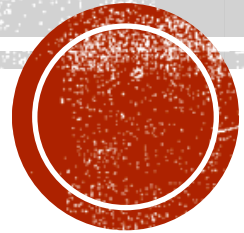
RAPID PROTOTYPING

Week 2 “The Chaos Begins”

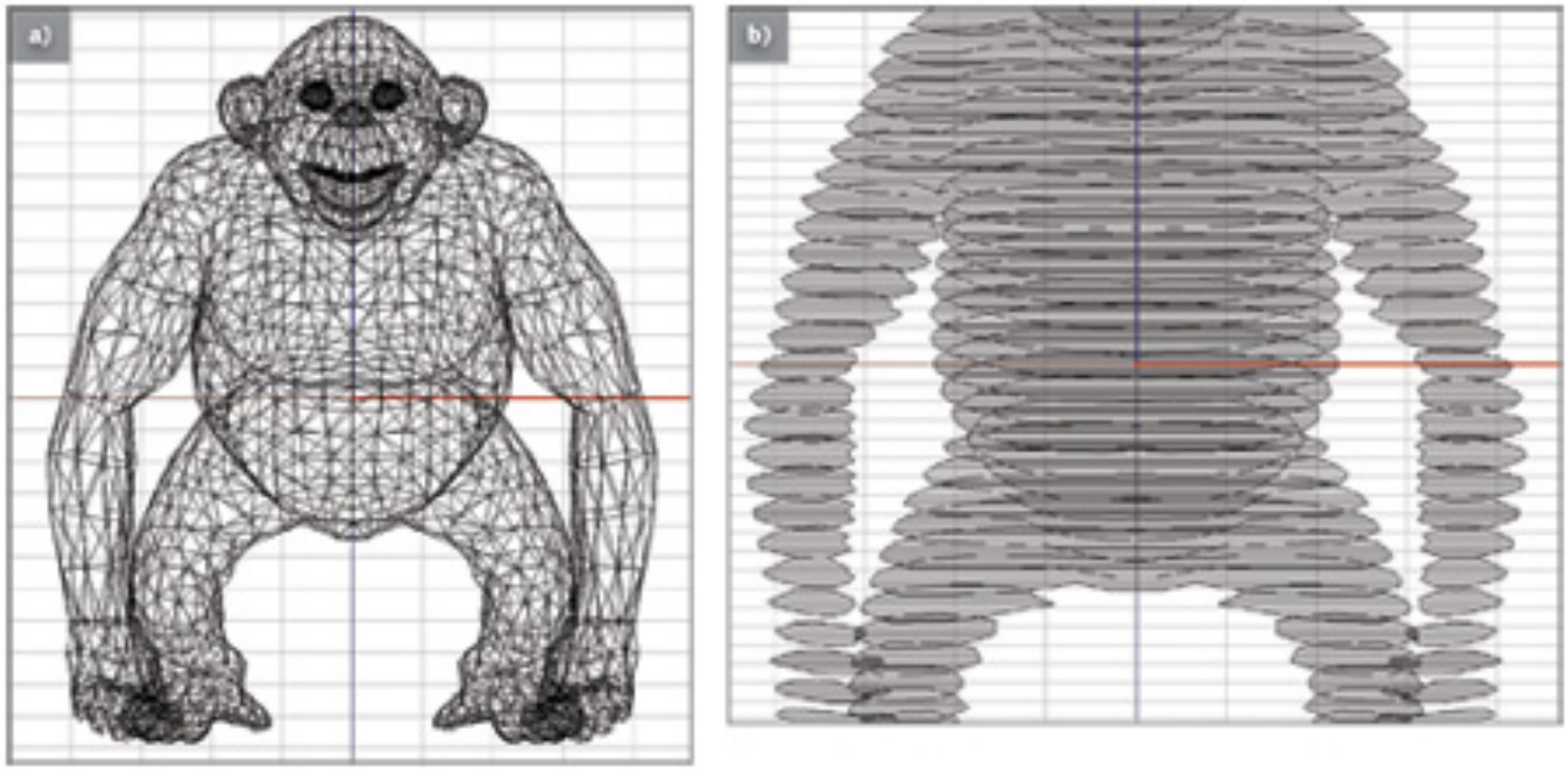


PLANNED AGENDA

1. 3D printing overview
2. Using 3D printers, software and hardware
3. The class project hardware
4. Finishing the designs for the class project
5. 2D with Tinkercad and Cricut
6. Online 3D designs / Print services
7. Demonstration of a prototyping project

1. OVERVIEW OF 3D PRINTING

HOW DO THESE THINGS WORK?



