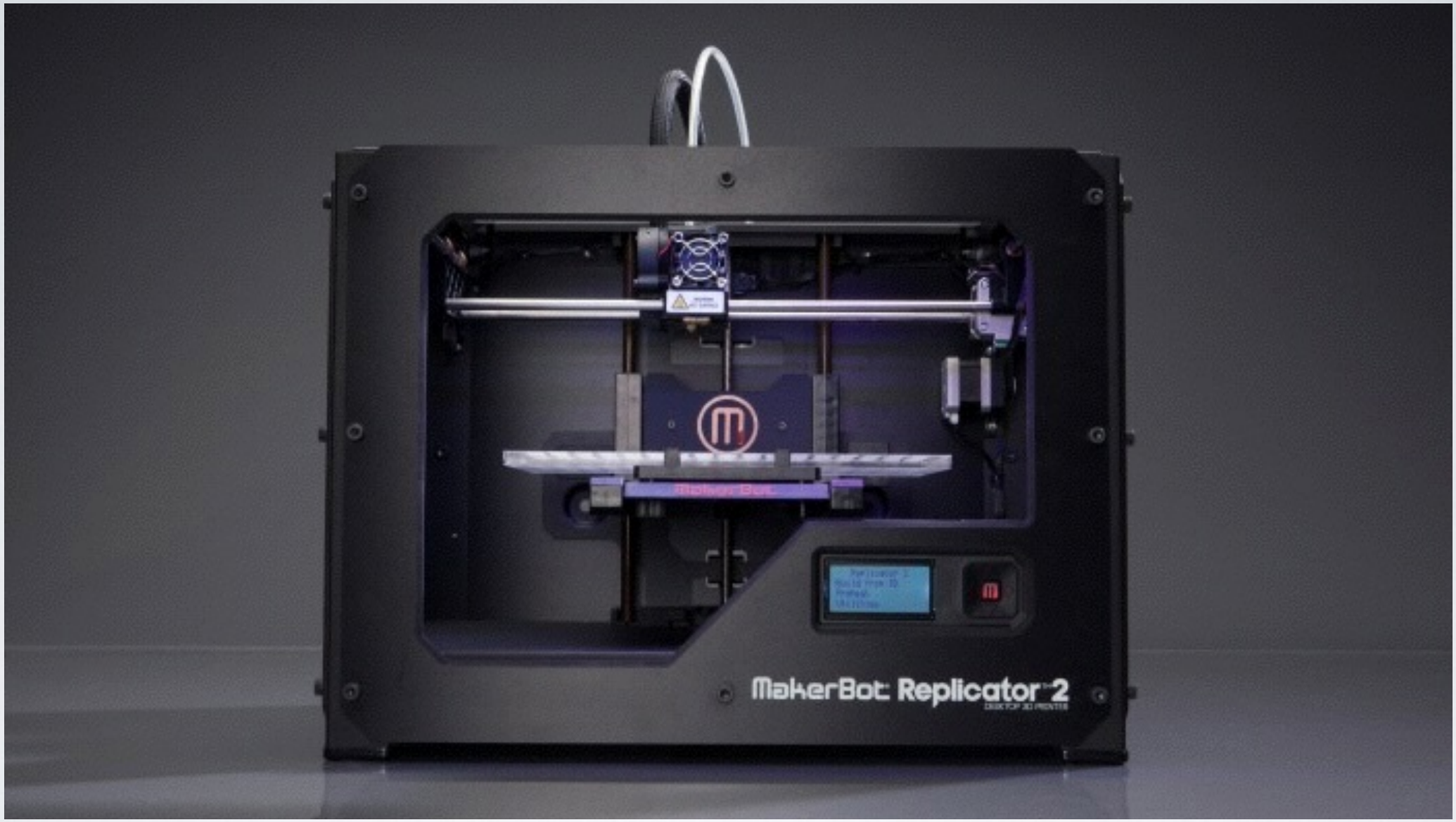
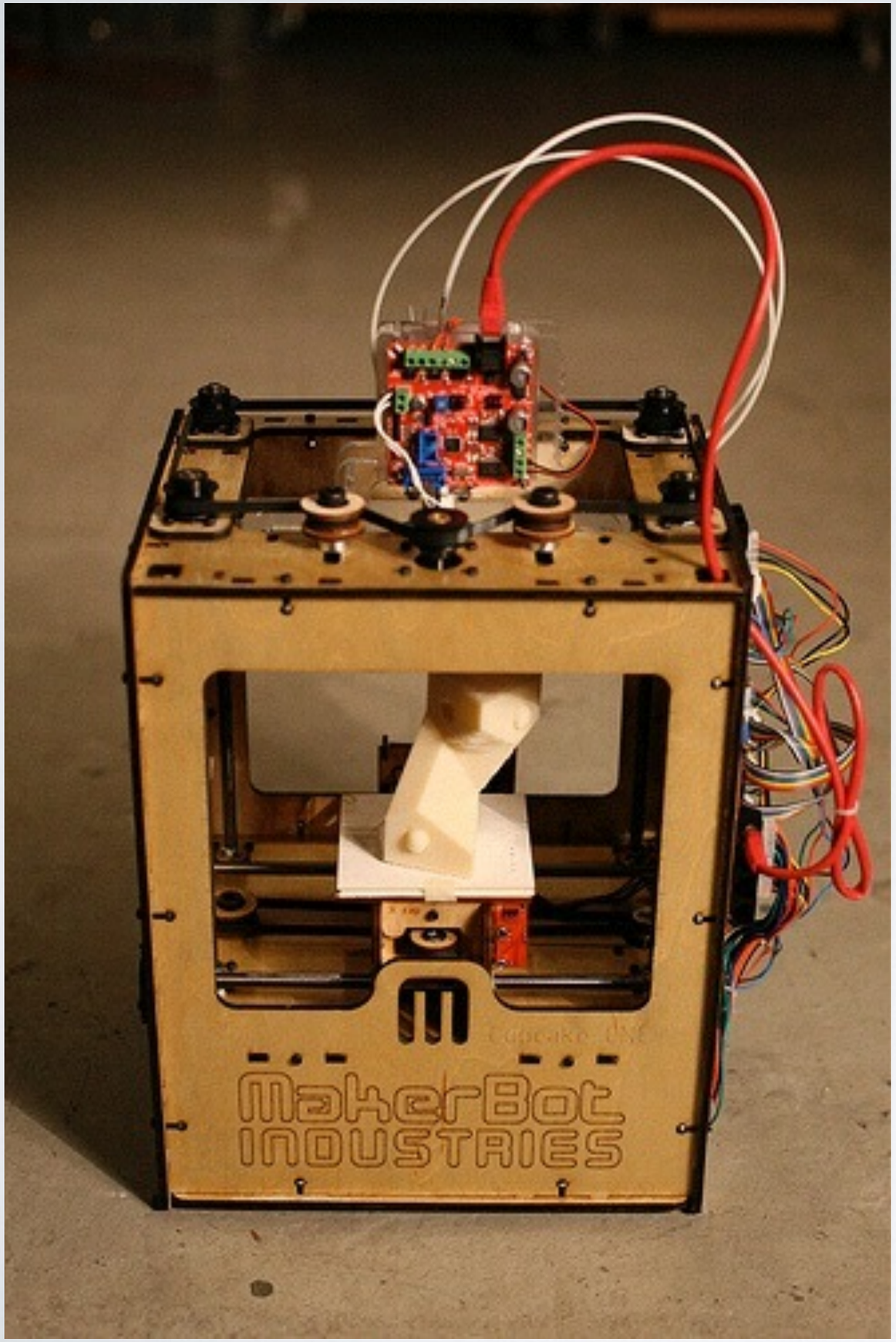
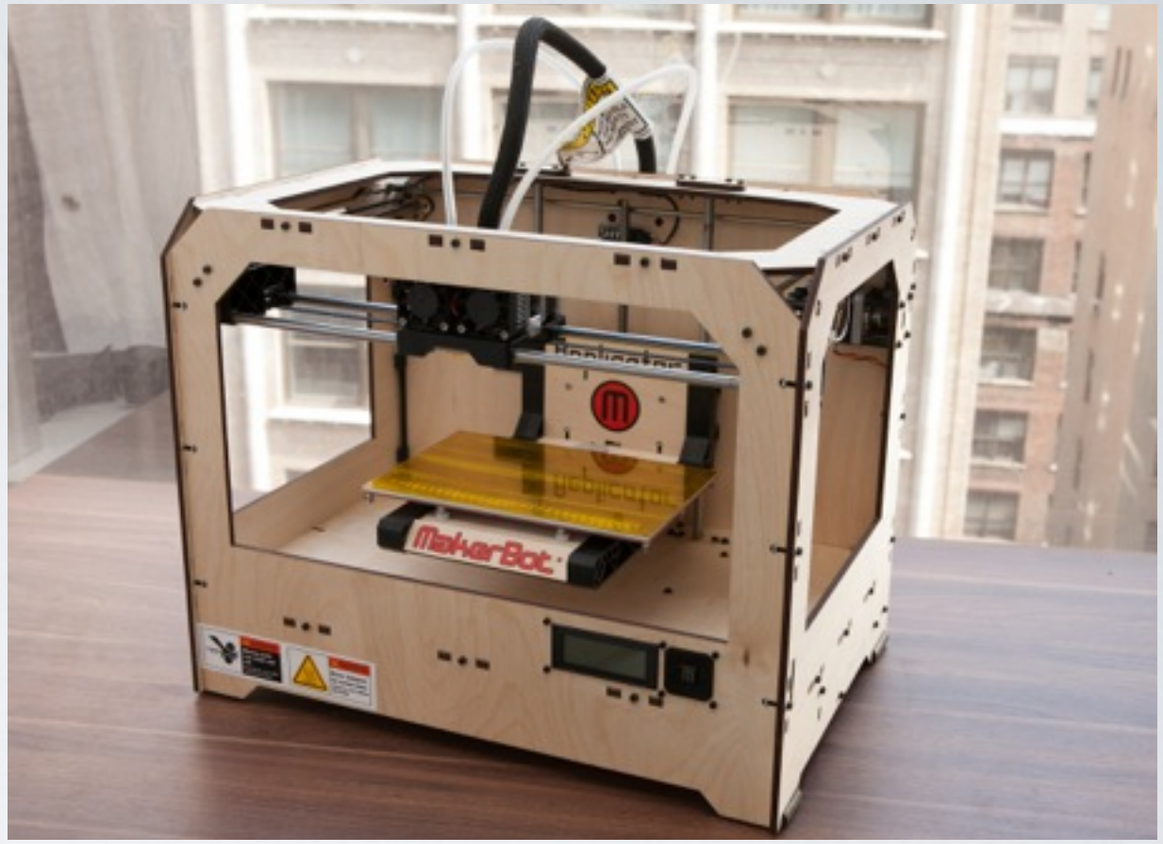
COMMERCIAL PRINTER

