

# Personal Manufacturing, the Gada Prize and the Future of Technology



**HOPE**



# TRANSHUMANISM

# Personalized Human Enhancement

- Personalized medicine
- Longevity or life extension
- Intelligence augmentation
- New business/tech paradigms (“Kurzweil's Law” aware)
- Social enhancement or augmentation
- Molecular nanotechnology
- Personal manufacturing
- Synthetic biology

**Progress on any of these is extremely valuable – business perspective or not**

# Magical Unicorn Predictions:

No more software patents

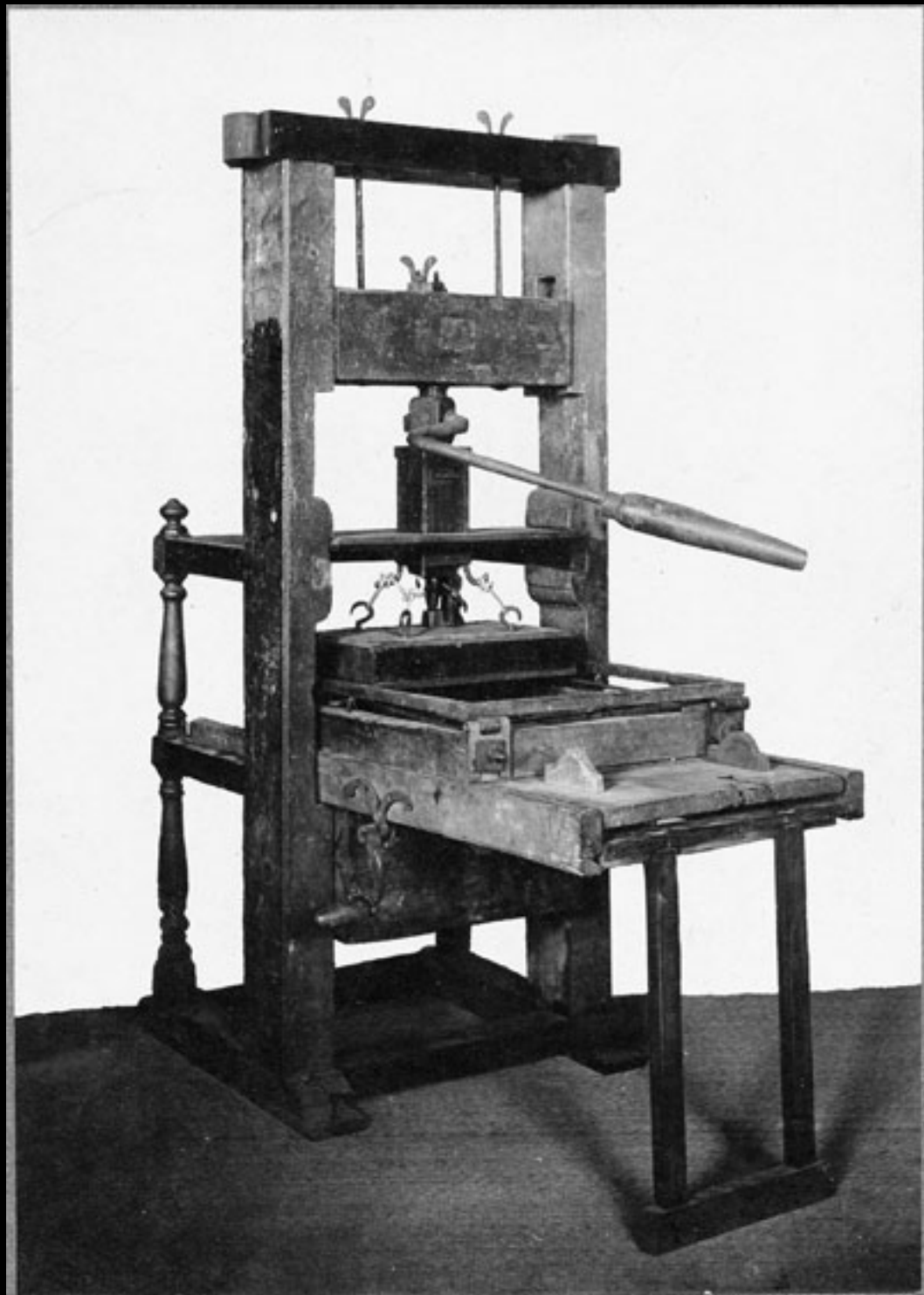
Really truly synthetic life

Era of post-scarcity





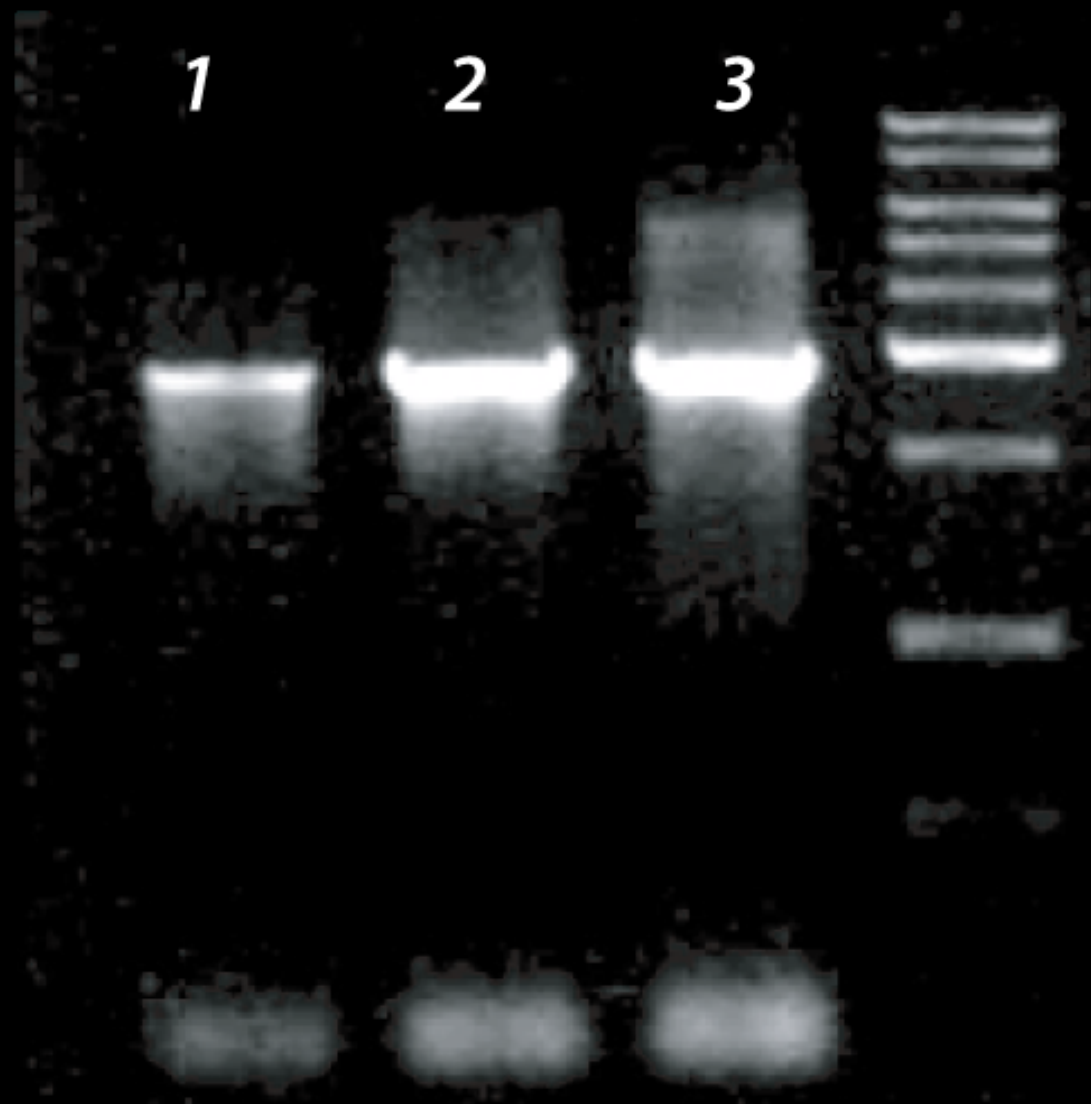
**Kurzweil's Law of  
Accelerating Returns  
applies to personal  
enhancement and  
personal manufacturing**