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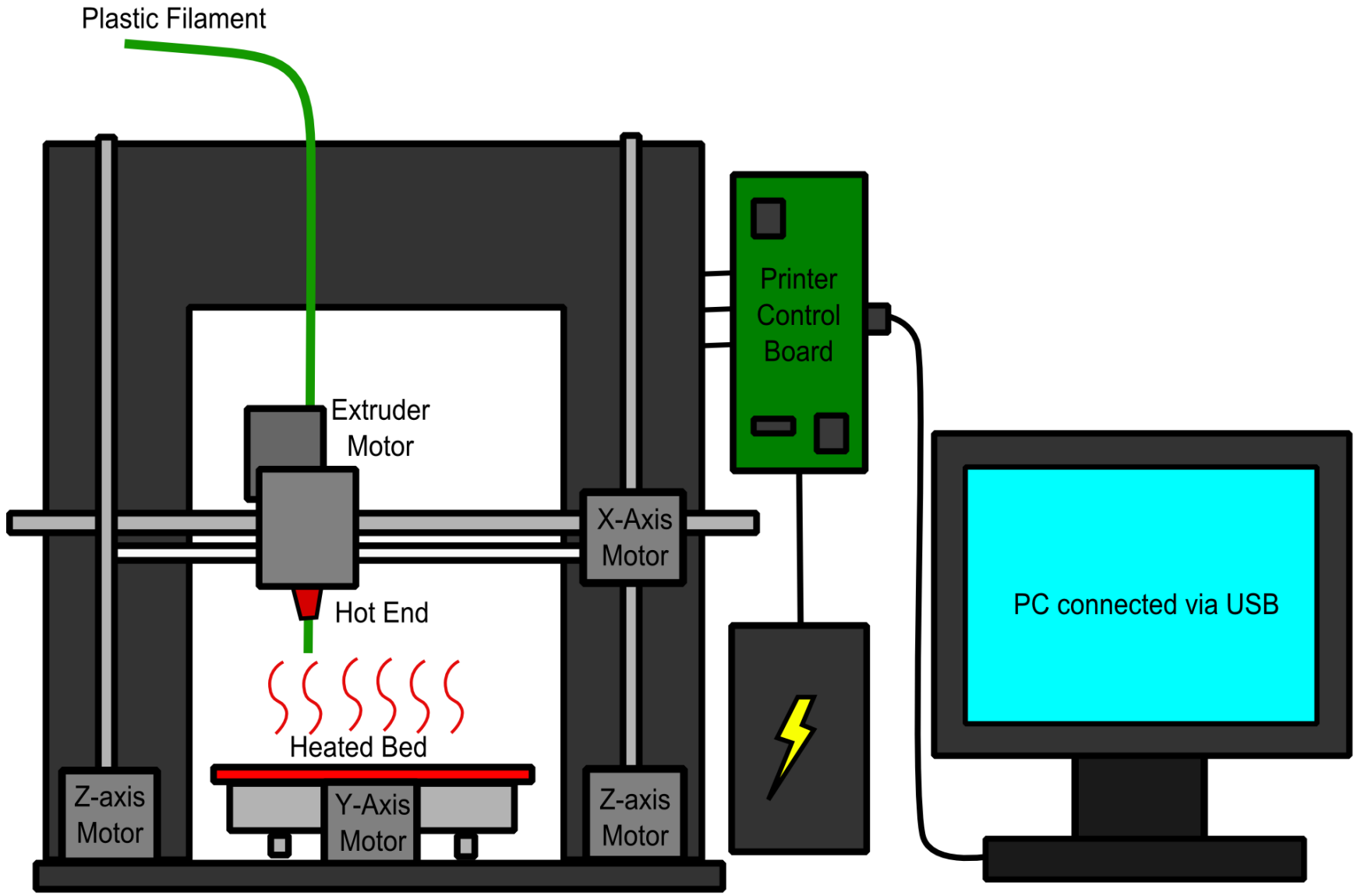