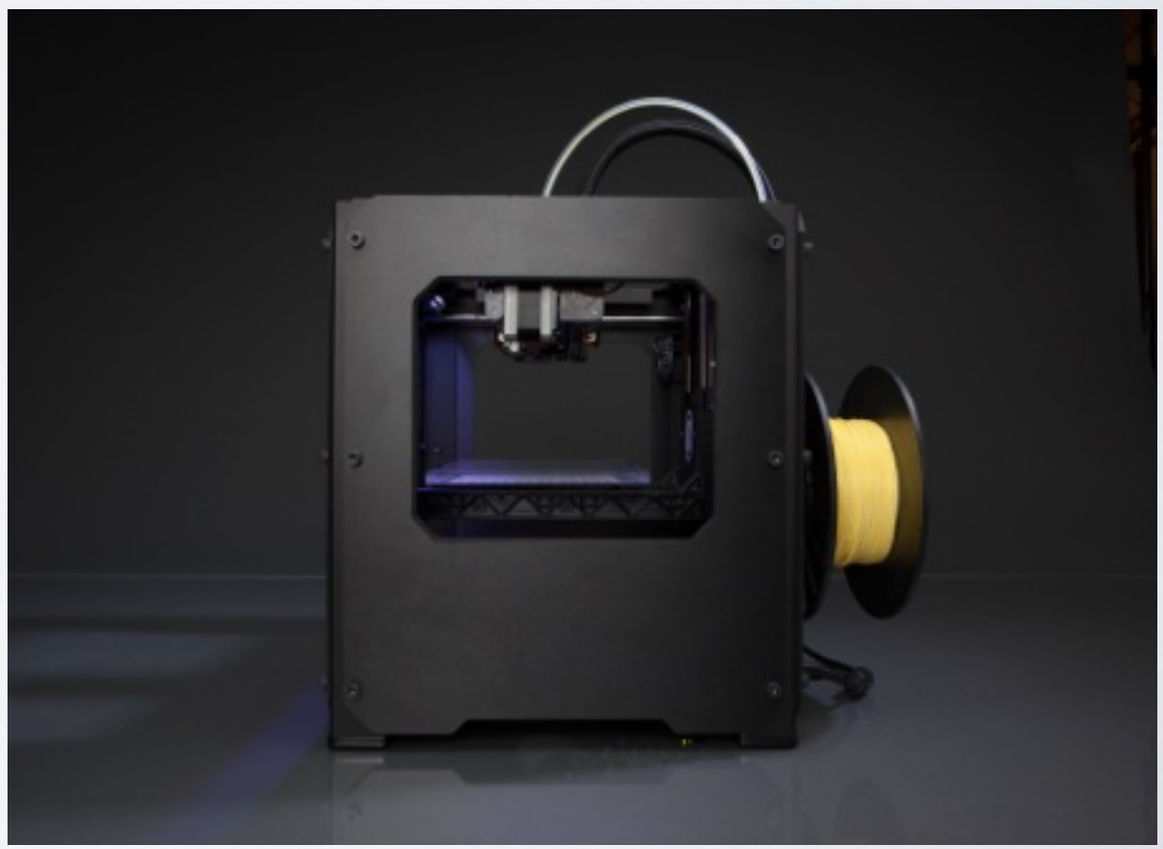


MAKERBOT

Brooklyn, NY - USA


MakerBot
INDUSTRIES


MakerBot



COMPANY INFO

Makerbot was born in 2009, it was one of the first reprap company.