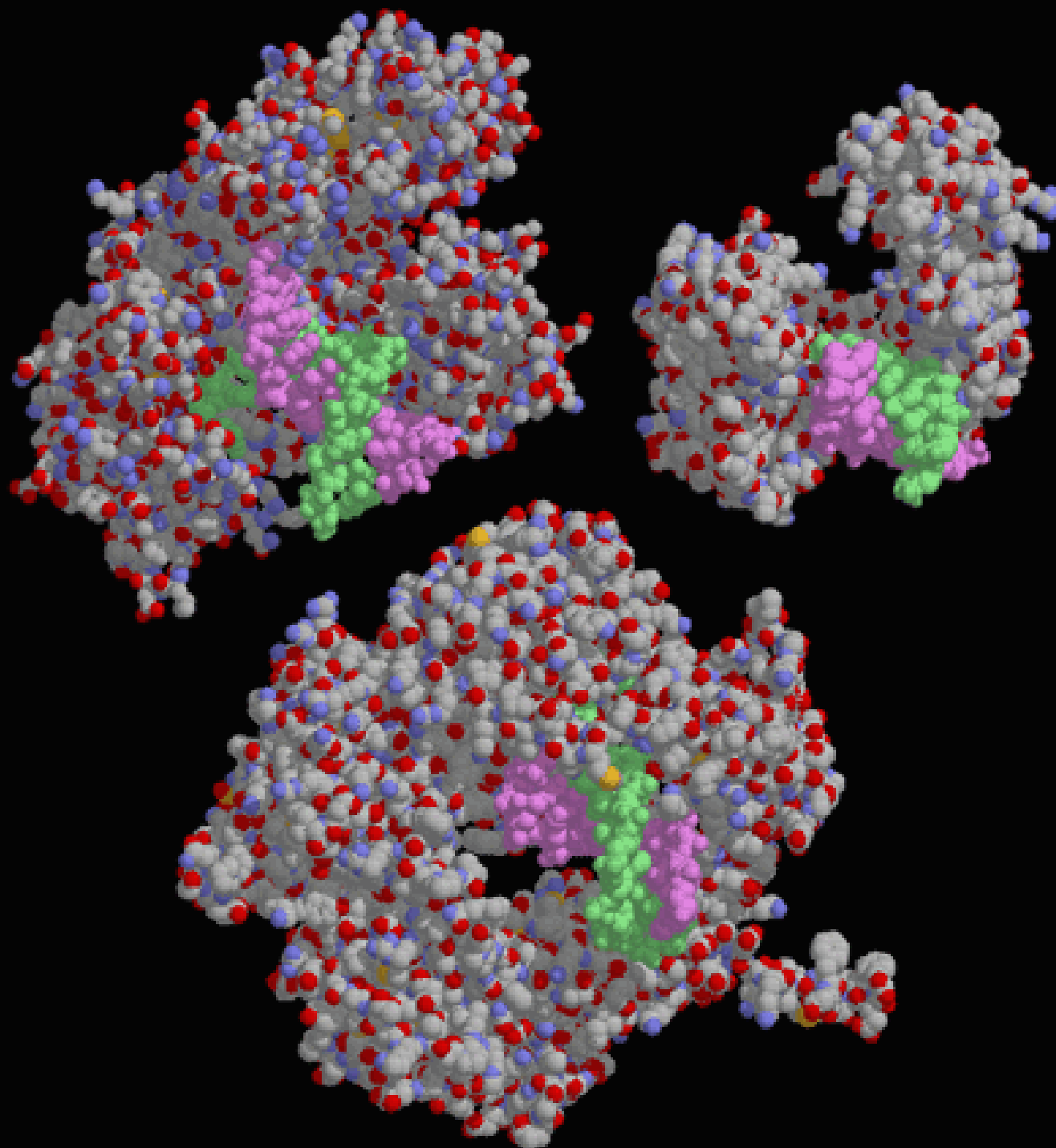


# Xerox 9700 [1977]







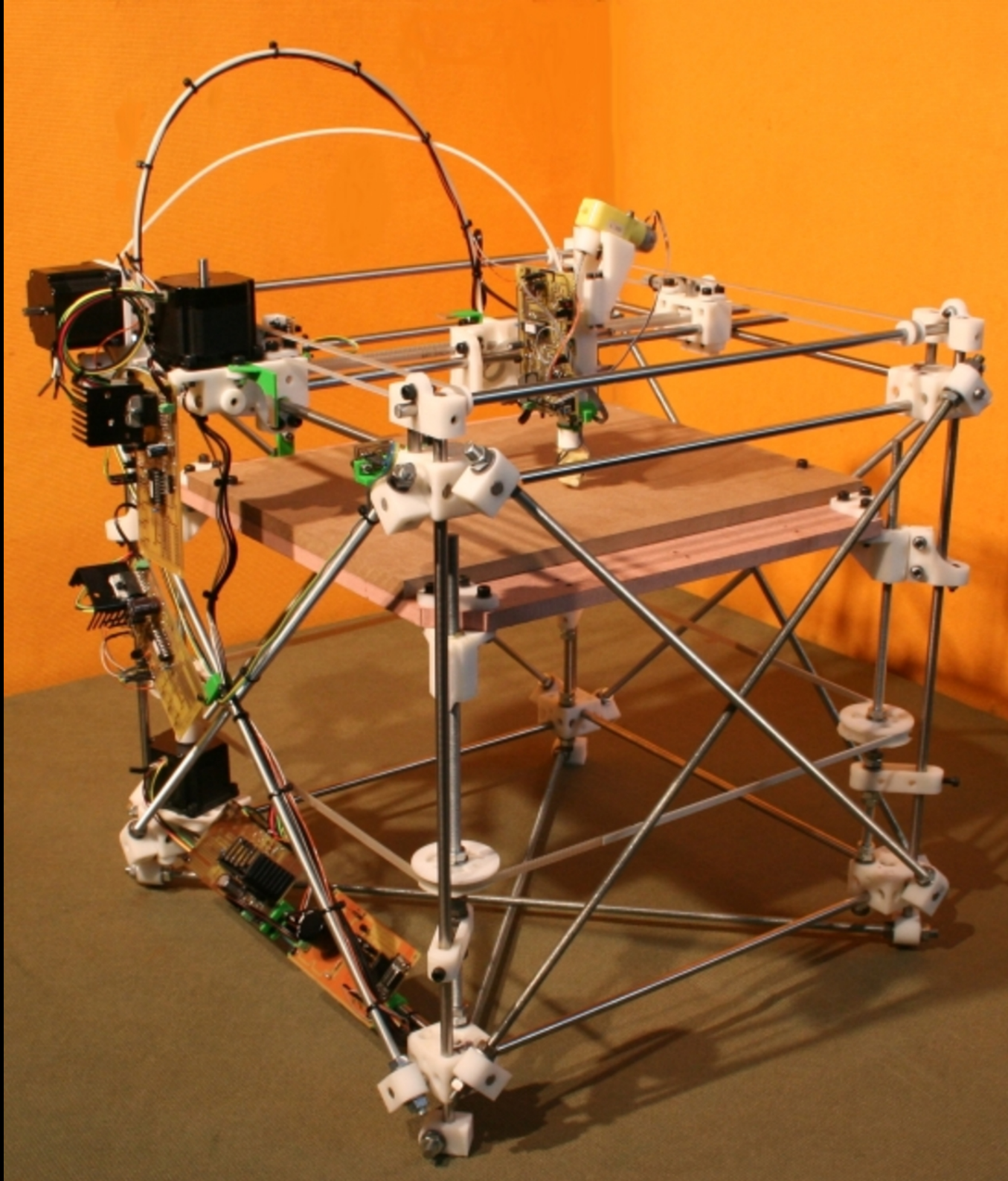


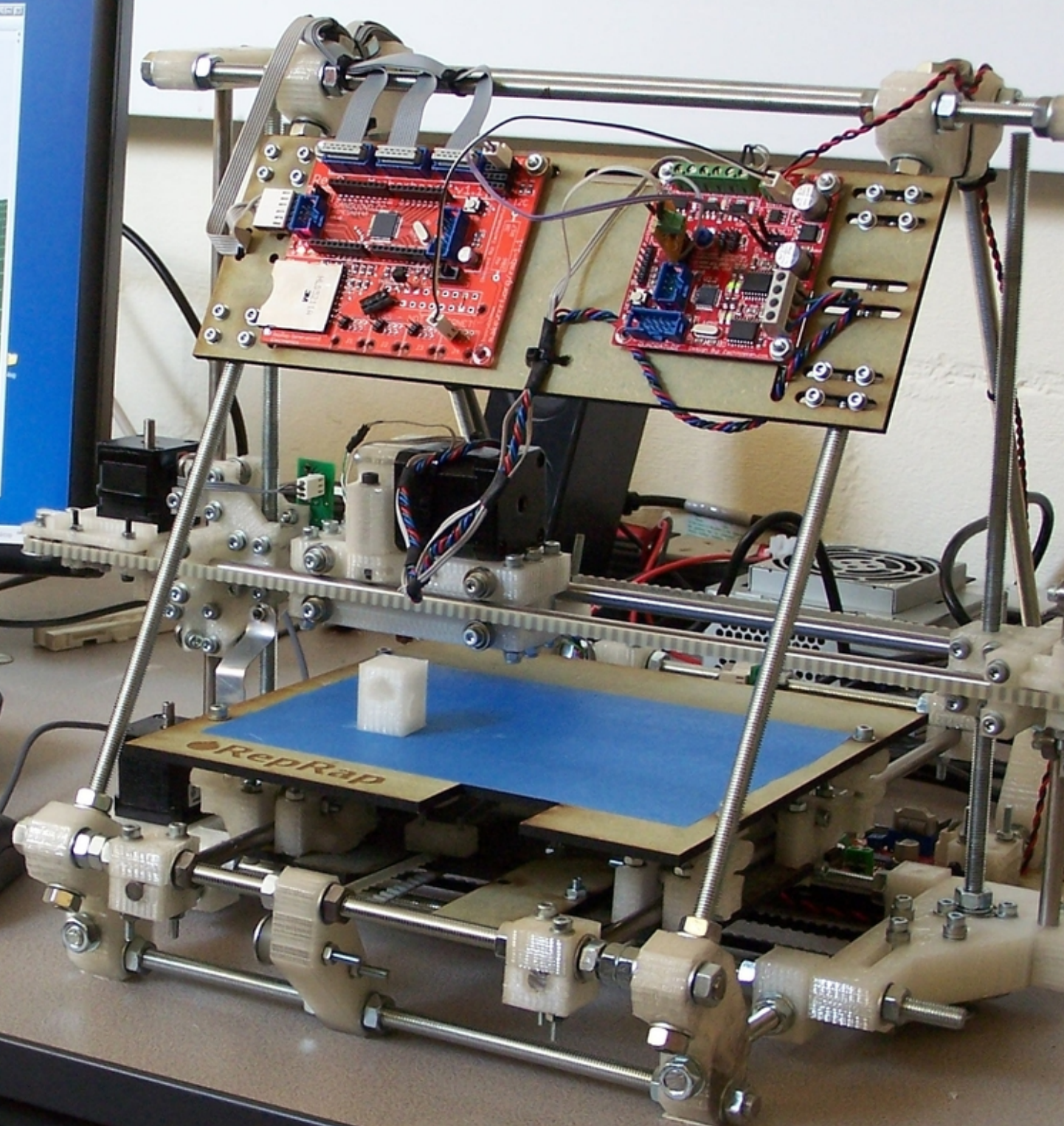
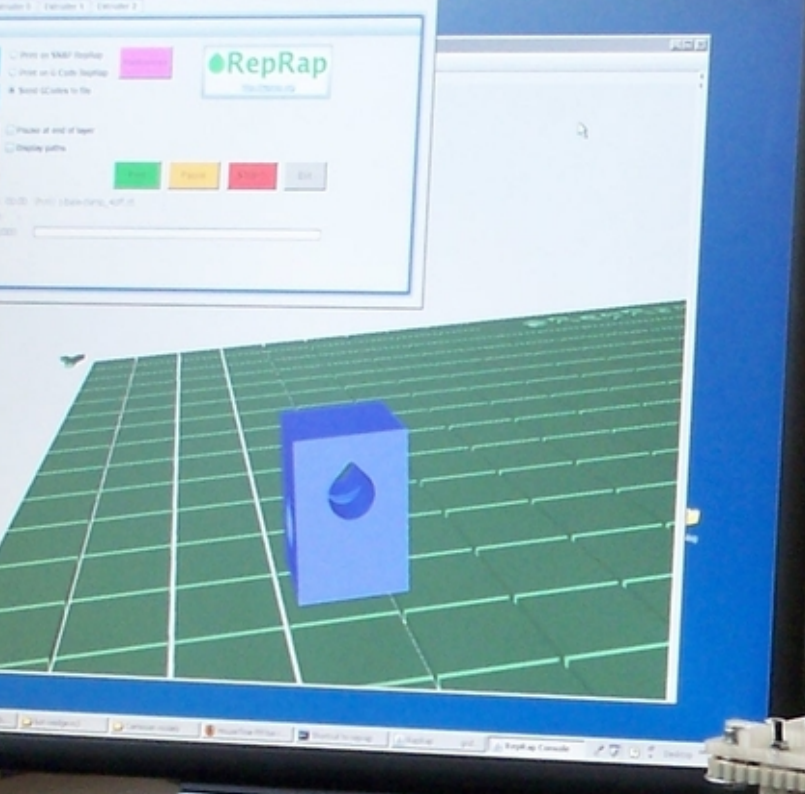




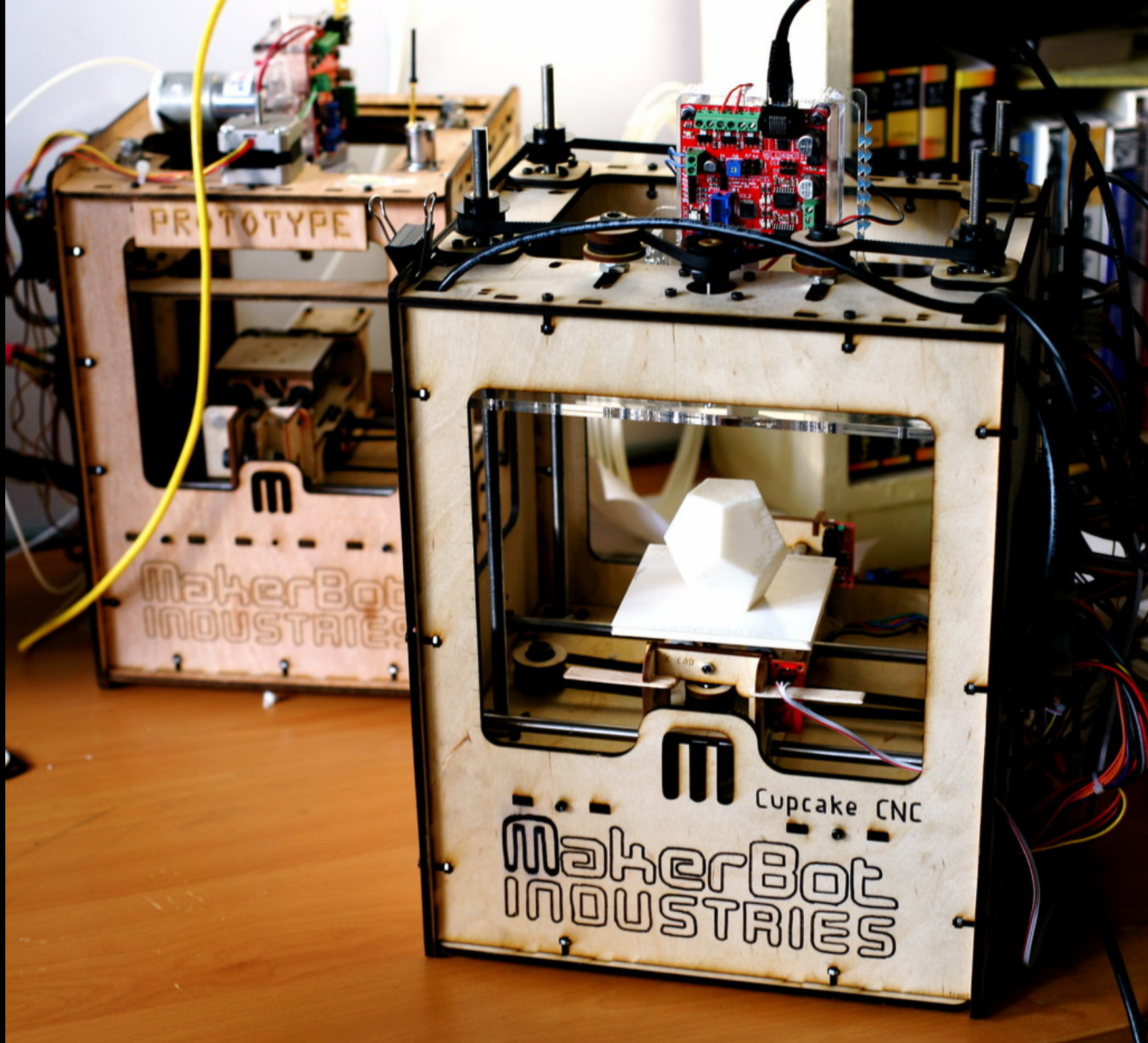












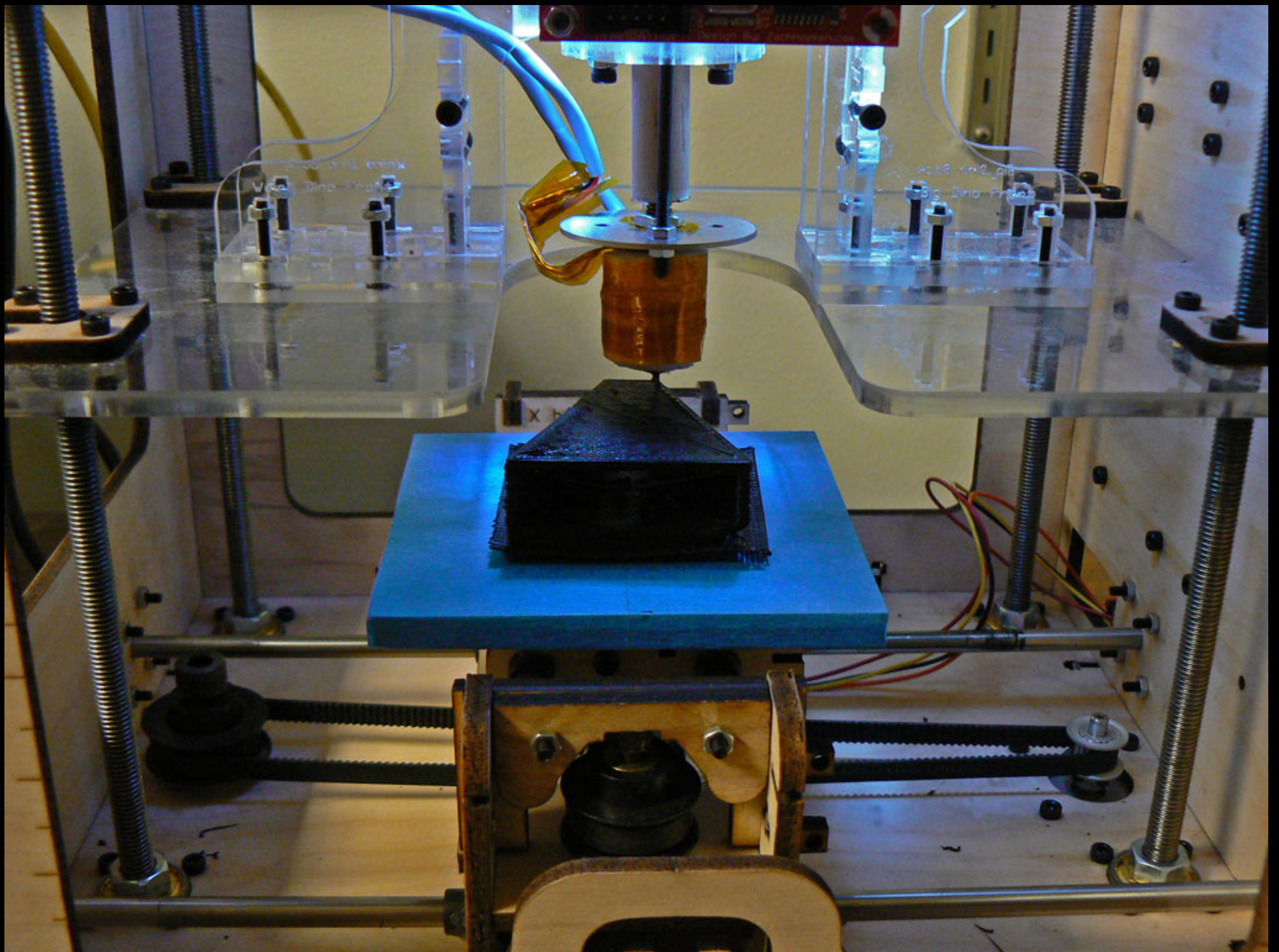
PROTOTYPE

MakerBot  
INDUSTRIES



Cupcake CNC

MakerBot  
INDUSTRIES





**Cost of personal 3D  
printers will drop.**

**(currently \$350 to \$1200.)**

Gada Prize @ Humanity+

# Gada Prize @ Humanity+

- Must print 3 materials (one must be conductive)
- Must be able to print PCBs
- Print beds must be reusable ~20 times
- Must keep cost under \$200
- Must have a build volume of 300x300x100mm
- Must be able to print its own parts unattended within 10 days
- Must print autonomously (no PC/laptop)
- Uses no more than 60 watts