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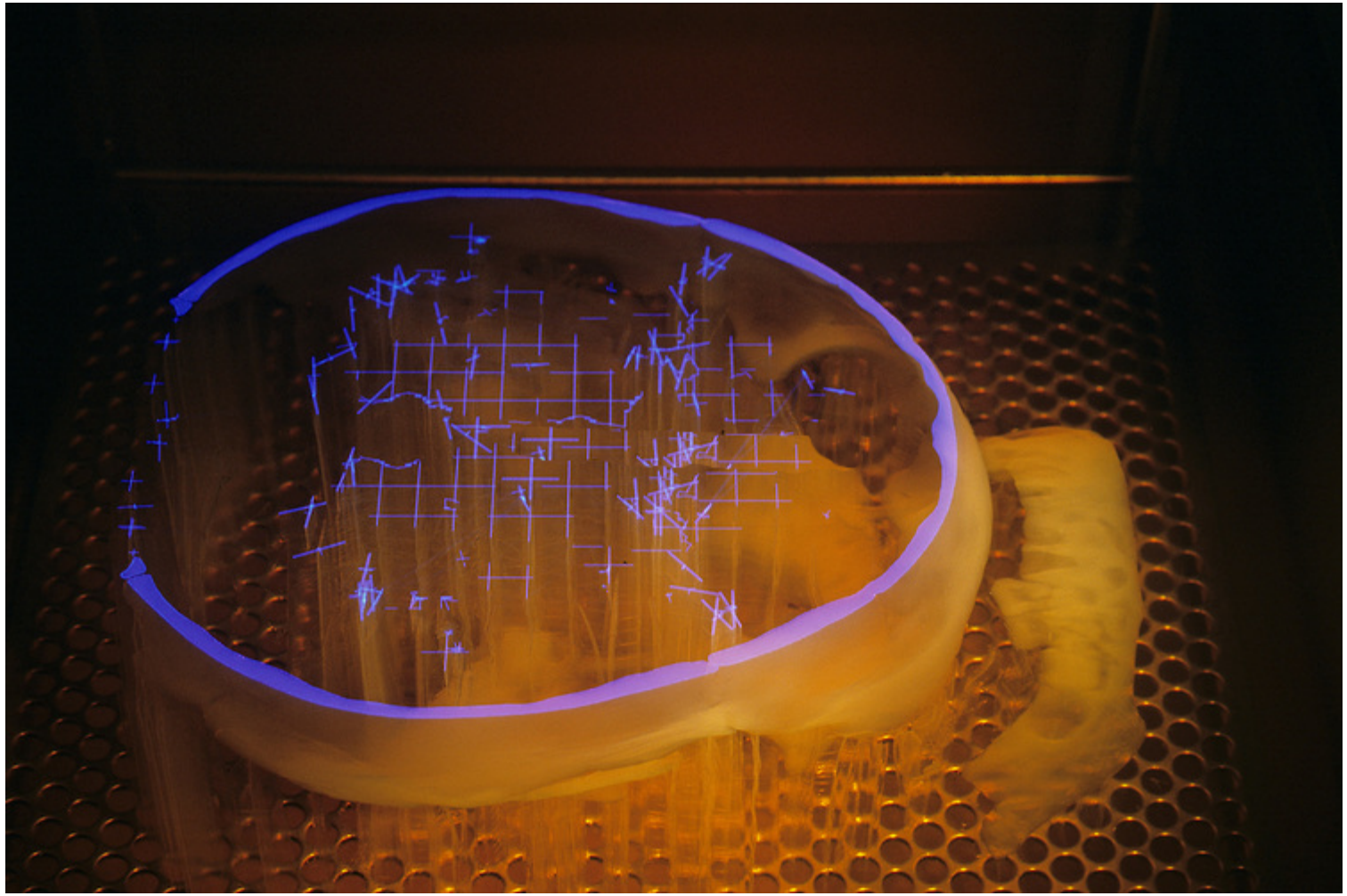