The printer is fully open source but can extrude only 2 type filament (ABS,PLA).

MakerBot INDUSTRIES

MAKERBOT WAS ACQUIRED BY **STRATASYS** FOR $**403M**

wasp

WORLD'S ADVANCED SAVING PROJECT

Massa Lombarda, RA - Italy

POWERWASP EVOLUTION

YOUR PERSONAL FAB

Milling & Printer machine

Max extrusion temperature 260°

Material: PLA, ABS, Nylon, Experimental extruder, Clay, Chocolate

Fully open source hardware

25000 mm/s^2 acceleration

The printer can rebuild itself

WWW.PERSONALFAB.IT

WASP A PRETTY STORY

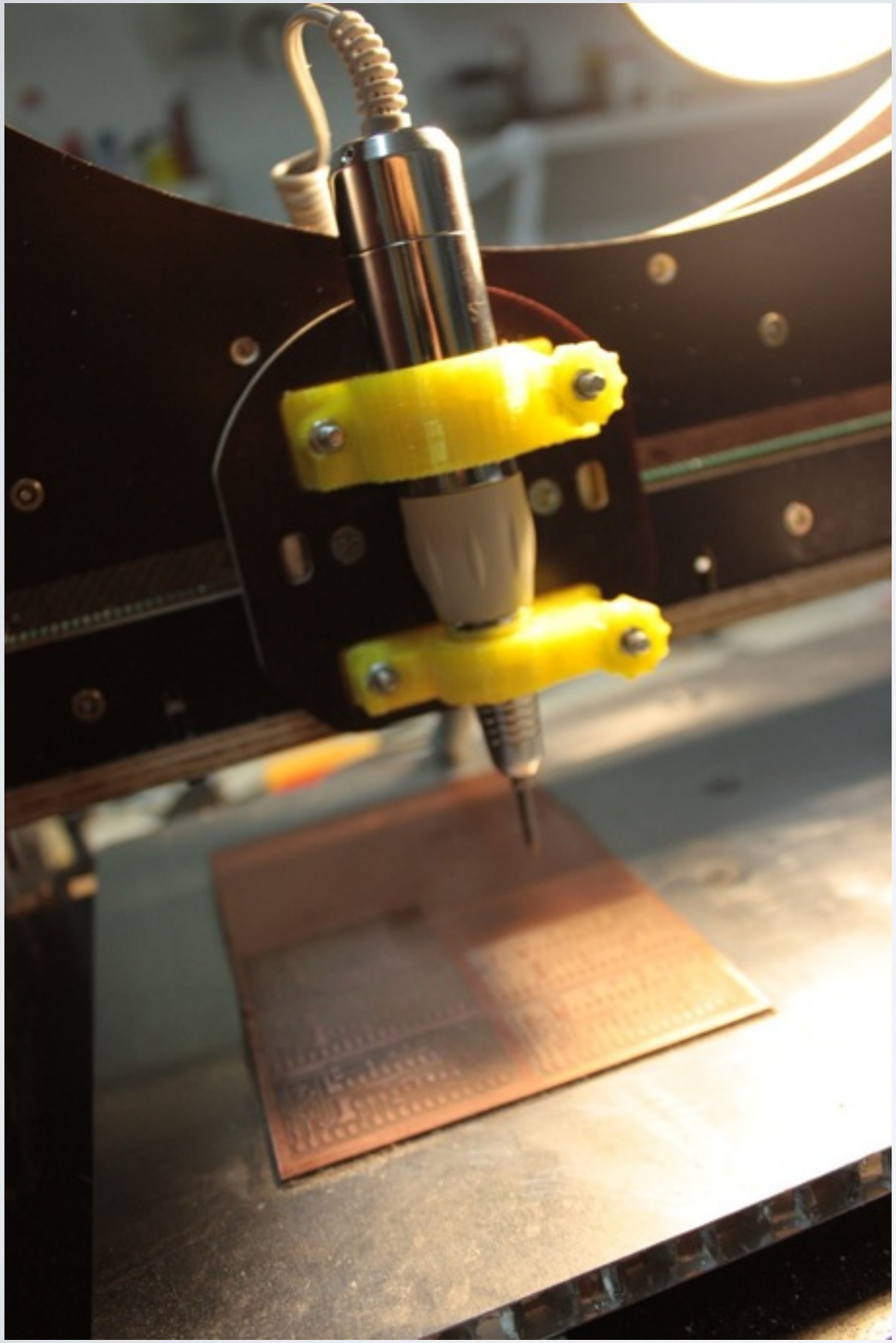
WASP born thanks to an idea of Eng. Massimo Moretti with the goal of **saving the world**.

Massimo is an inventor and the CEO of Centro Sviluppo Progetti. He design and produce automatic machines for 20 years.

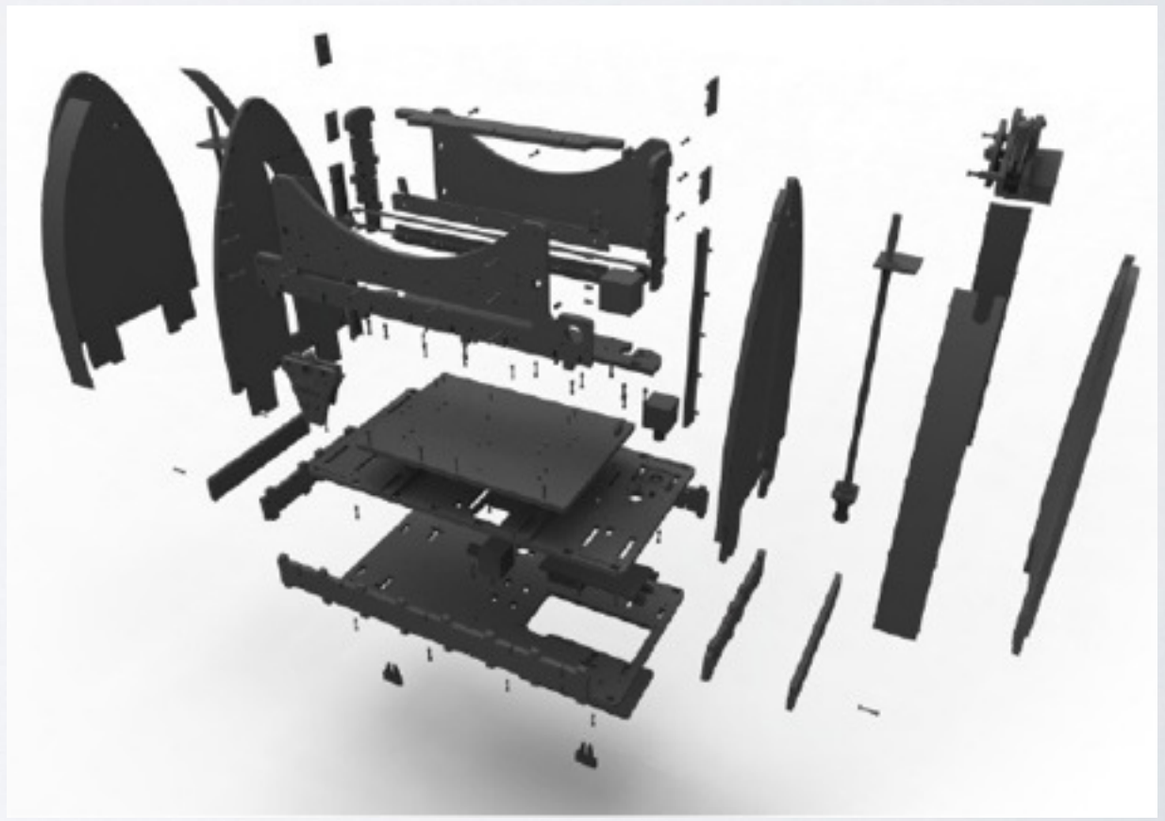
Now WASP project involves a lot of student that contribute as volunteer.