**[gadaprize.org](http://gadaprize.org)**

# IT WILL BE AWESOME IF THEY DON'T SCREW IT UP:

3D Printing, Intellectual Property, and the Fight  
Over the Next Great Disruptive Technology

Michael Weinberg  
November 2010

# Open Source Hardware

OSI-style open-source started with software

Copyright law vs. patent law

Society is primed for proprietary innovation

Need new (widely understood) innovation paradigms

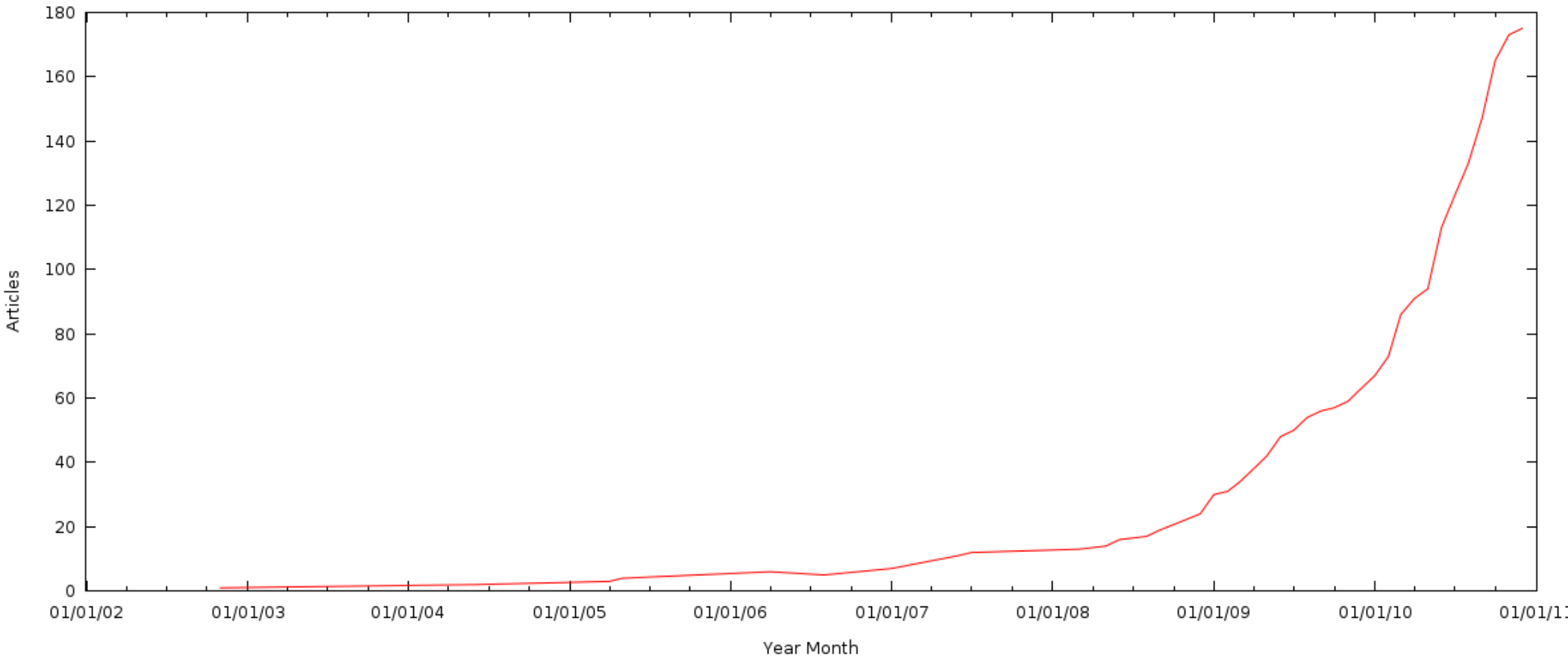
**So what do you build?**





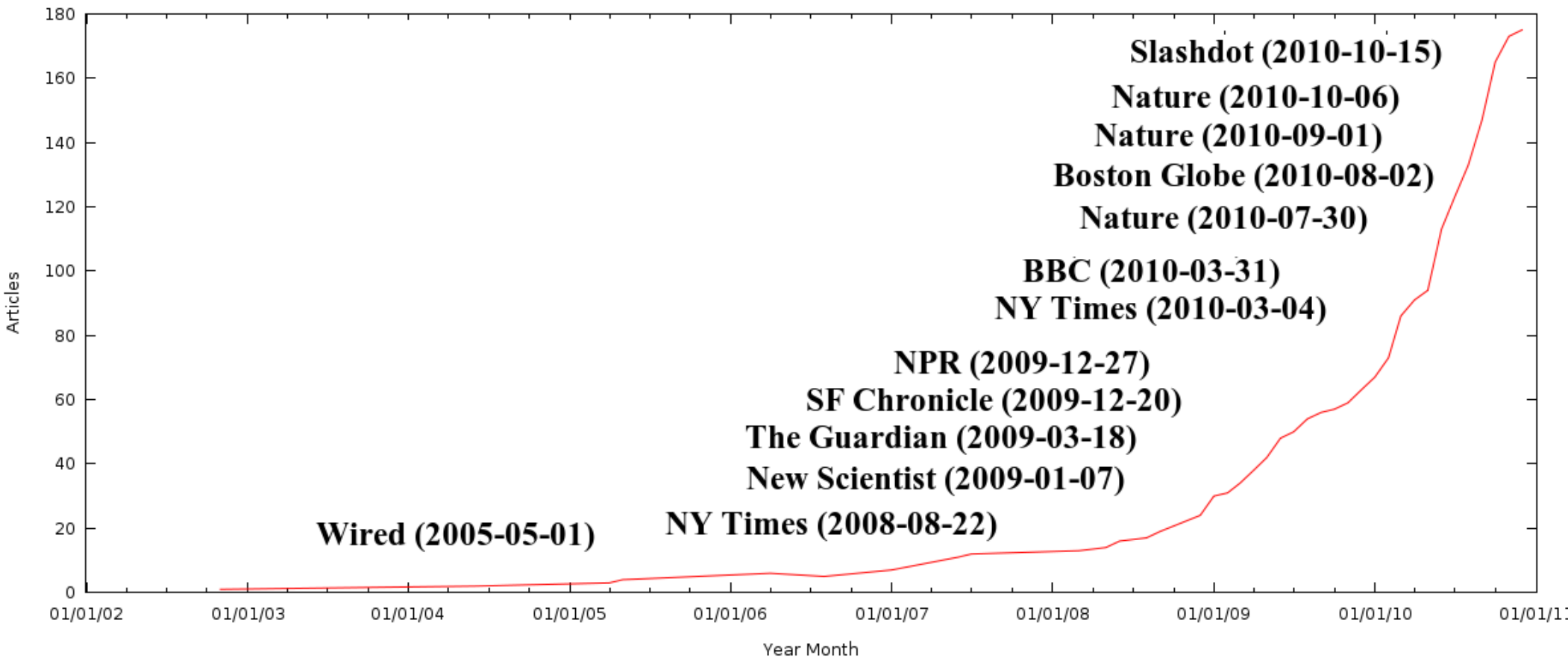
# Growth of DIYbio & DIYgenomics

DIYbio News



# Growth of DIYbio & DIYgenomics

DIYbio News





**vroom**

# Needed Lab/Shop Equipment for Personalized H+

- Gel boxes & transilluminator
- Centrifuge (diyfuge, dremelfuge, ...)
- DNA sequencer & synthesizer
- Spin coater & oven
- Chromatography columns
- 3D printer
- Milling machine (shop machinery)
- Would be nice: AFM, STM, SEM, etc.