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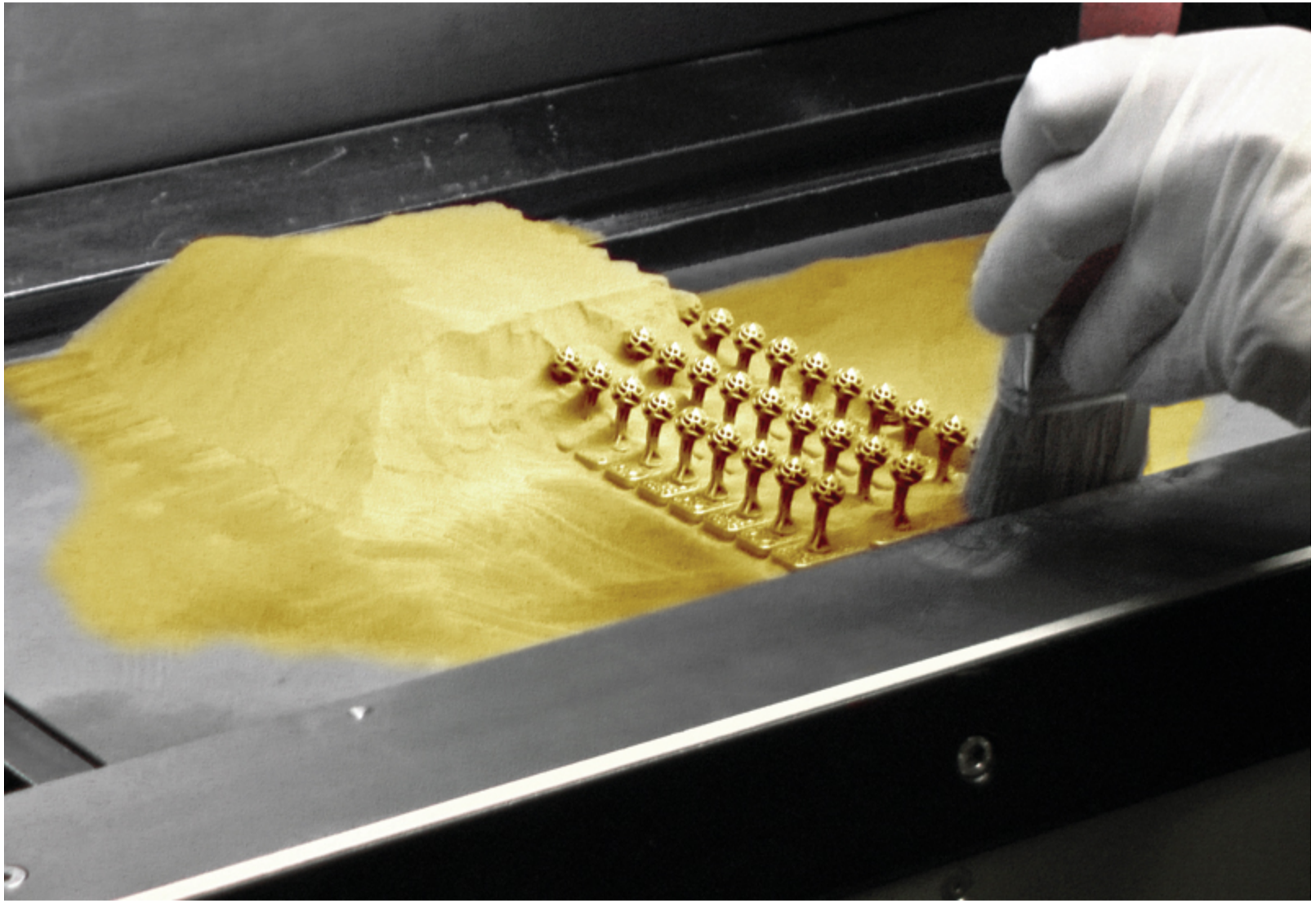
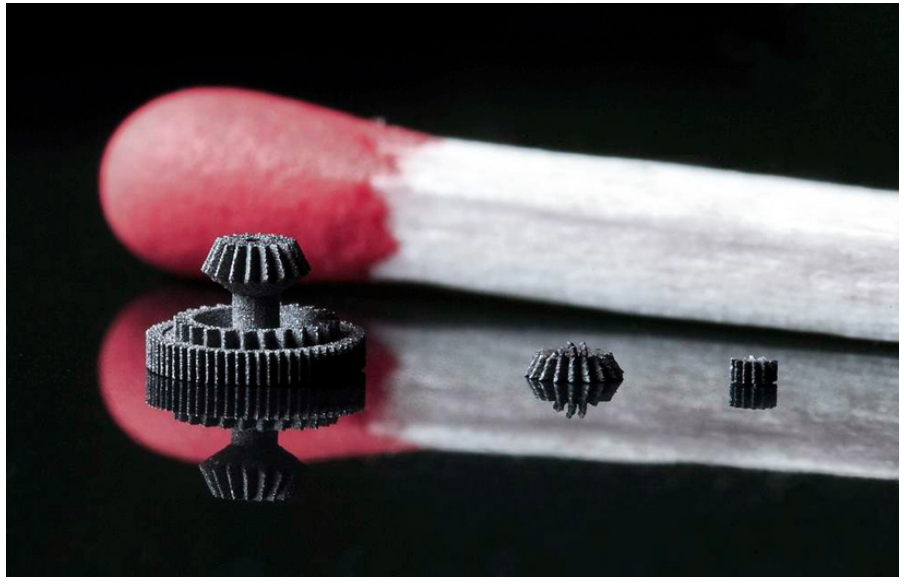