SAMPLES

Created by **PowerWasp Evolution**



WASP
WWW.WASPROJECT.IT

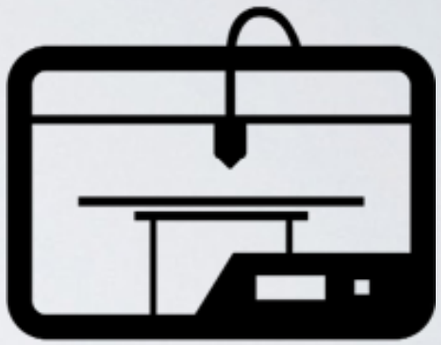


INNOVATIVE BUSINESS MODEL

THE VISION

Idea

Build house



3D printed

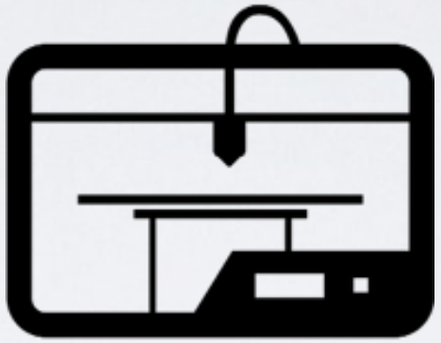
For
Worldwide

In cheaper way and
eco-friendly

INNOVATIVE BUSINESS MODEL

THE MISSION

Build



3D printer

To finance

Cheaper and
eco-friendly houses
3D printed

To make better world

THE BIG DELTA

The dream starts to take form

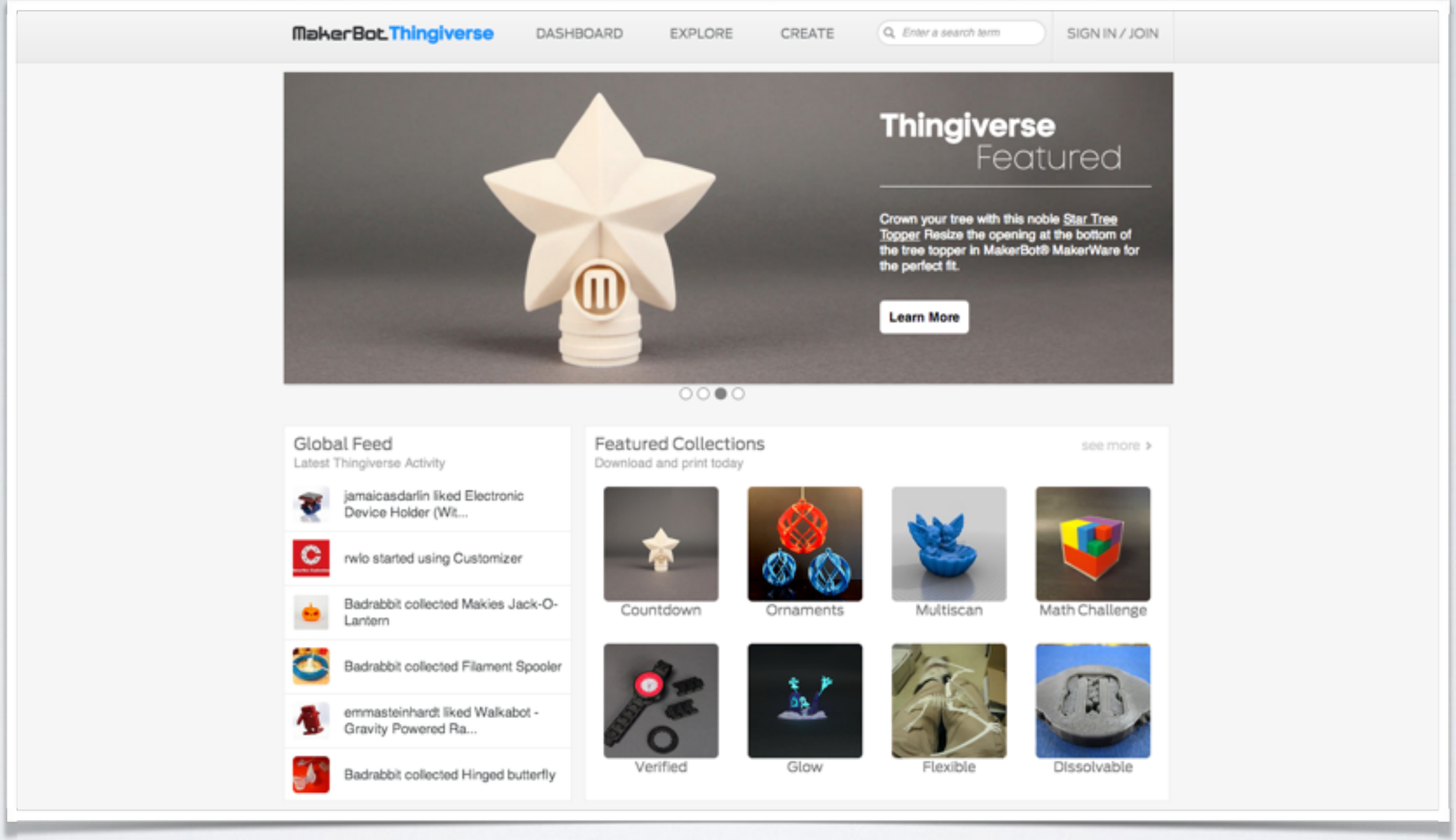
Video

NOT ONLY PRINTER

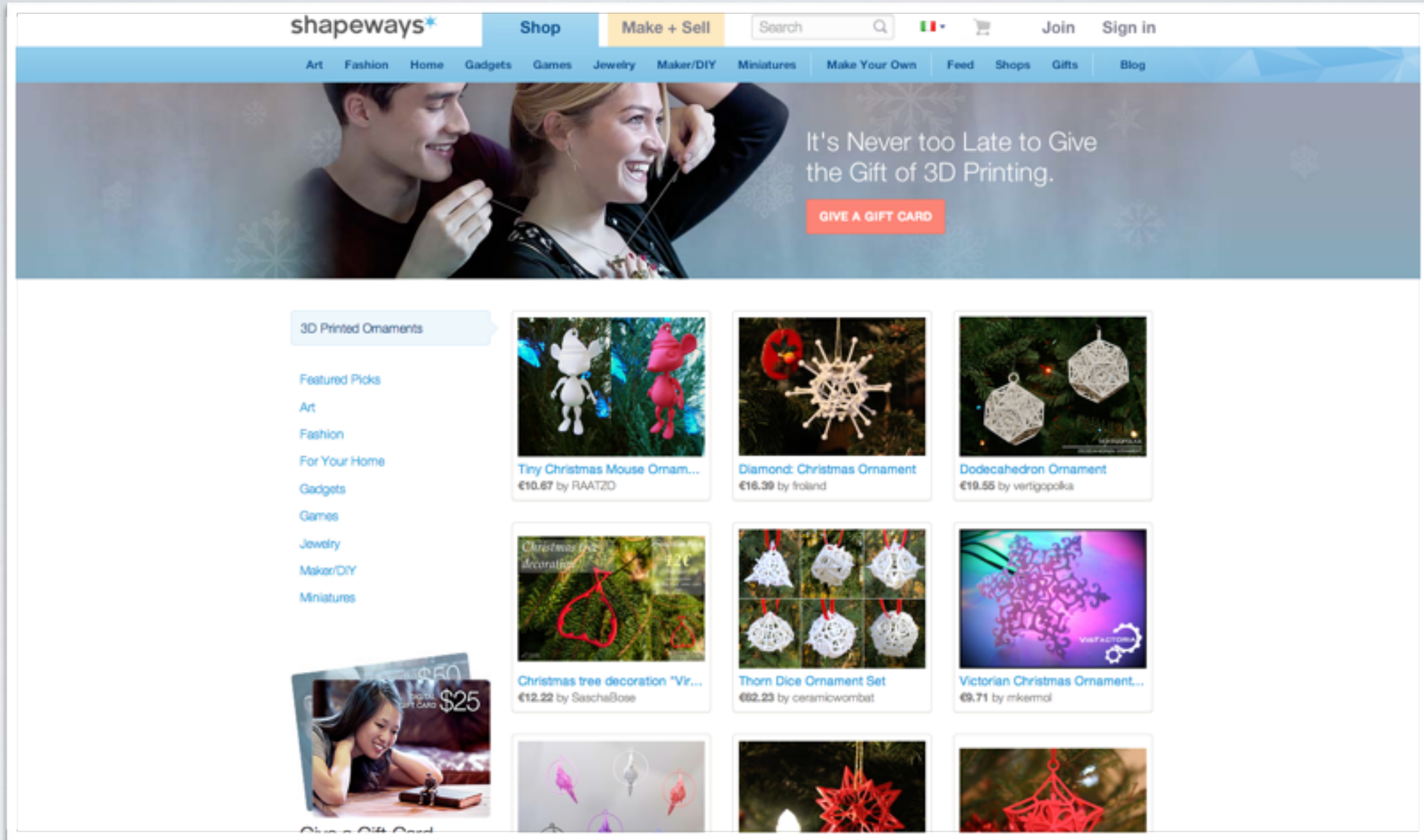
Using the big delta printer WASP is building pyrolytic stove.

That no emit CO and can **save** a lot of **human life**, specially in Africa where 5% of children are killed by stove emissions.