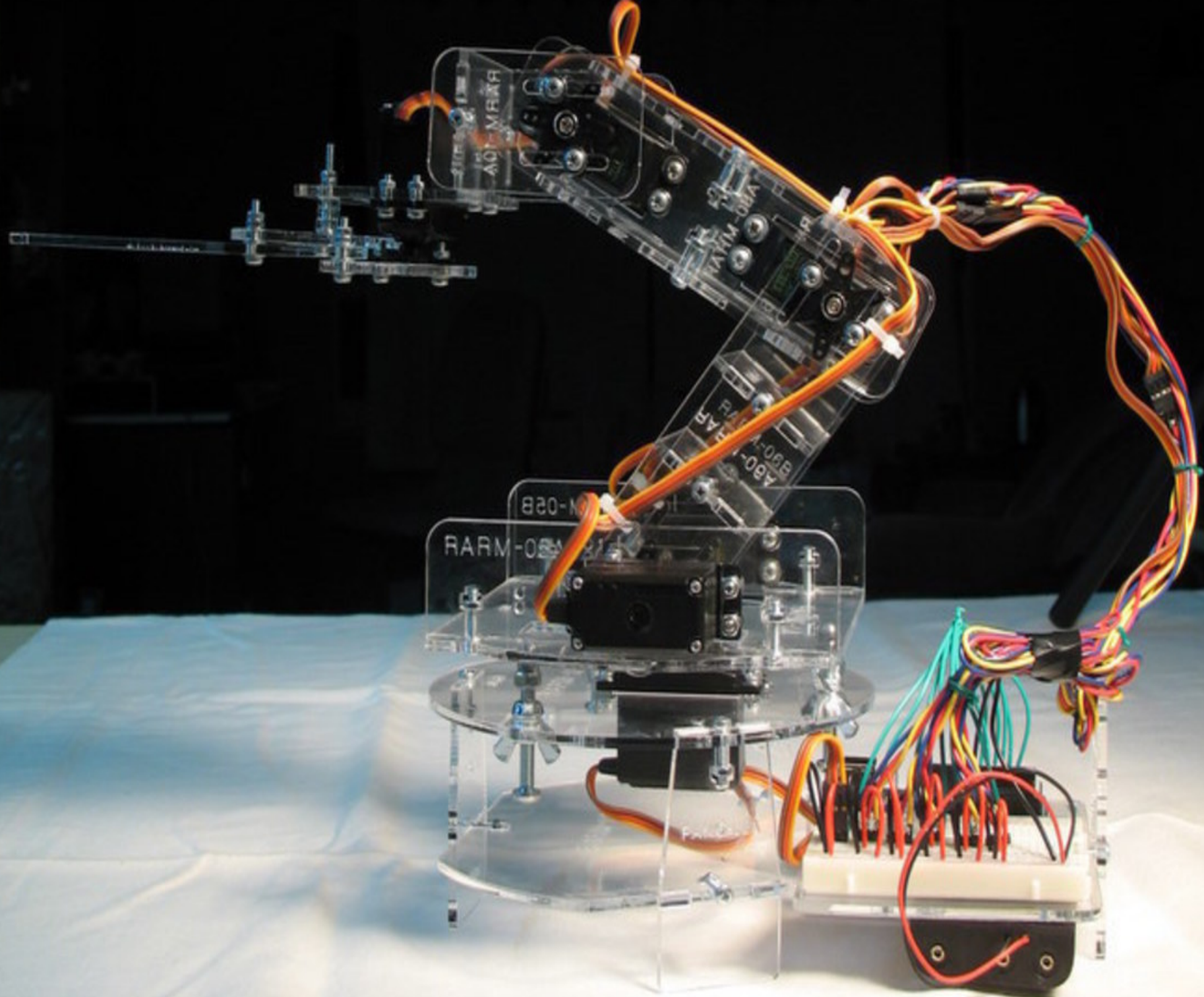
Mechmate



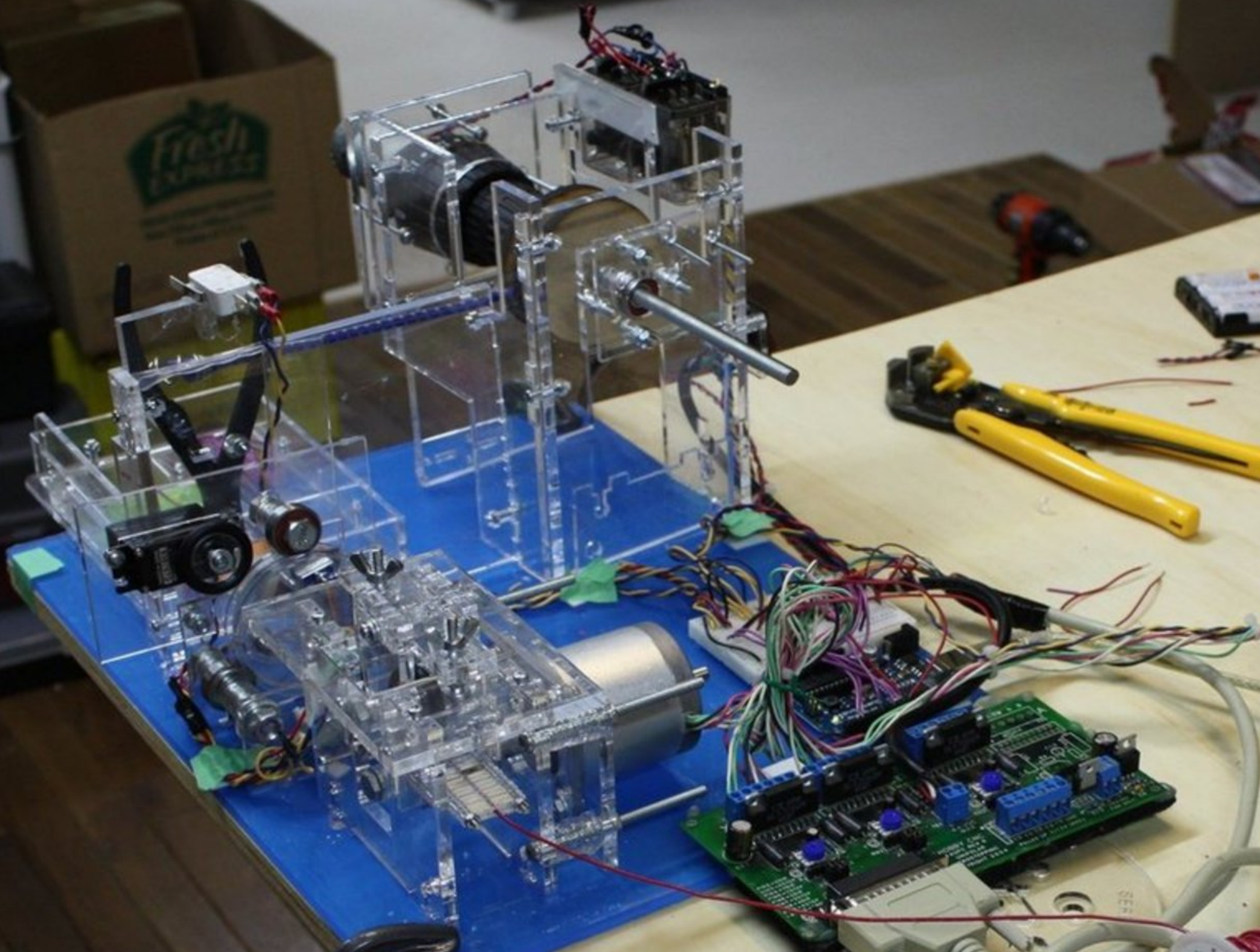


# Jorge Barrera's Open source CNC

(MFG.com labs)

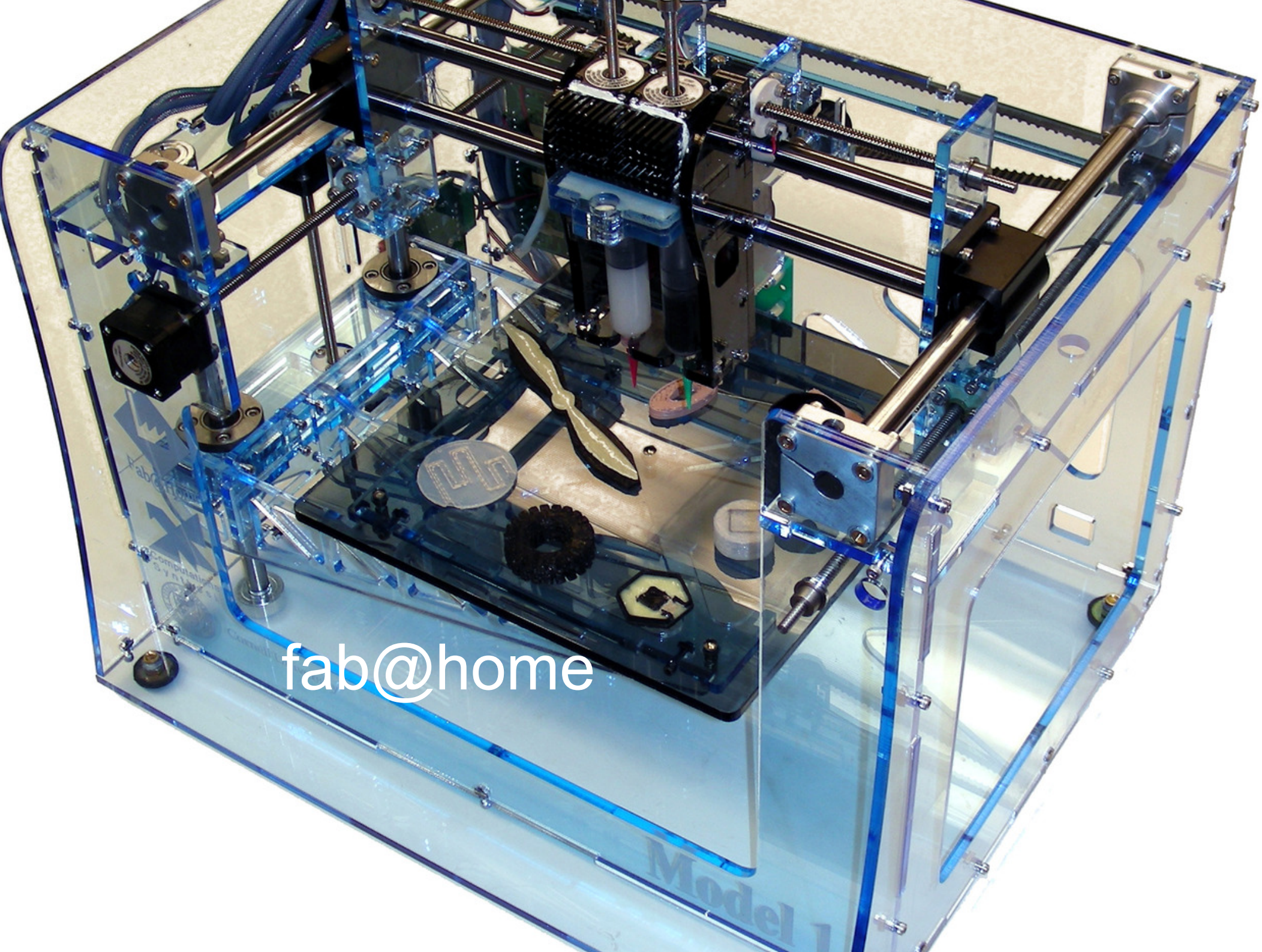






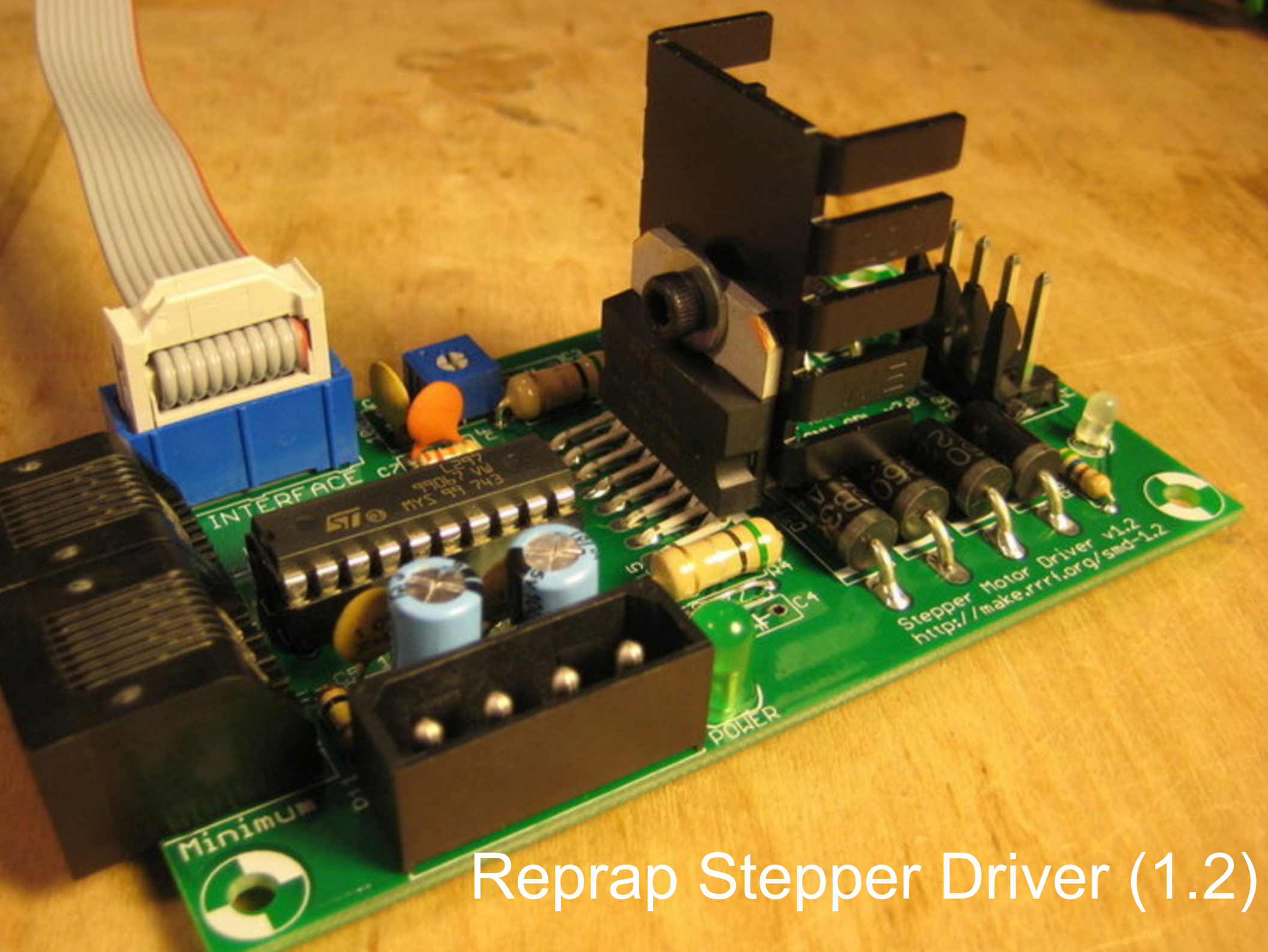
Candyfab 6000



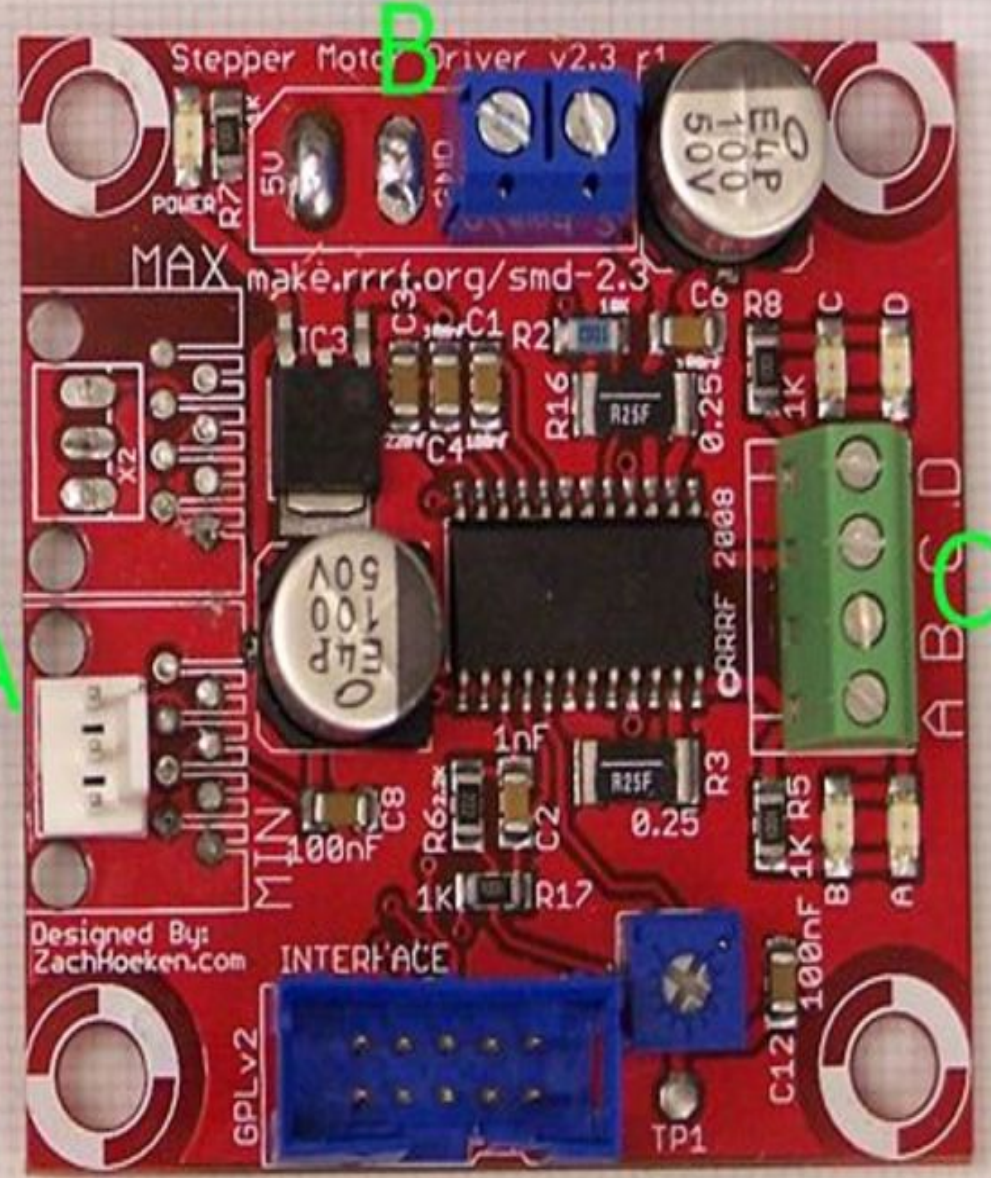
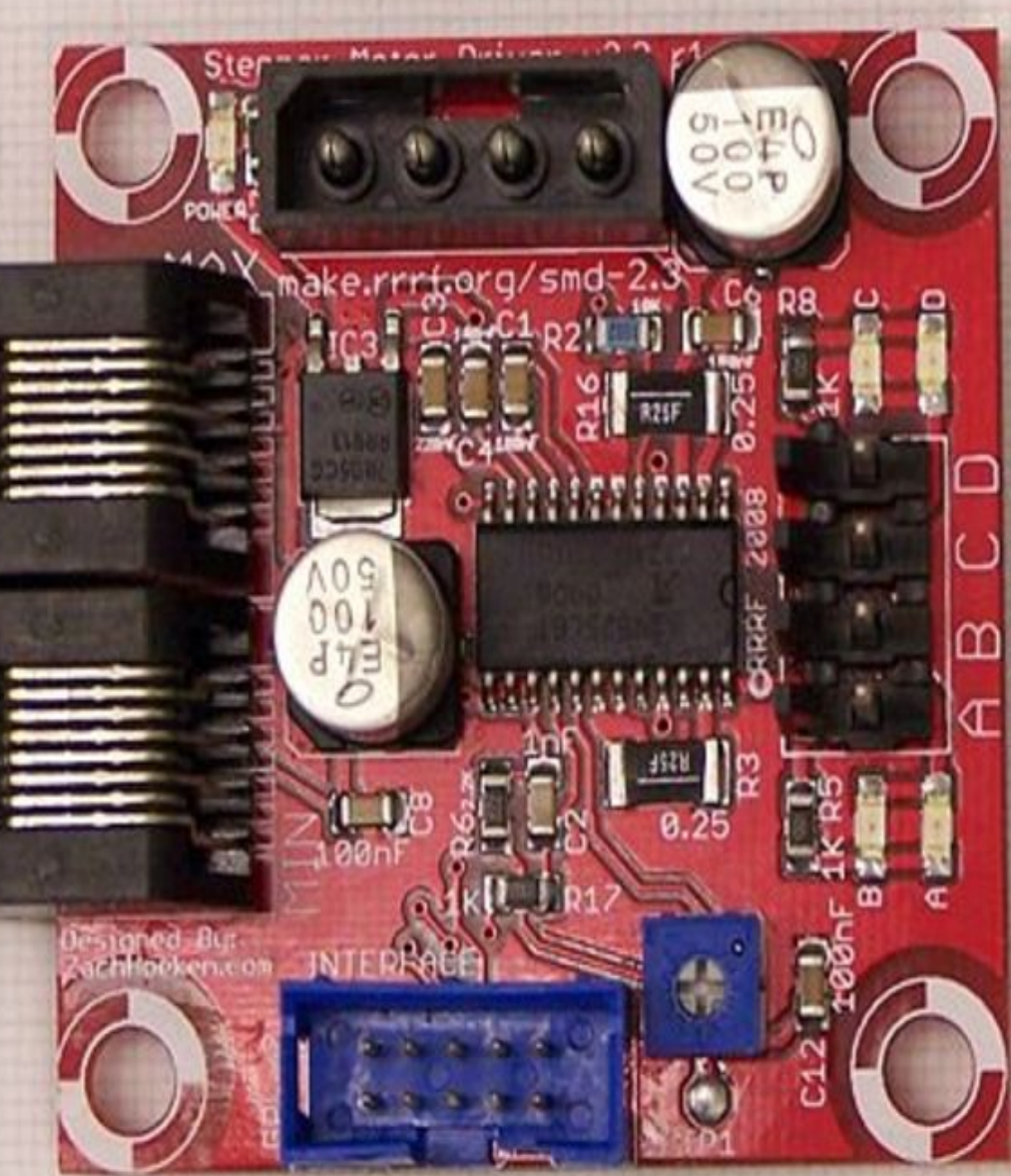