WHAT ARE PEOPLE SO AFRAID OF?

HOW WILL 3D PRINTING IMPACT MY LIFE?



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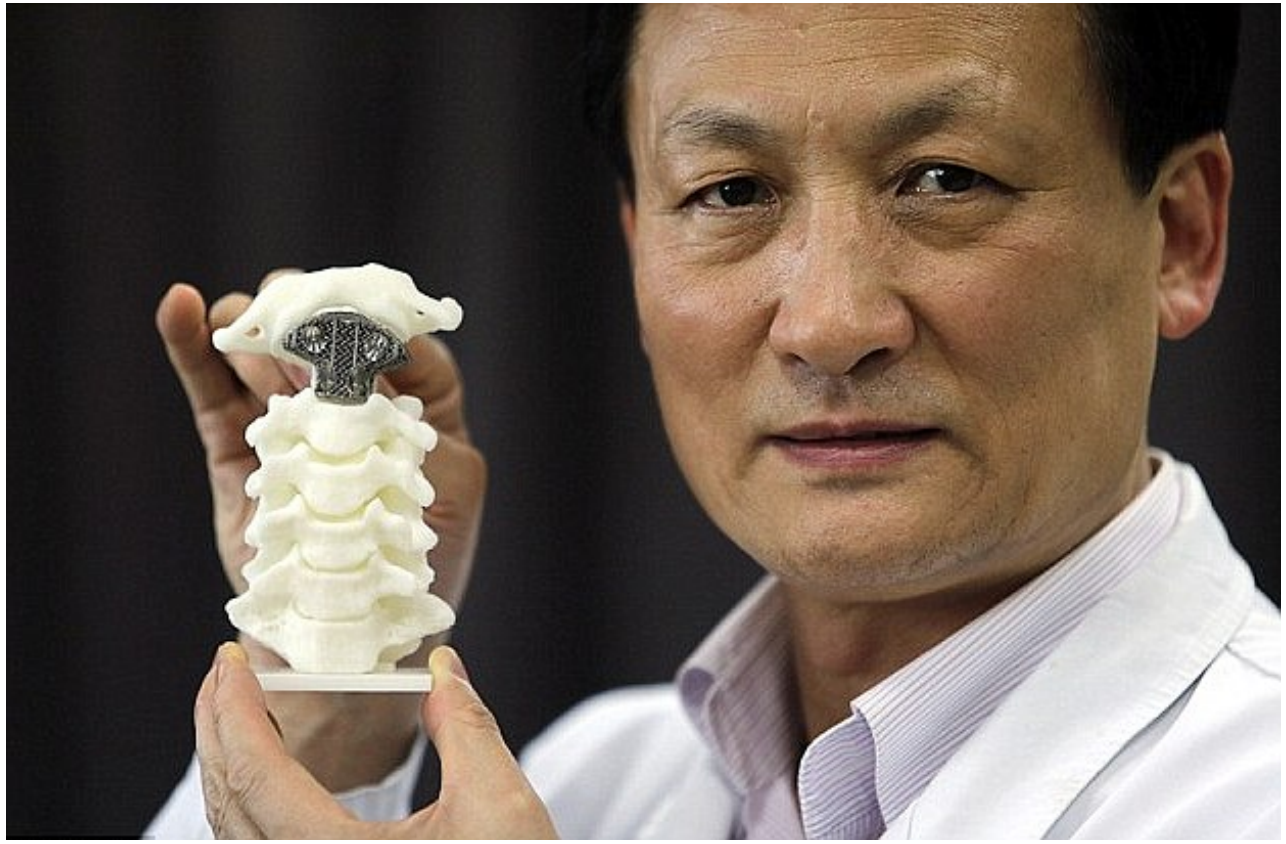