WHERE CAN I FIND EXISTING 3D OBJECTS?



THINGIVERSE IS A DATABASE OF 3D OBJECTS READY TO PRINT



SHAPEWAYS IS A STORE WHERE YOU CAN SELL WHAT YOU CREATE

MATERIALS

For FDM printer are used round filament and with diameter 1.75 mm or 3 mm

There are several materials.

PLA
(POLYLACTIC ACID)

Extrusion temp: 180°-200°

Adv:

Bioplastic

Low extrusion temp

Dis/age:

Poor mechanical properties

ABS
(ACRYLONITRILE BUTADIENE STYRENE)

Extrusion temp: 220°-240°

Adv:

High details in printed object

Dis/age:

Poor mechanical properties

Toxic

High extrusion temp

NYLON

Extrusion temp: 200°-210°

Adv:

Good mechanical properties

More flexible

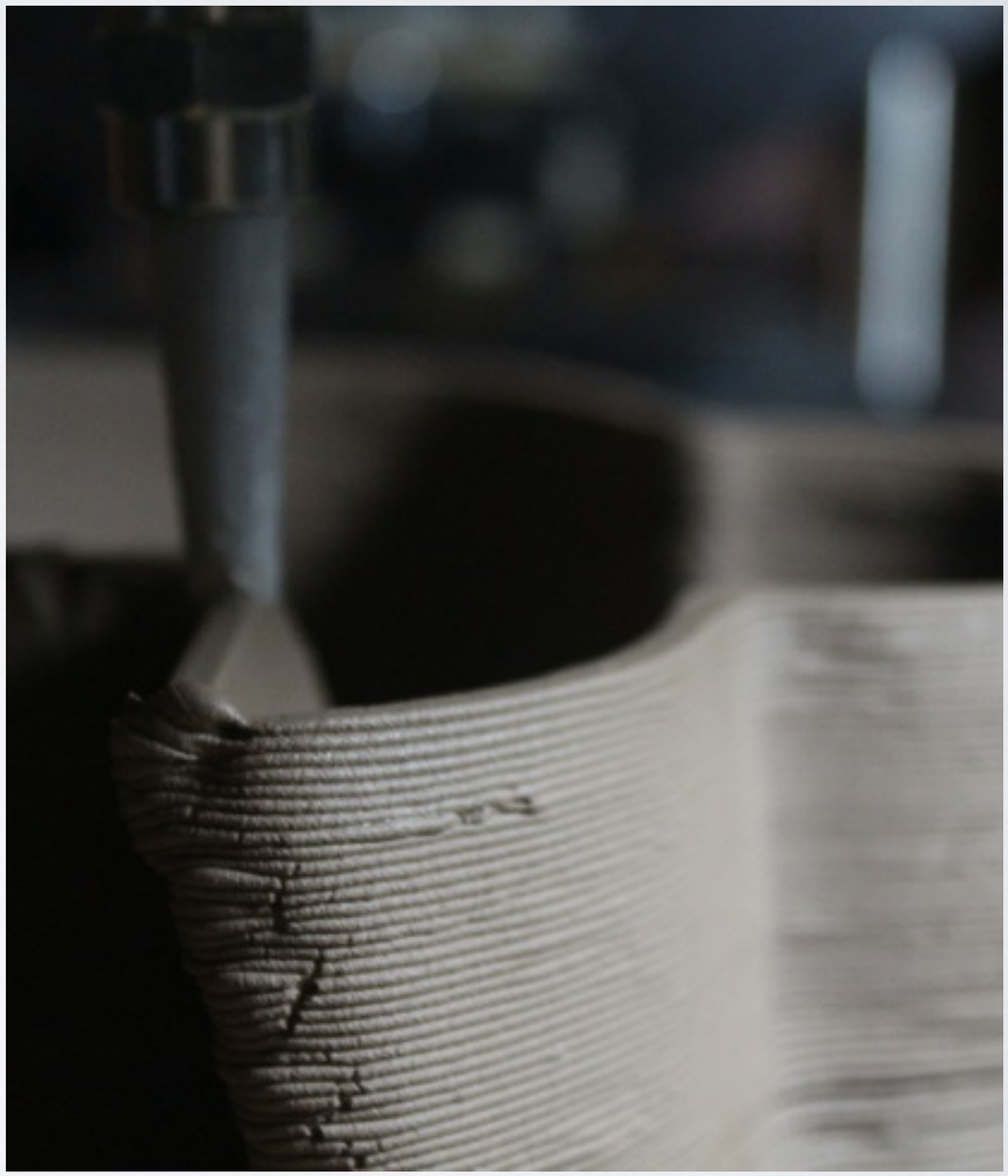
Dis/age:

Expansive

When extruded deform

OTHER MATERIALS

- HIPS (High Impact Polystyrene)
- Metal
- Clay
- Experimental materials

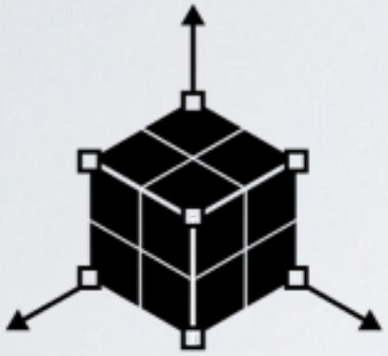


STICK FILAMENT

Modular PLA or HIPS sticks

HANDS ON

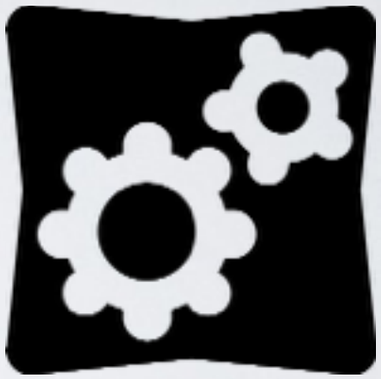
HOW TO PRINT



3D modelling

.STL

Export in STL format

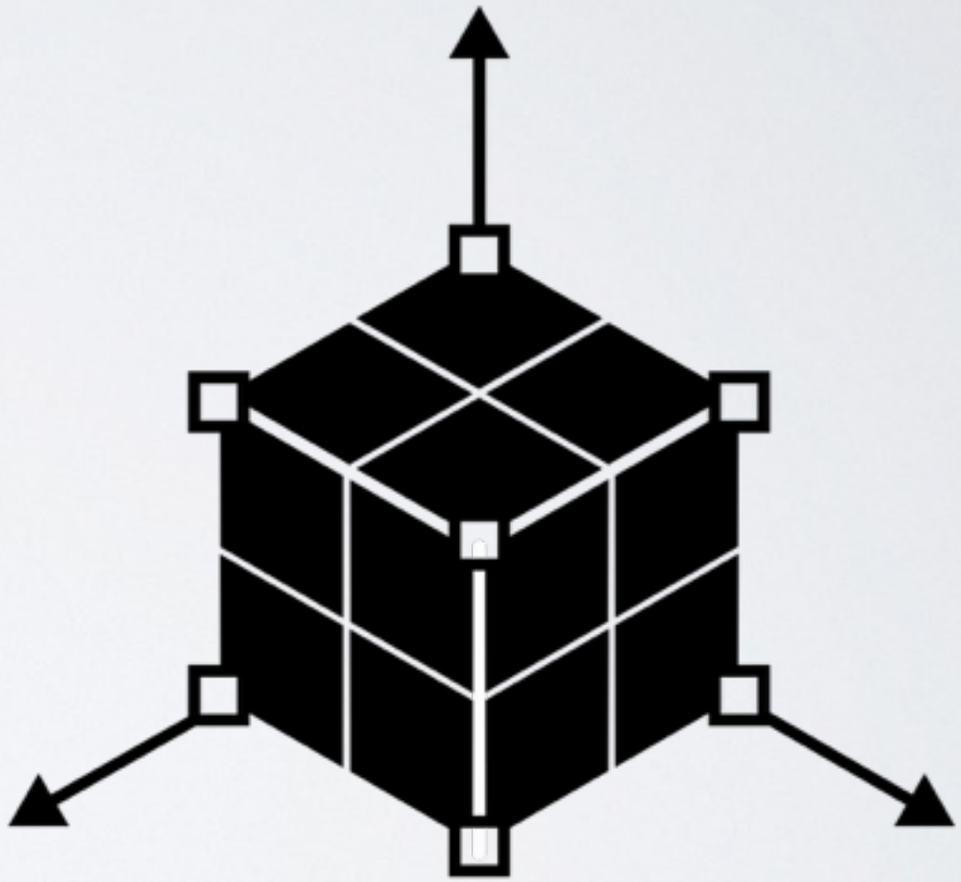


GCode
The machine language

3D MODELLING

Tools to create 3D Objects:

- **Autodesk Inventor**
- Rhino 3D
- **Google SketchUp**
- OpenSCAD
- Other



Autodesk Inventor Professional 2014 - UNREGISTERED VERSION Front Loader

Assemble | Simplify | Design | 3D Model | Inspect | Tools | Manage | View | Environments | Get Started | Add-Ins | Autodesk 360

Place | Create | Free Move | Free Rotate | Joint | Constrain | Show | Show Sick | Hide All | Pattern | Mirror | Load Express | Plane | Axis | Point | UCS | Load Full

Component | Position | Relationships | Pattern | Productivity | Work Features | Express