fab@home

Model 1



Reprap Stepper Driver (1.2)



# Reprap Stepper Driver 2.3

20mm



Pulleys Made with a Rewrap



Gears made on Reprap

# MakerBeam T-slot

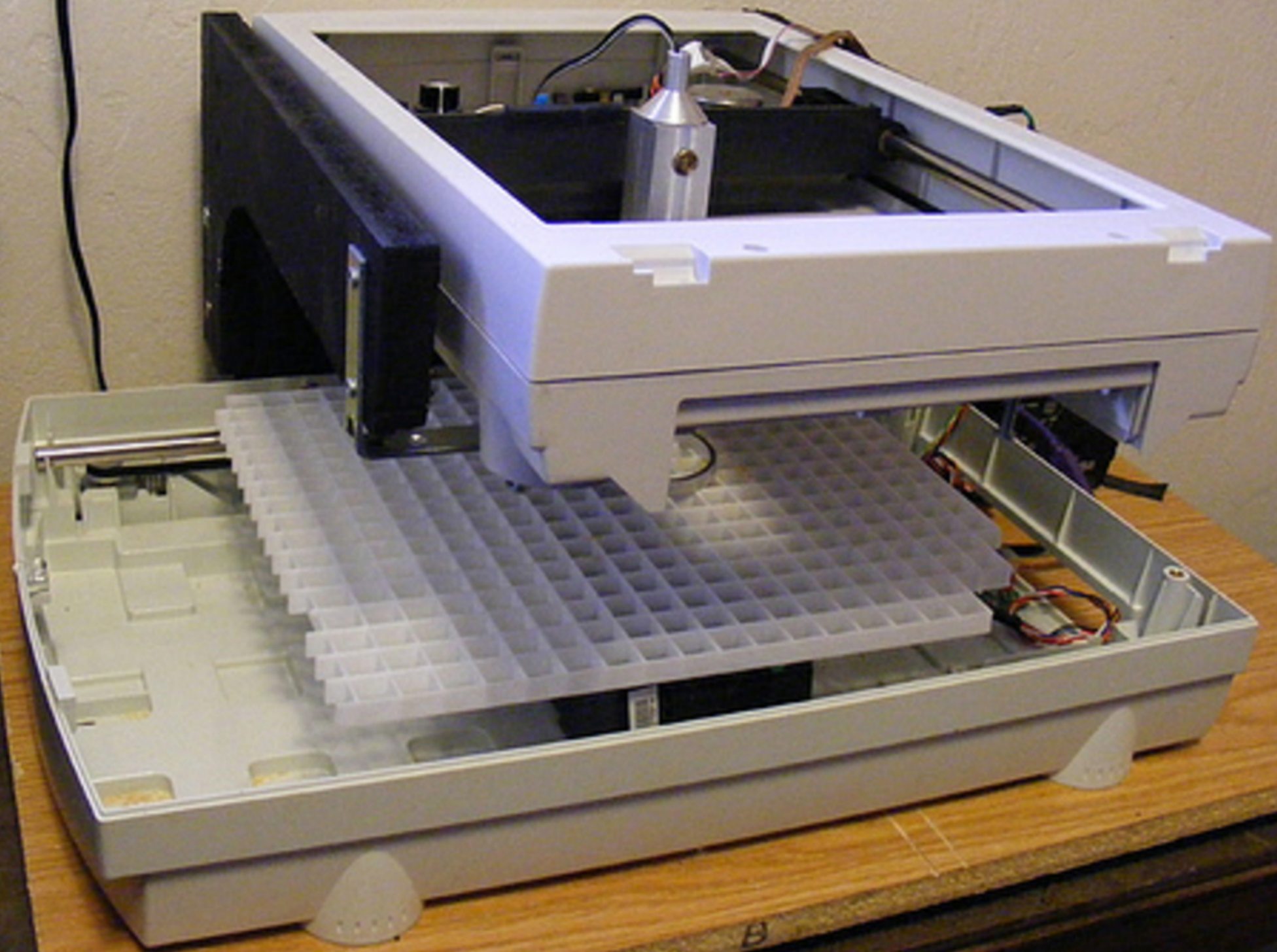
(made on a rewrap)



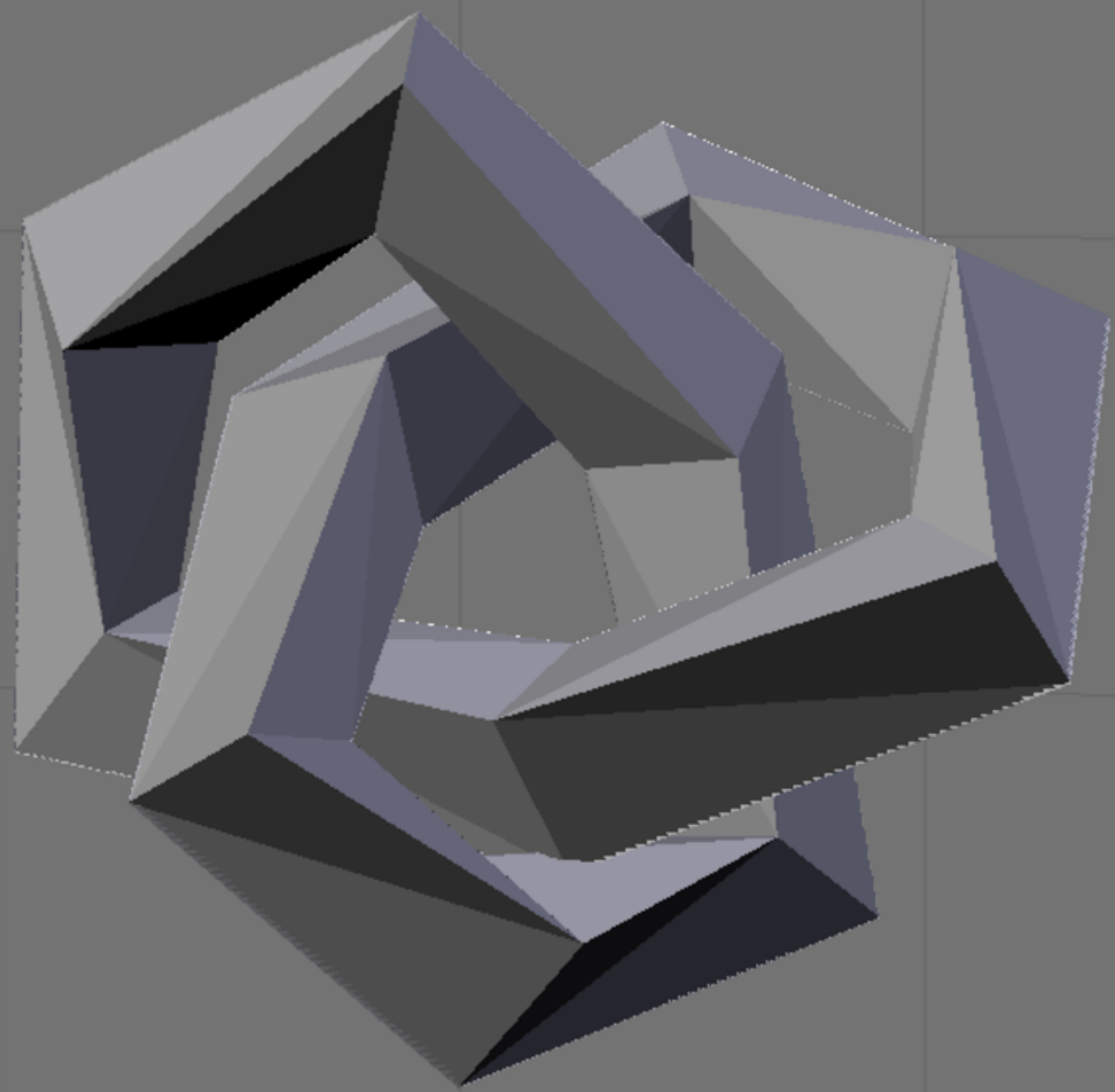




Gridbeam







(1) Curve.005\_net

View Select Object Object Mode Global

Panels

Extensions Touch No Overwri  
No Set Scene  
Other: 0.000 Edge Edge Settings  
Threads: Disable Te Free Tex ima

Do Sequence  
Do Composite

spX: 100.00 spY: 100.00  
PNG Crop

Detail  
Preview  
PC  
PAL 16:9



# CEB Field Testing

- 6 Bricks per minute achieved with manual controls
- 12 brick theoretical limit with automatic controls





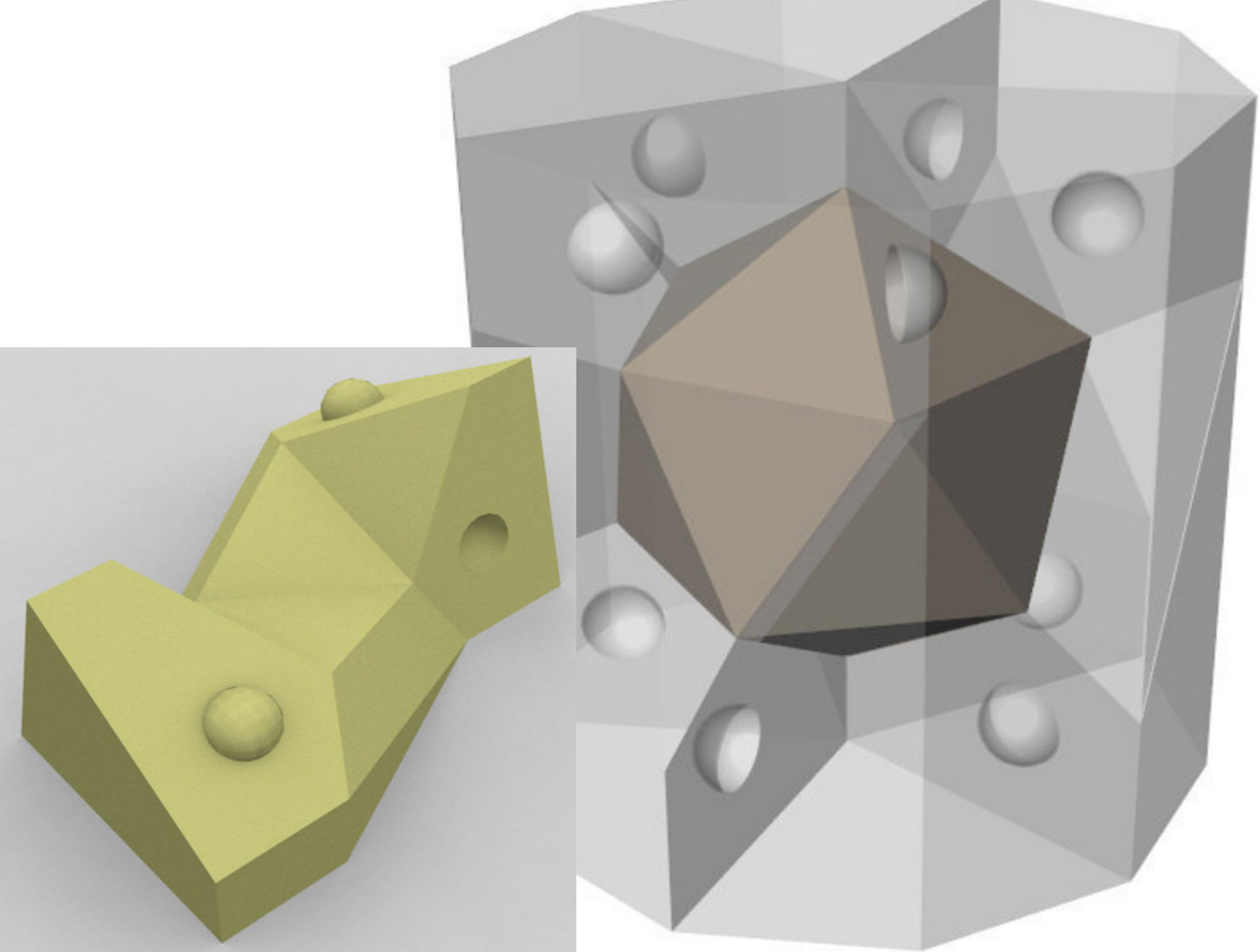
TUFF-4  
Material de polietileno de alta densidad