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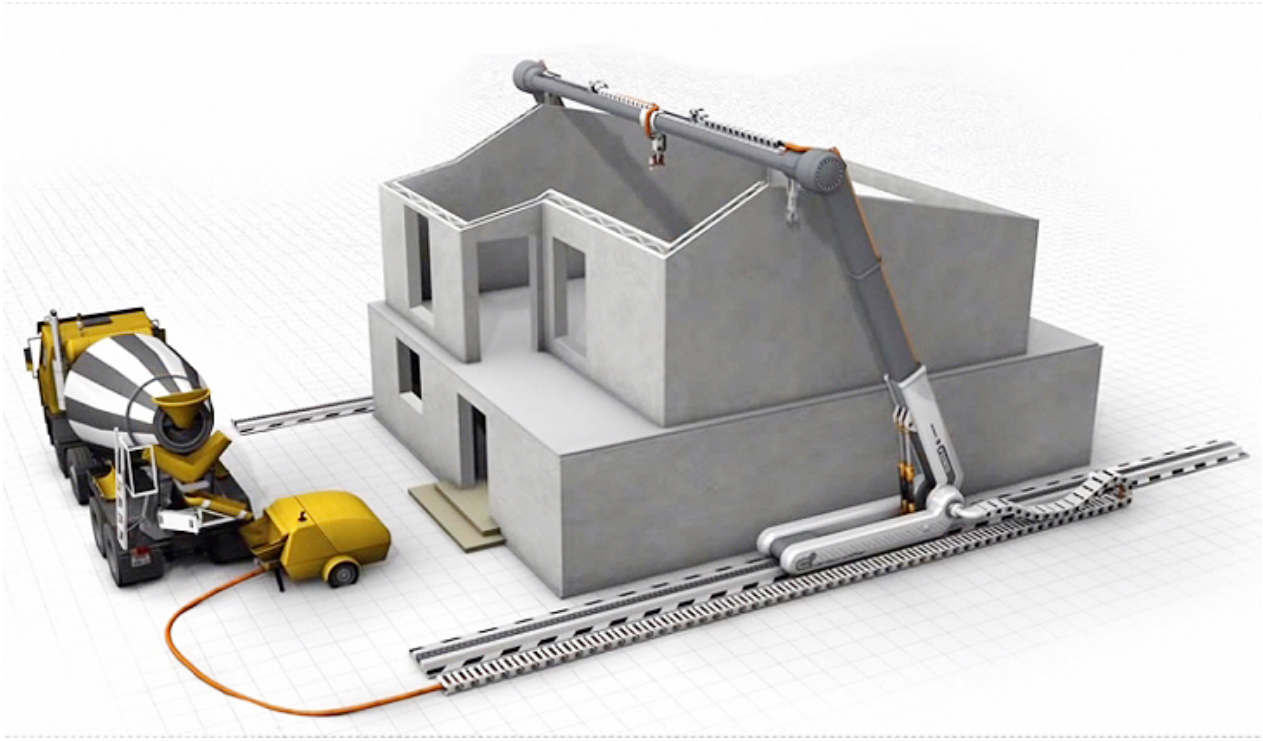
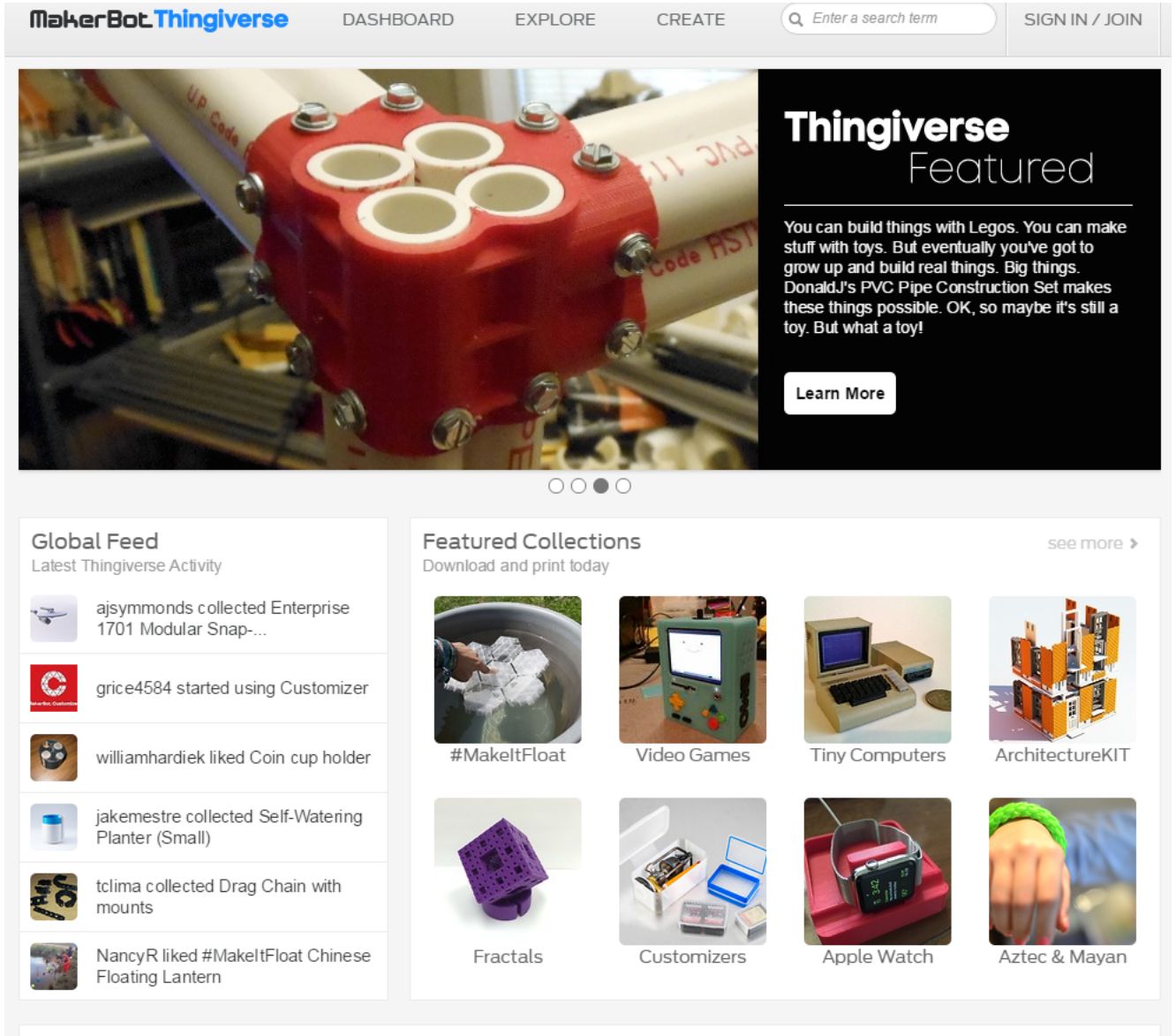