Model

Express View

- Front Loader.iam
  - Relationships
  - Representations
  - Origin
  - Assy, Chassis, Rear:1
  - Assy, Chassis, Front (001):1
  - Assy, Cab:1
  - 20_5x25 Ground Effect-01:1
  - 20_5x25 Ground Effect-01:2
  - 20_5x25 Ground Effect-01:3
  - 20_5x25 Ground Effect-01:4
  - V138.24.01.010:1
  - V138.24.01.010:2
  - V138.24.01.010:3
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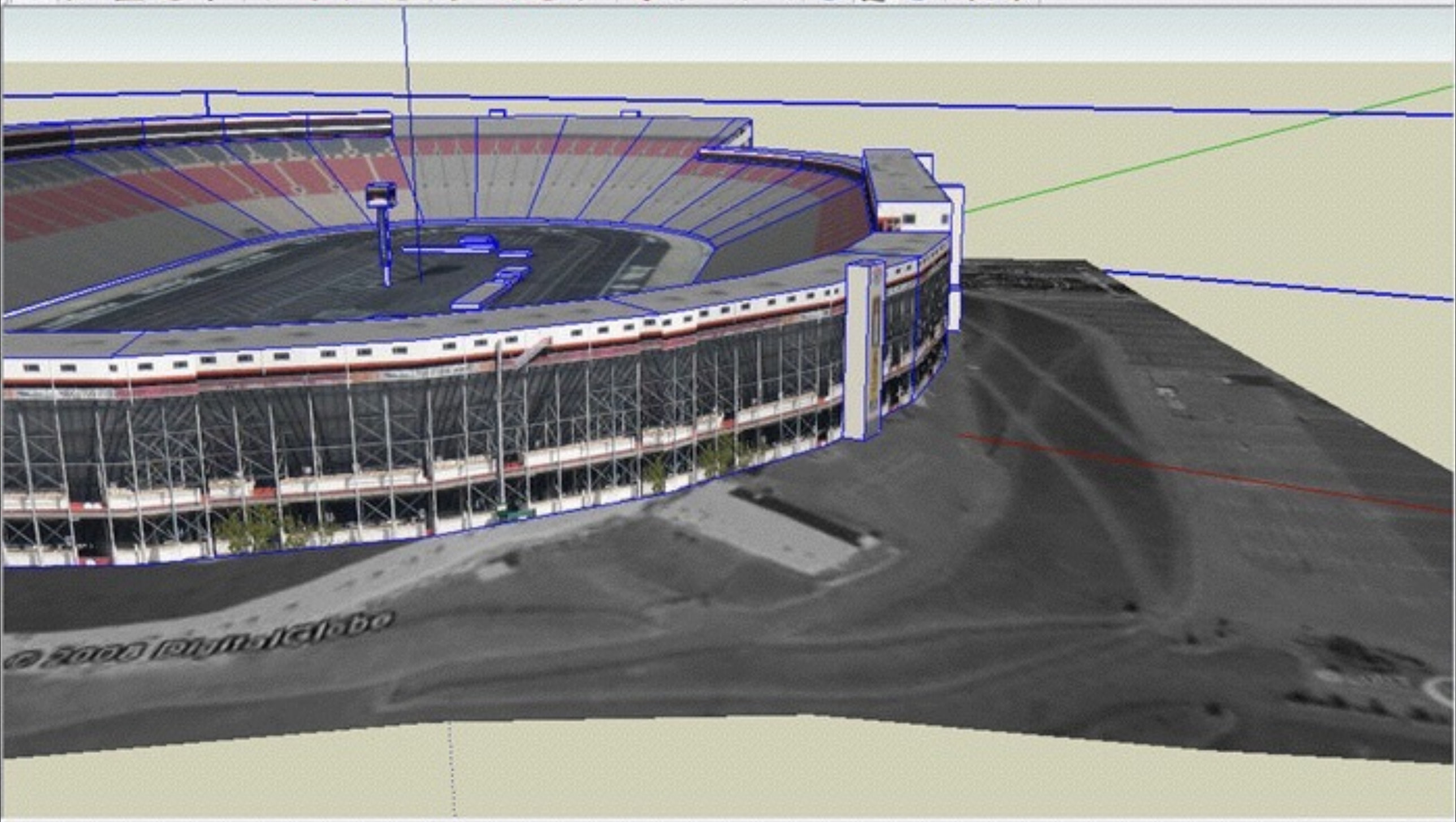
  - PK46.21.00.006:2
  - PK46.21.00.030:1
  - PK46.25.00.007:2
  - PK46.25.00.008:2
  - PK46.21.00.040:1
  - PK46.25.00.012:1
  - PK46.25.00.010:2
  - PK46.25.00.008:3
  - PK46.25.00.007:3
  - PK46.25.00.010:3
  - PK46.25.00.008:4
  - PK46.25.00.007:4
  - PK46.25.00.010:4
  - PK46.25.00.008:5
  - PK46.25.00.007:5
  - Tube & Pipe Runs

Ready

3959 1738

Senza titolo - SketchUp

File Modifica Visualizza Telecamera Disegno Strumenti Finestra Guida



Seleziona oggetti. MAIUSC per estendere la selezione. Trascina il mouse per selezione multipla.

GCODE

This is language is used also for industrial CNC machine and contains old the coordinates which the tools have to travel.

It is editable text file and if you need you can add or modify instructions.

```
G1X244.31889Y57.13659
G1X243.7534Y57.5108
G1X242.81572Y56.90988
G1X242.02159Y55.99545
G1X239.55504Y54.08171
G1X236.77501Y52.5638
G1X233.92435Y51.92587
G1X231.24583Y52.65208
G1X229.90721Y54.03844
G1X228.83142Y55.92018
G1X227.85484Y58.28963
G0X262.46667Y52.3875
G1X261.92862Y52.91245
G1X261.7662Y53.81302
G1X262.20209Y54.50417
G0X262.46667Y52.3875
G1X263.91245Y52.8038
G1X264.91171Y53.33953
G1X265.37708Y54.10729
G1X264.84793Y55.03333
G0X226.4585Y81.77319
```