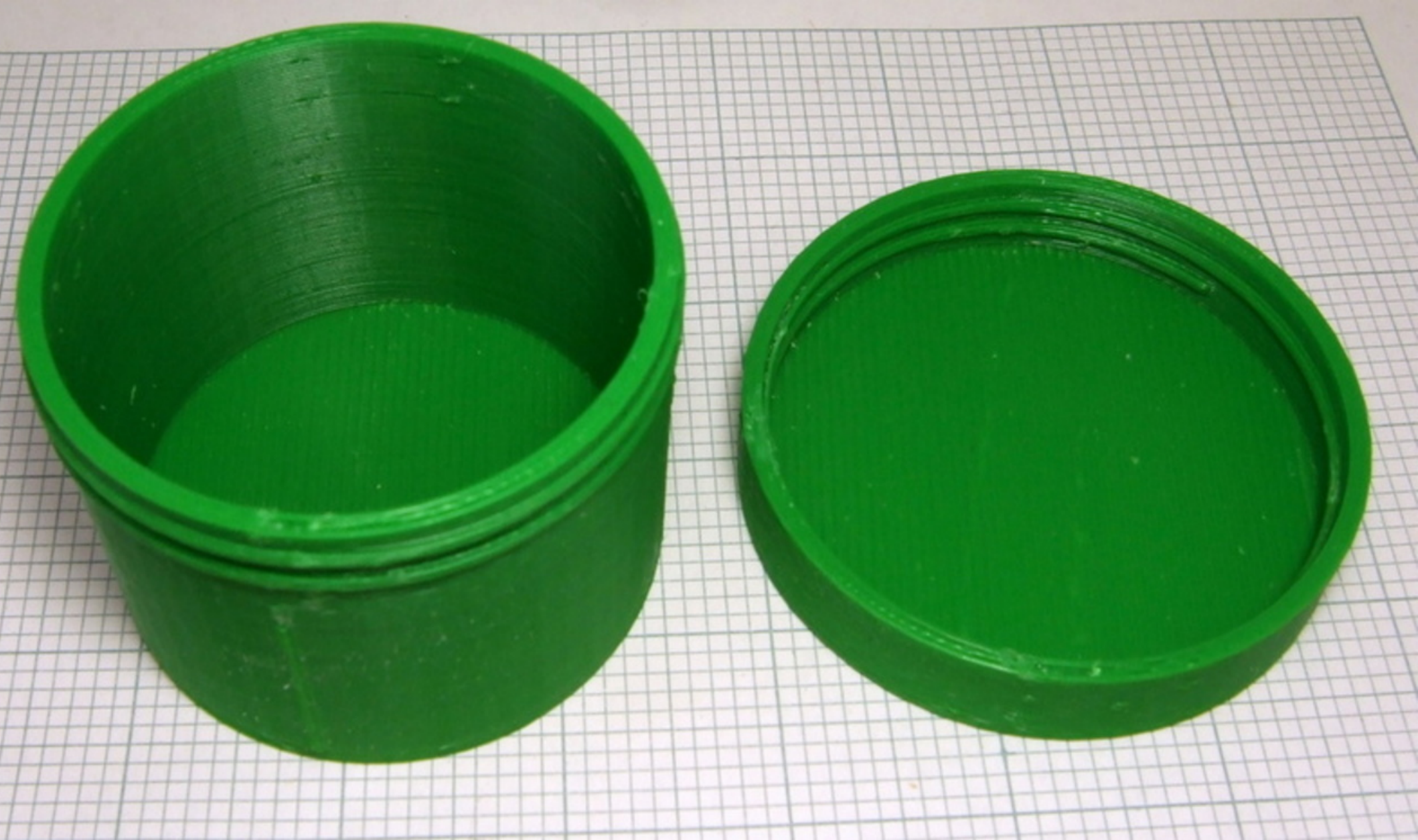


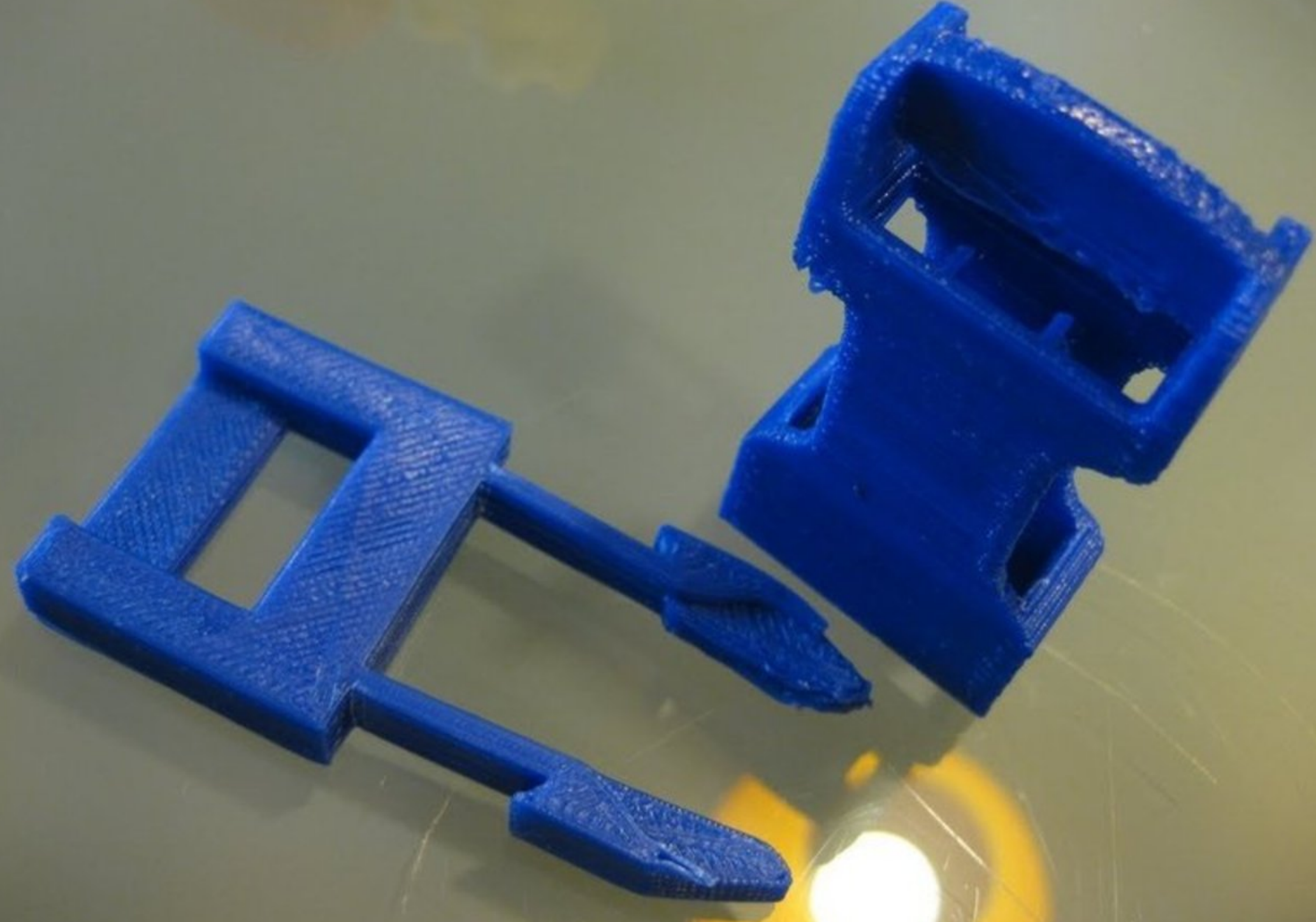




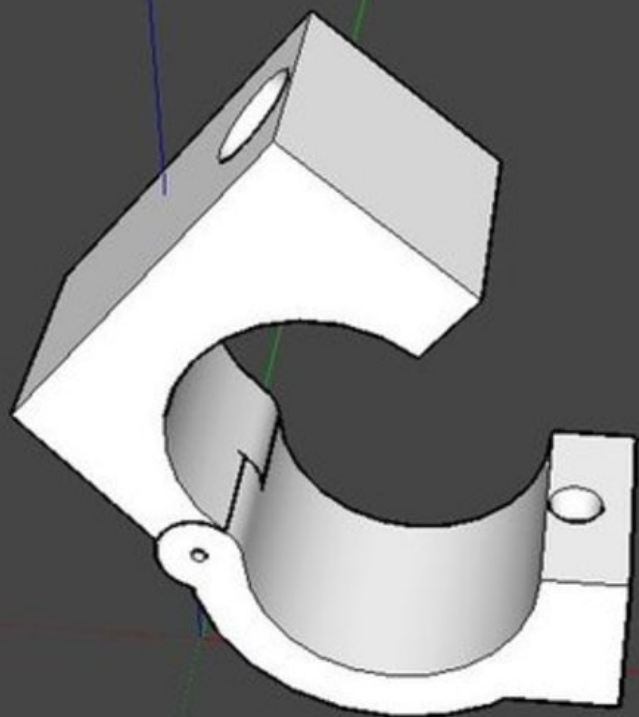


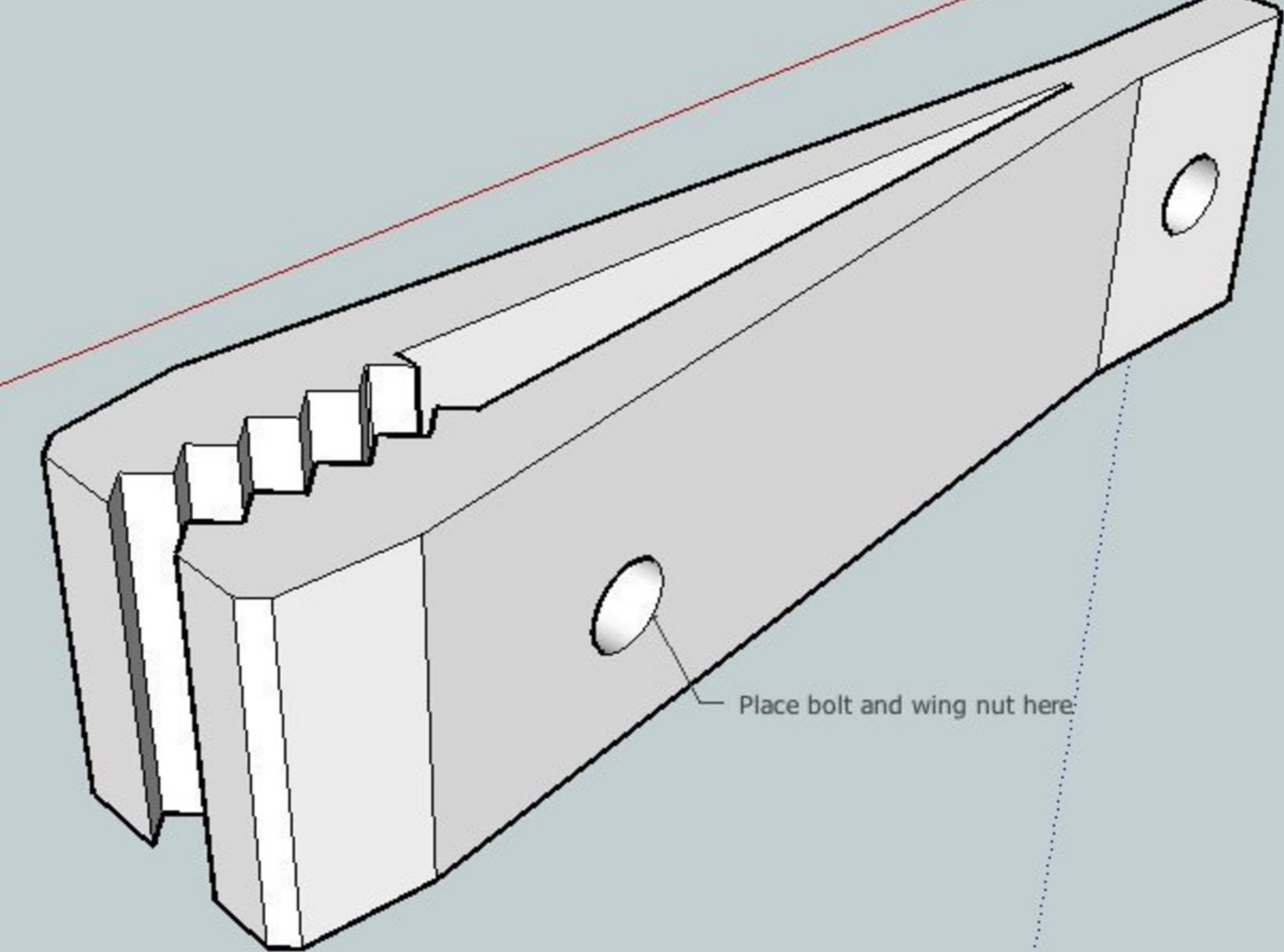












Place bolt and wing nut here







# Organ Scaffolding 3D Tissue Culture



OpenEEG

# Eyewriter Eye Tracker



# Elphel open source CMOS camera

Sync	System Internal / External (with support for multiple sensor frontends - Stereo / 3D Setups available)
Interfaces	RS-232, 100Mbit Ethernet, SATA, USB, ZIF IDE, GPIO (for ext. sync)
Power Consumption	2.4 -5.8 W (depending on operation and load)
Weight	215 g (without lens or accessories)