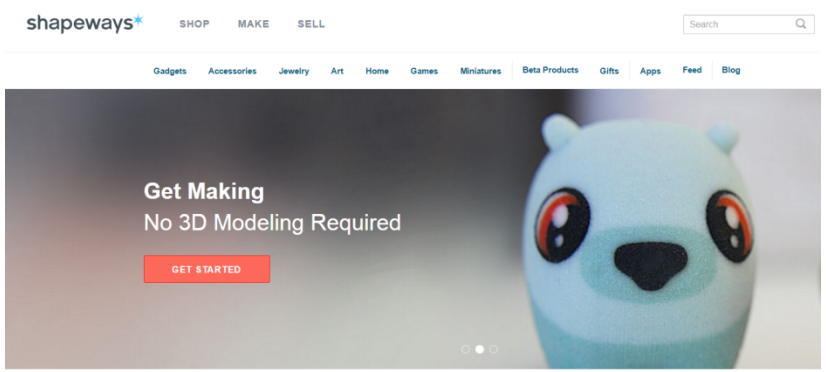
HOW CAN I USE 3D PRINTING?

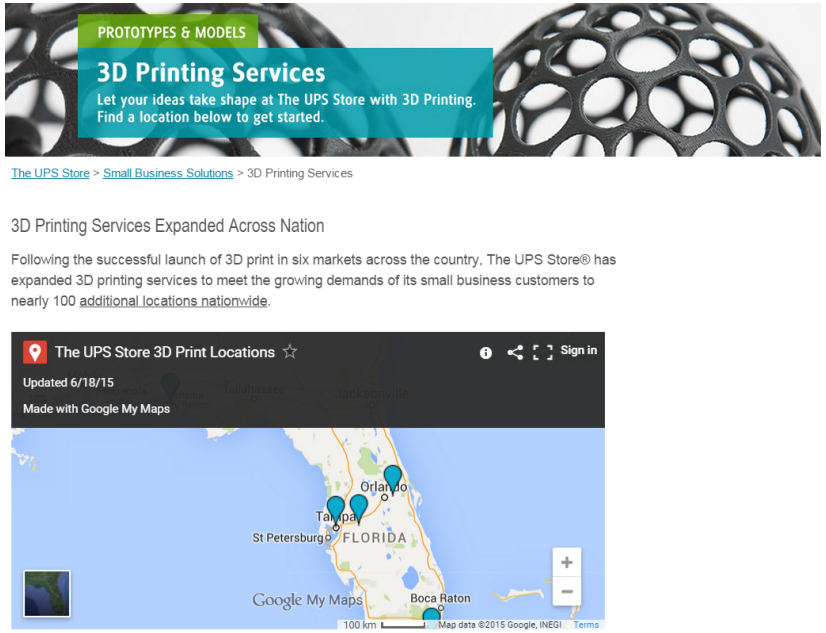
1. **Download files from a 3D repository and print on the Incubator's printers.**
2. **Learn a 3D design program and print your own designs.**
3. **Send files to a 3D printing service.**
4. **Join a makerspace for access to 3D printers and other tools of digital manufacturing.**
5. **Buy a 3D printer.**