UNDERSTANDING GCODE

Set axis origin

G92 X0 Y0 Z0

Command Type
G92 is store position
G0 is rapid positioning
G1 working path

Axis positions
Absolute position of 3 axis
in current moment

To set temperature use command
M109 S<temp>

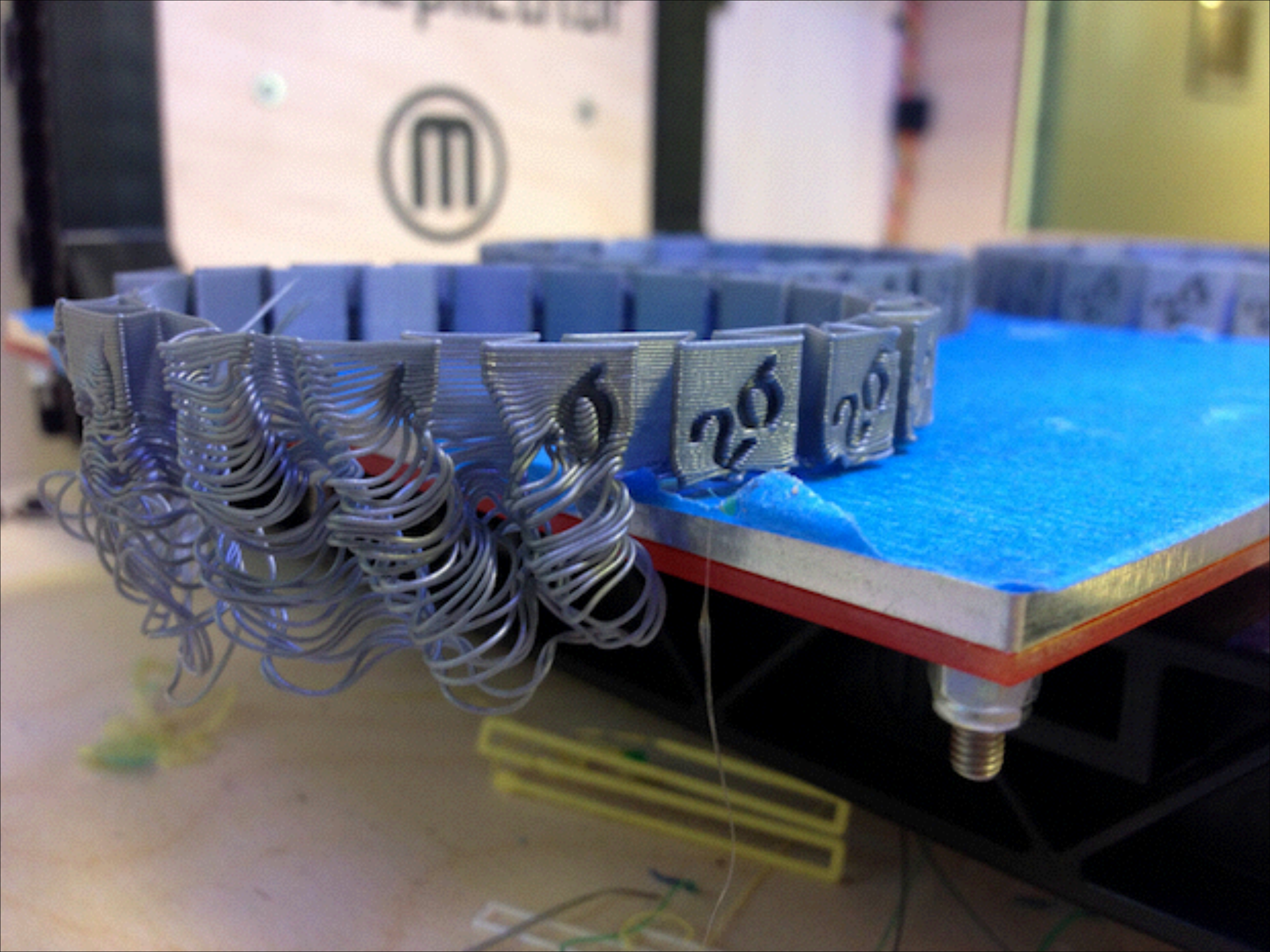
EXTREME GCODE

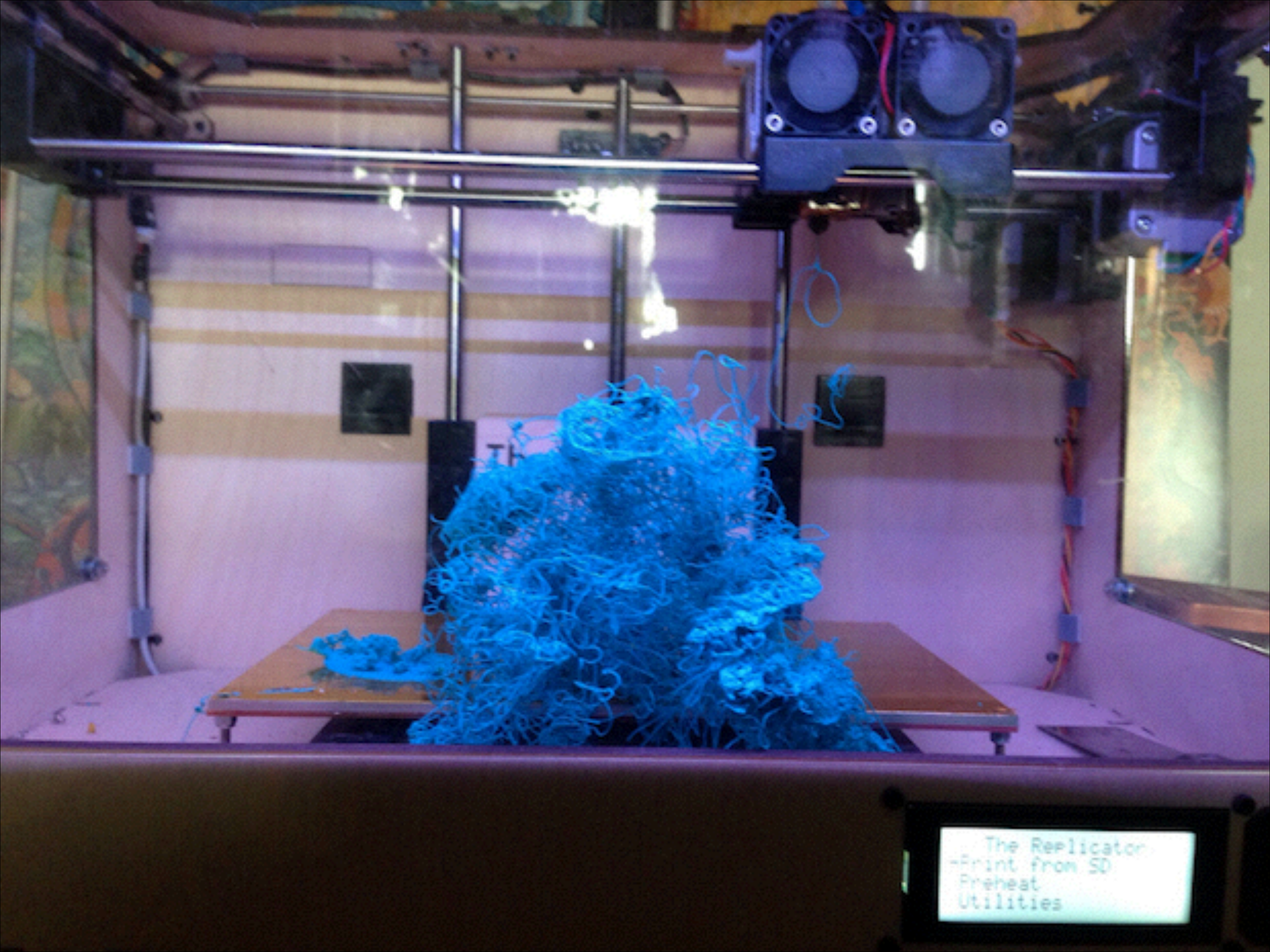
There a project called **MIDI to CNC** that allowed to use your machine to reproduce melodies.

LISTEN!

PRINTING MISTAKES

Thing-O-Matic




The Replicator
-Print from SD
Preheat
Utilities

"The ones that who are crazy enough to think that they can change the world, are the ones who really do".

–Steve Jobs

QUESTIONS