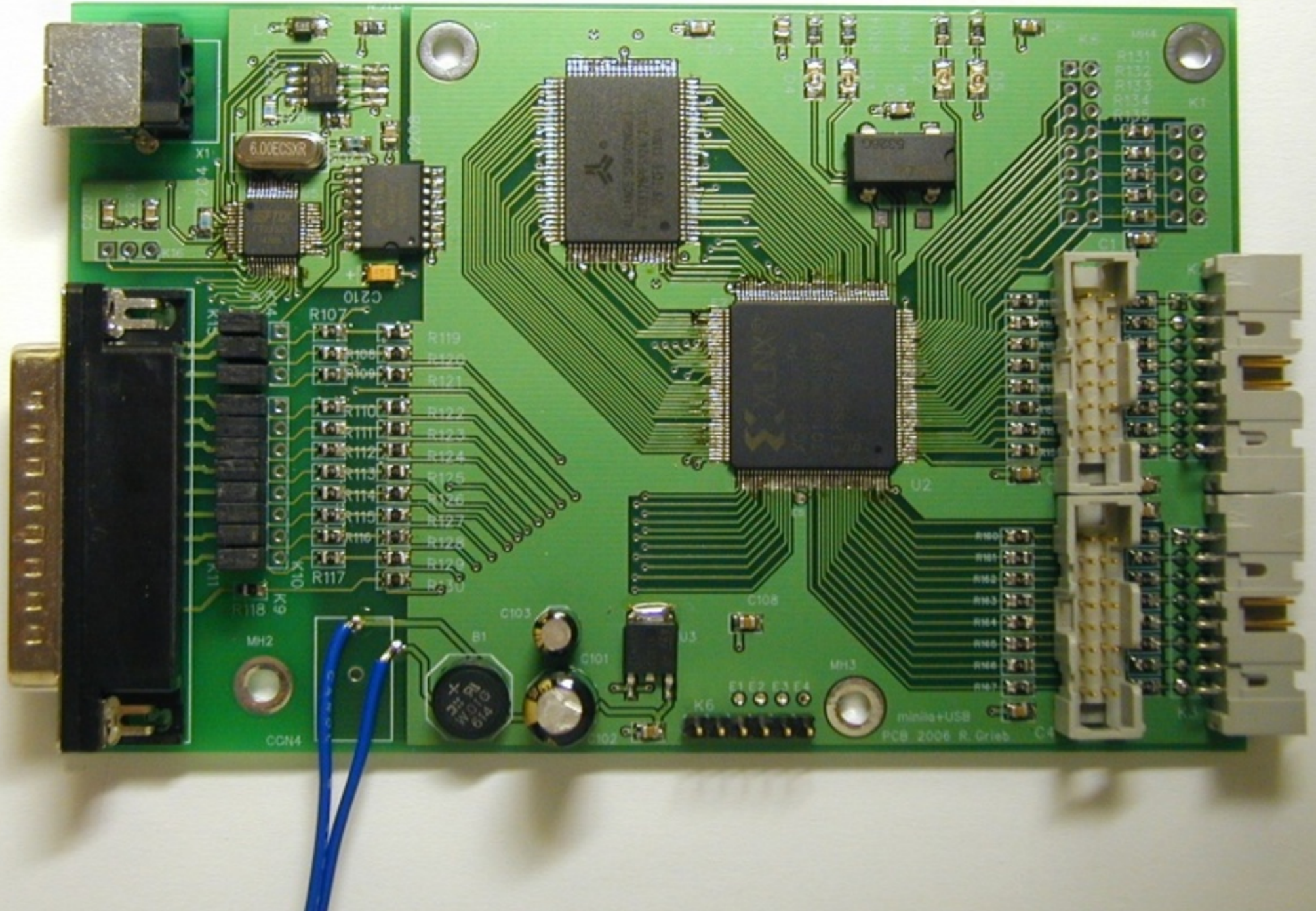
## Key Features

- Free Software and Open Hardware - specially designed to allow creation of new products
- Color and B/W Sensor Frontends available: Aptina 5MPix CMOS with /without IR Cutoff Filter
- High speed hardware accelerated image/video compression: 80 MPix/s
- Recording formats: Quicktime, OGM, JPEG Image Sequence, JP4 RAW Image Sequence, RAW sensor data, HDR (experimental)
- Available Mediums: Stream over 100Mbit Ethernet (unicast or multicast), 2 Compact Flash Card slots, ZIF IDE Connector for camera internal 1.8" HDD, SATA Connector for external HDD, SSD or RAID
- USB Applications: Audio recording, GPS module & compass allow recording geotagged video, etc.
- GPIO for external synchronization
- User/Developer friendly and open scripting: PHP (API, examples), CGI, C, C++, etc.
- Software Development Kit (SDK) and full hardware documentation freely available
- Firmware Upgrade (both GNU/Linux and FPGA) over the network
- Power supply: Power over Ethernet, 12-36V (mobile applications) or regulated 3.3V

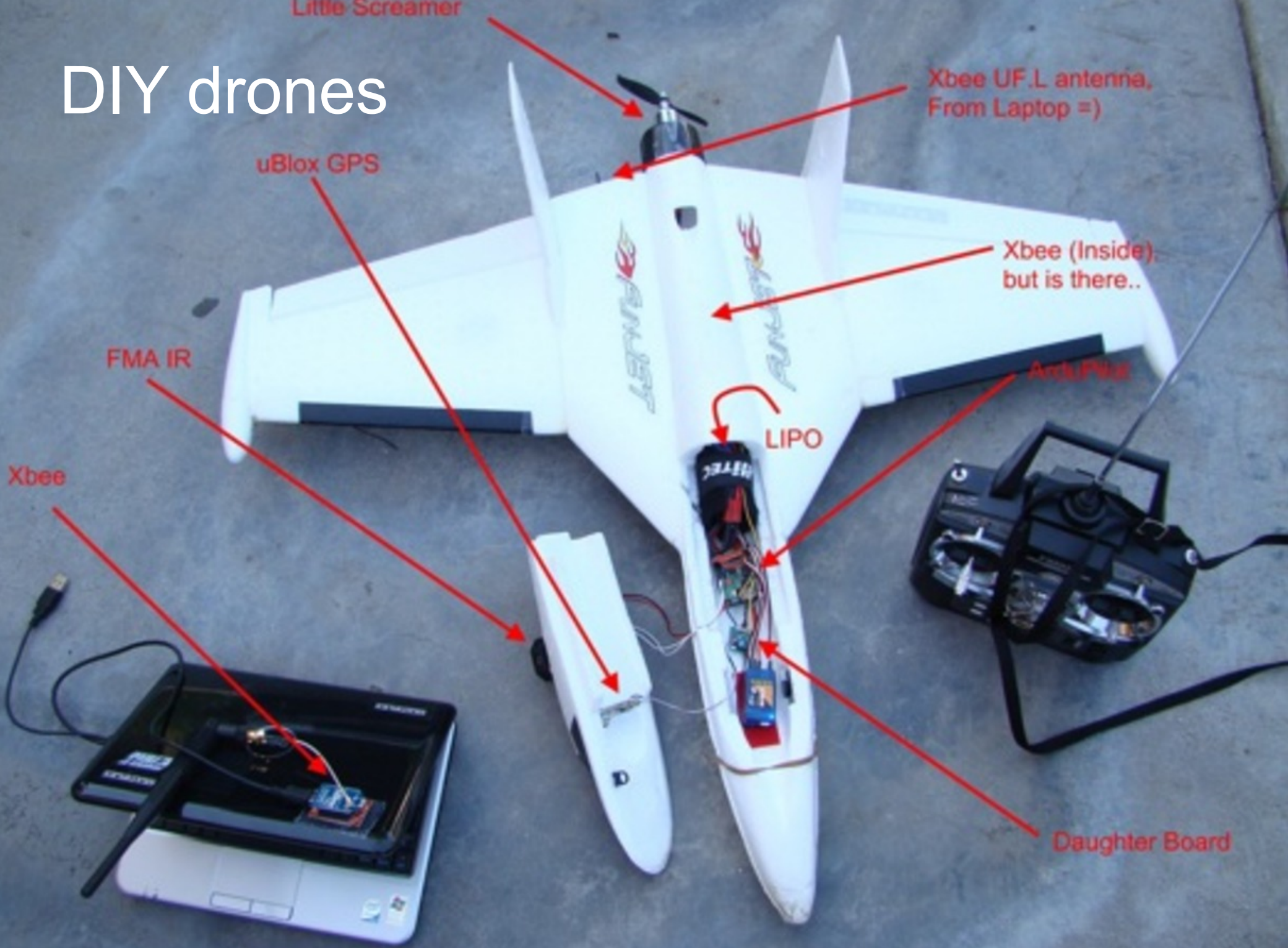


Elphel NC353L-369-GEO with lens, CF card and compass module (internally installed)

# MiniLA Logic Analyzer



# DIY drones



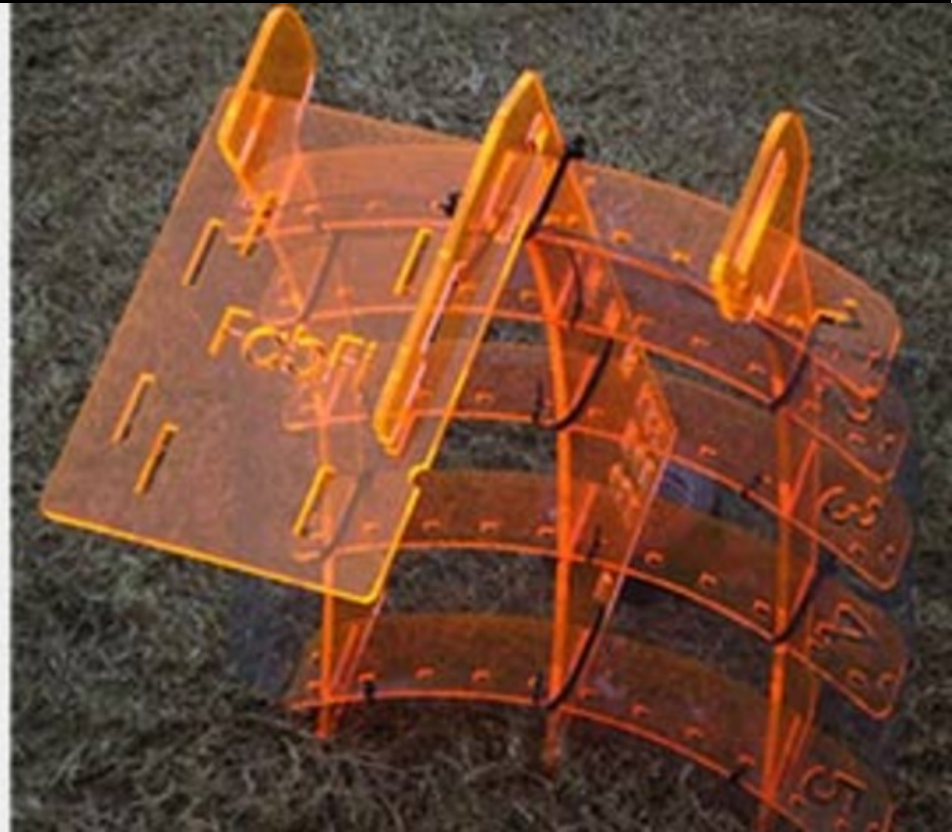
# Ronja Optical link



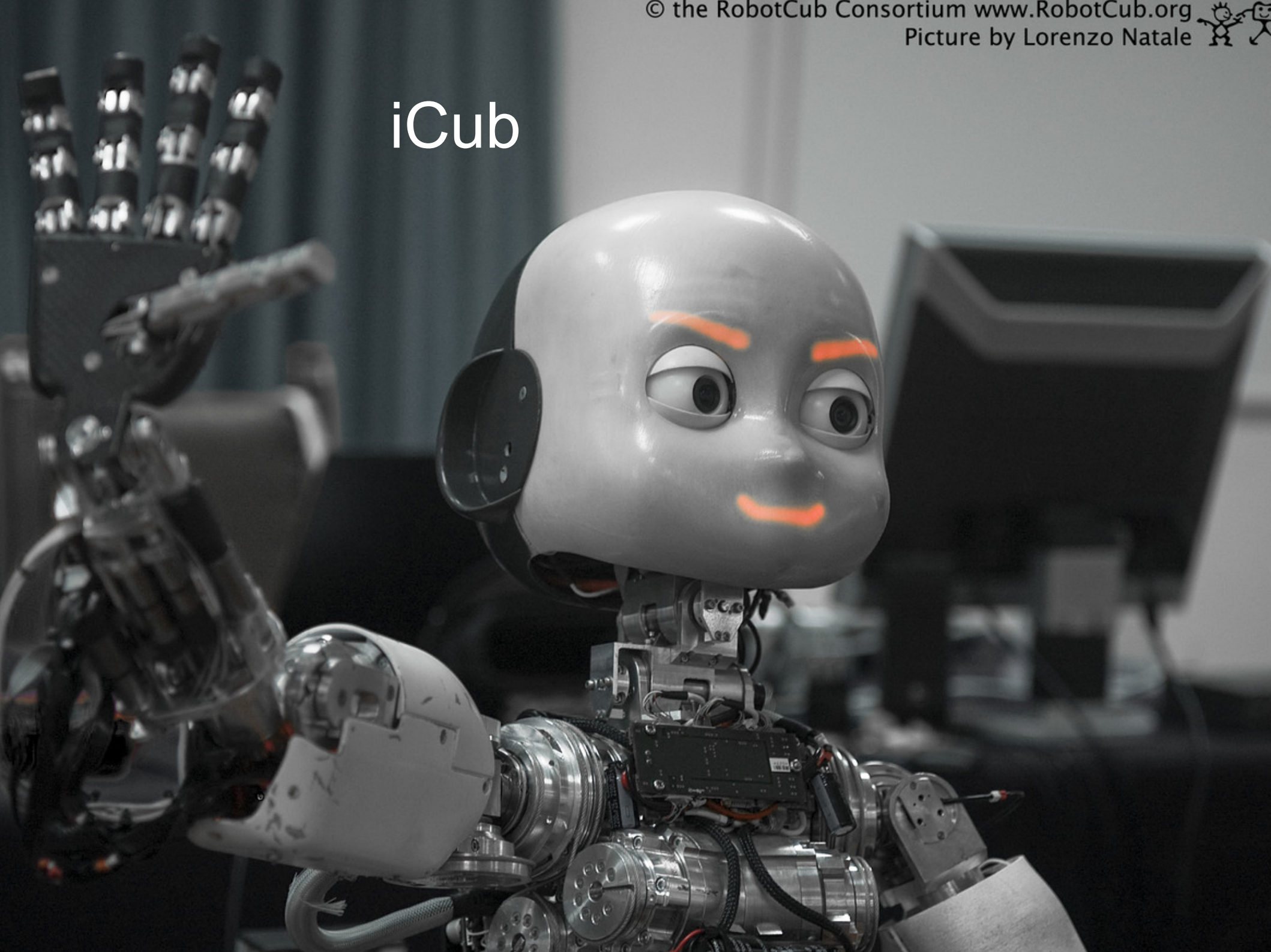


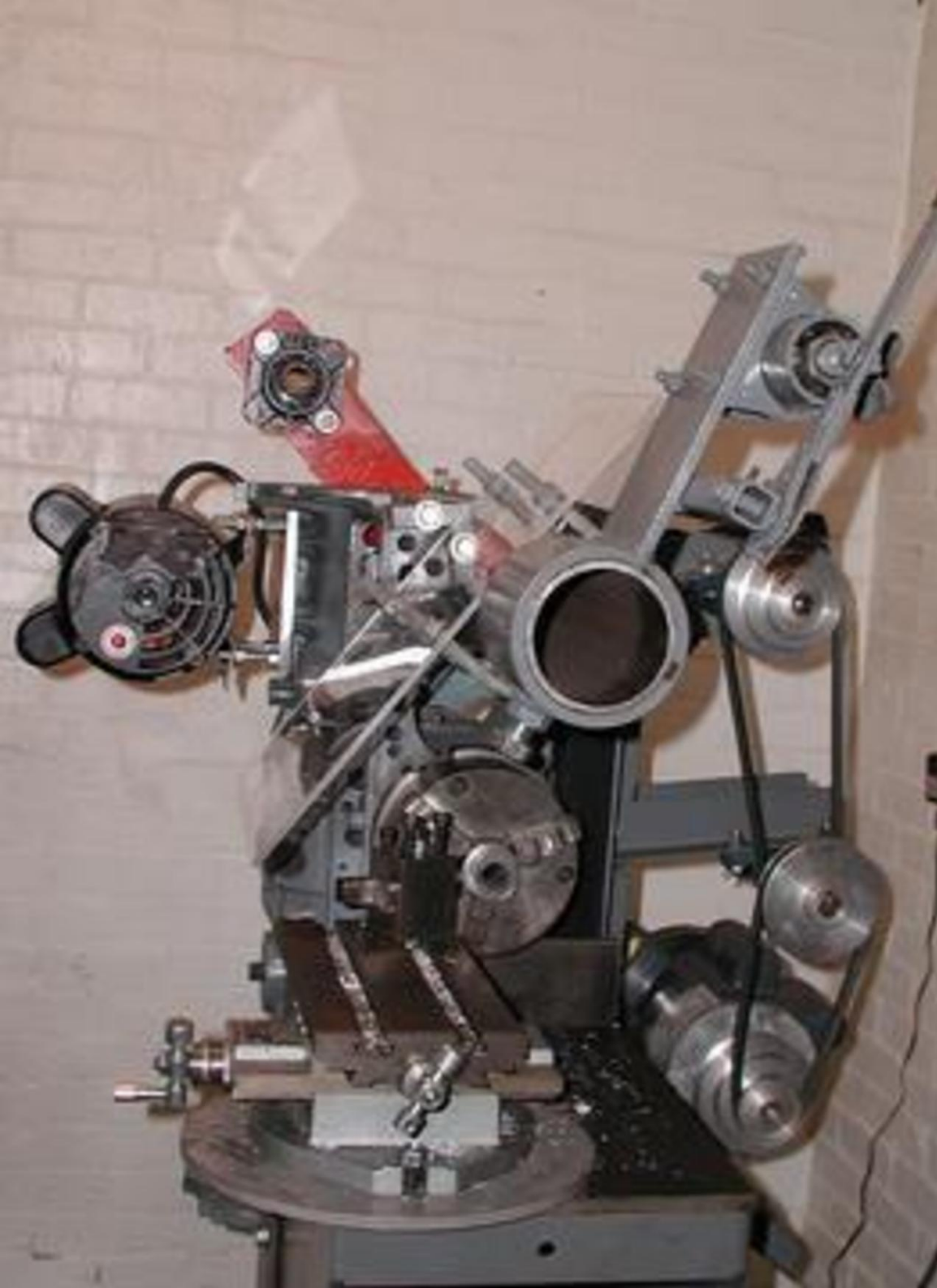


# FabFi point to point radio link

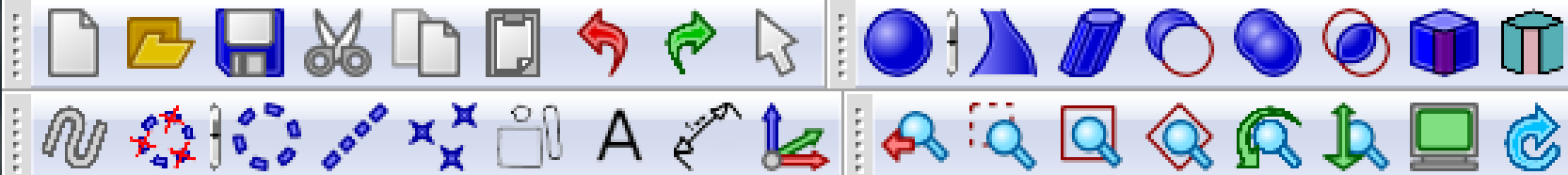


# iCub





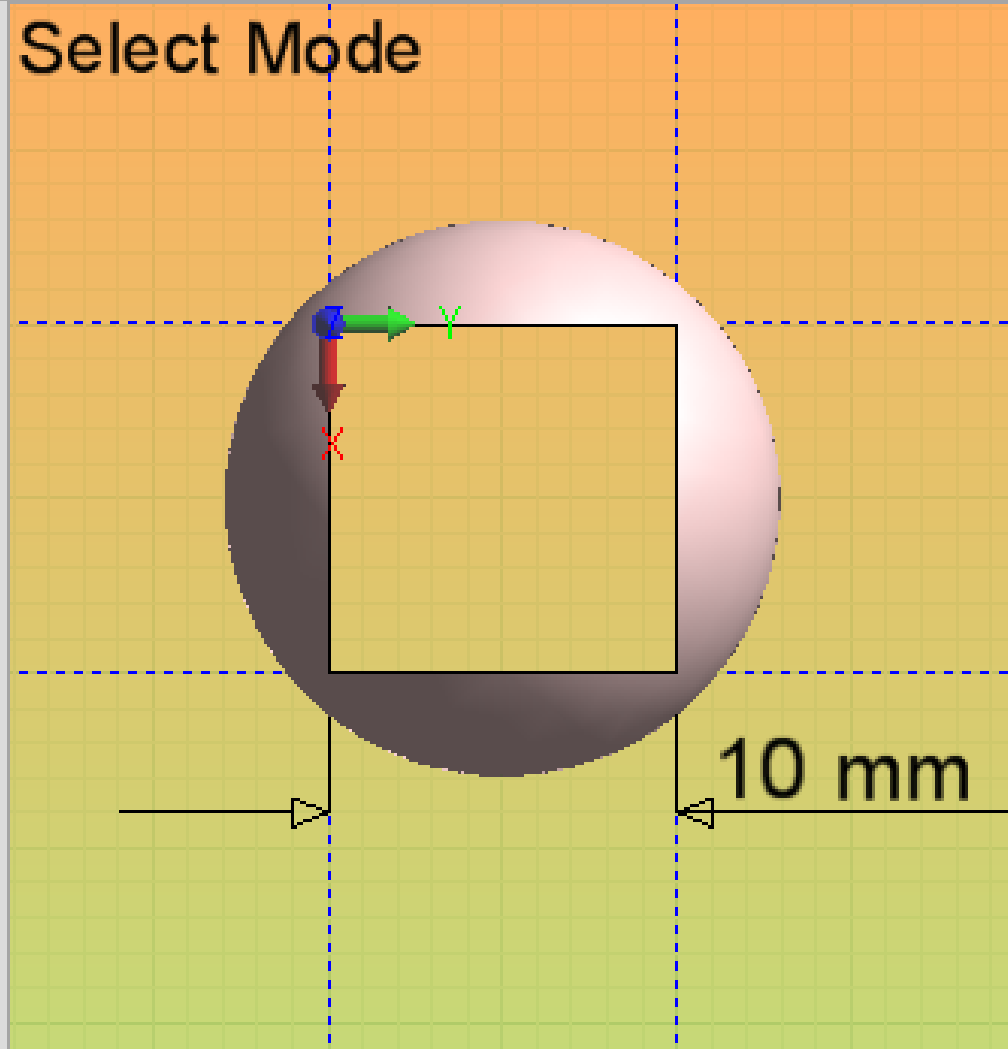
Multimachine



- Objects
- Result of Cut Operation
  - Dimension
  - Infinite Line
  - Infinite Line
  - Infinite Line
  - Infinite Line


Input

Input Mode	Select Mode
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**Insert DNA Duplex**



✓ ✗ ?

**Message**

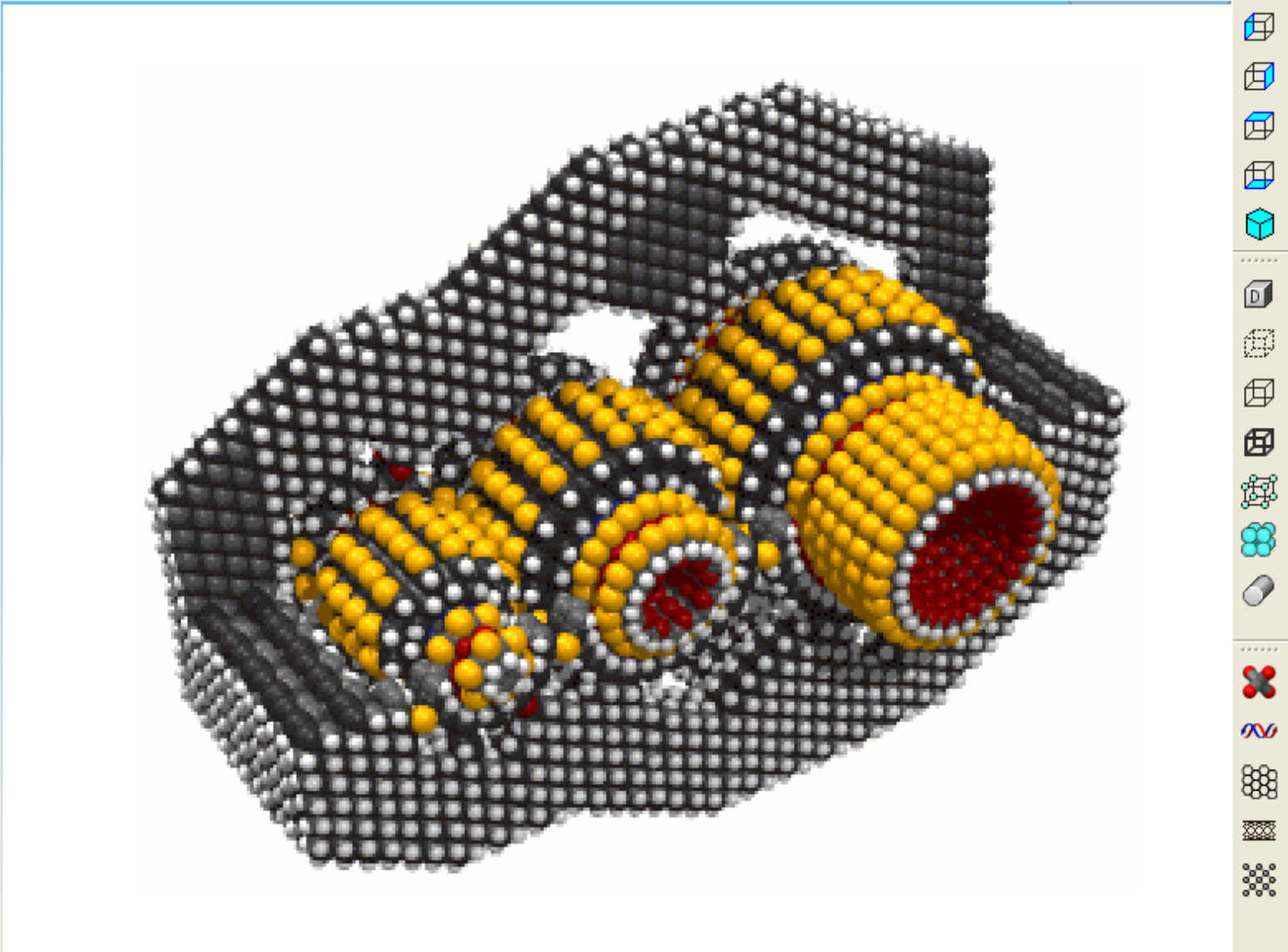
Specify two points in the 3D Graphics Area to define the endpoints of the DNA duplex.

**Parameters**

Conformation: B-DNA  
Model: PAM-3  
Base Pairs: 0  
Bases Per Turn: 10.00  
Duplex Length: 0.0 Angstroms

**Advanced Options**

Rubber band Line:  
Display As: Ribbons  
 Enable line snap



# Community Aggregation

- When futurist organizations began, the Internet wasn't doing technology like this
- Distributed development models
- Strategy: Apply software development methods and workflows from open-source software to the world of hardware and technology
- Liason between these projects and Humanity+
- Aggregate projects and updates together

# Get Involved In Making



# BioCurious



**239**

BACKERS

**\$35,319**

PLEGDED OF \$30,000 GOAL

**0**

SECONDS TO GO

**FUNDING SUCCESSFUL**

This project successfully raised its funding goal on September 23.



**PLEDGE \$3 OR MORE**

The Coffee Level. Can you live without



**JOIN THE NARRATIVE**

**MAKE STUFF**

What do you need from me?

# LEGIT FOLLOW-UP SLIDE :-)

**Bryan Bishop <kanzure@gmail.com>  
m: 512-203-0507**

**<http://heybryan.org/>**

**irc: #hplusroadmap on freenode**

**Thank you.**