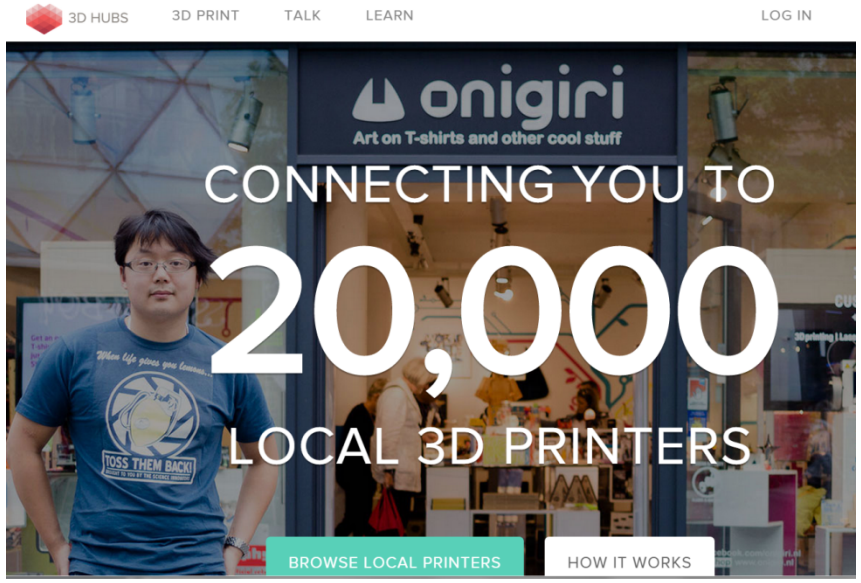
REPOSITORY: WWW.THINGIVERSE.COM

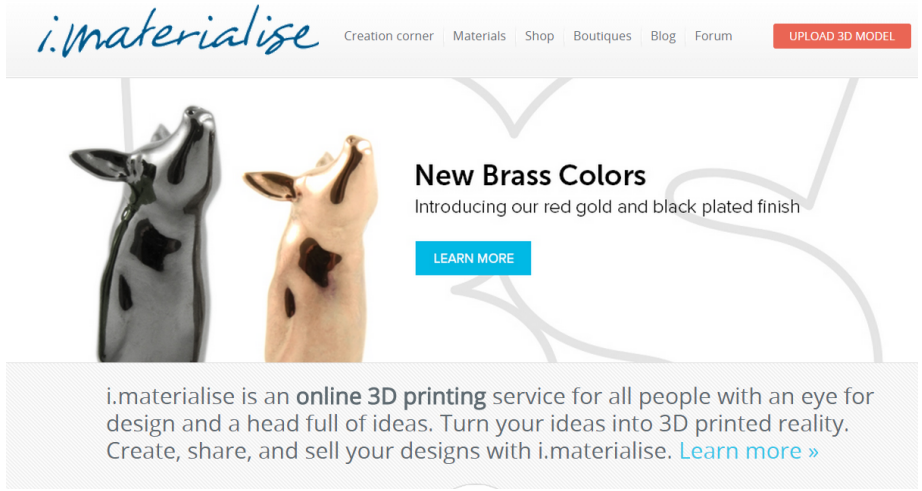


YOU DON'T NEED A PRINTER TO PRINT

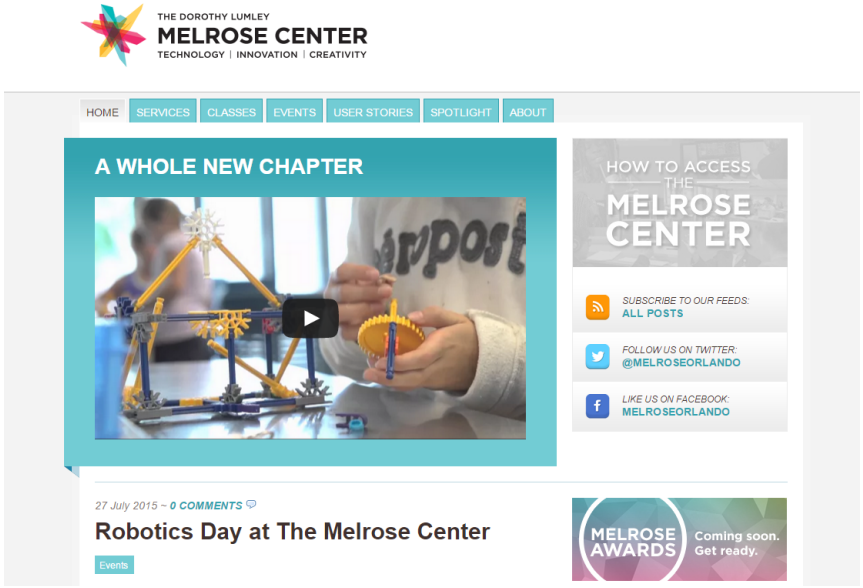


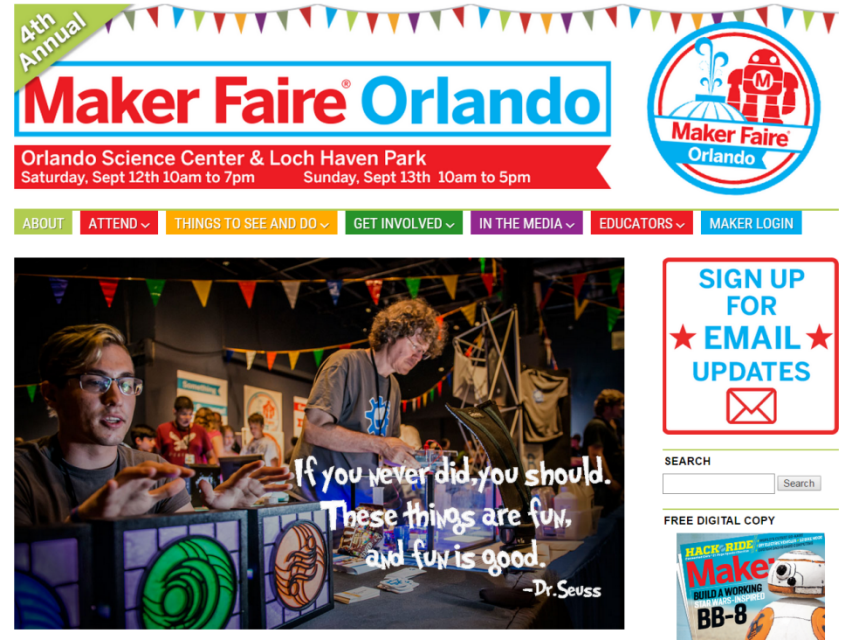






MAKERSPACES PROVIDE THE BEST SUPPORT





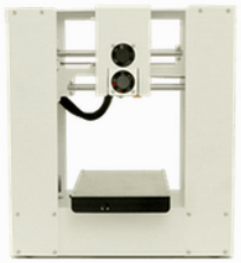
YOU CAN BUY ONE . . .

printrbot

Store | Compare Printers | News | Education | Distributors | PB Labs | Support

Play
For beginners, kids and enthusiasts.

$399



- 100mm x 105mm x130mm (X-Y-Z) build dimensions (apx 4" x 4" x 5")
- 80 cubic inch build volume
- 50 microns resolution
- 80mm/sec max print speed
- 1.75mm PLA/flexible filament

Simple
Our most popular 3D printer

$599

- 150mm x 150mm x 150mm (X-Y-Z) build dimensions (apx 6" x 6" x 6")
- 216 cubic inch build volume
- 50 microns resolution
- 80mm/sec max print speed
- 1.75mm PLA filament

Plus
Great Value

$1199

- 250mm x 250mm x 265mm (X-Y-Z) build dimensions (apx 10" x 10" x 10")
- Heated bed comes standard (max temp 80C)
- 50 microns resolution

2. USING 3D PRINTERS, SOFTWARE AND HARDWARE

- Software (specfic apps vary by site)
  - Cura – setup and slicer
  - Pronterface – machine control
- Filament, material, diameter, and quality
- Extrusion, temperatures, speed, nozzle health & cooling
- Bed preparation, material, leveling, additives
- Print removal, tools & techniques
- Post print finishing, clipping, sanding, painting

3. THE CLASS PROJECT HARDWARE

1. Arduino
2. WS2812 ring
3. Pushbutton
4. Resistor
5. USB cable
6. Diffusion material
7. Wire

4. FINISHING THE DESIGNS FOR THE CLASS PROJECT

- Sketching, dimensioning, CADing
- Checking printability
- Scheduling printing

5. 2D WITH TINKERCAD AND CRICUIT

- 2D output from Tinkercad
- Other software to generate SVG files
- 2D digital fabrication
- Cricuit hardware
- Designspace software

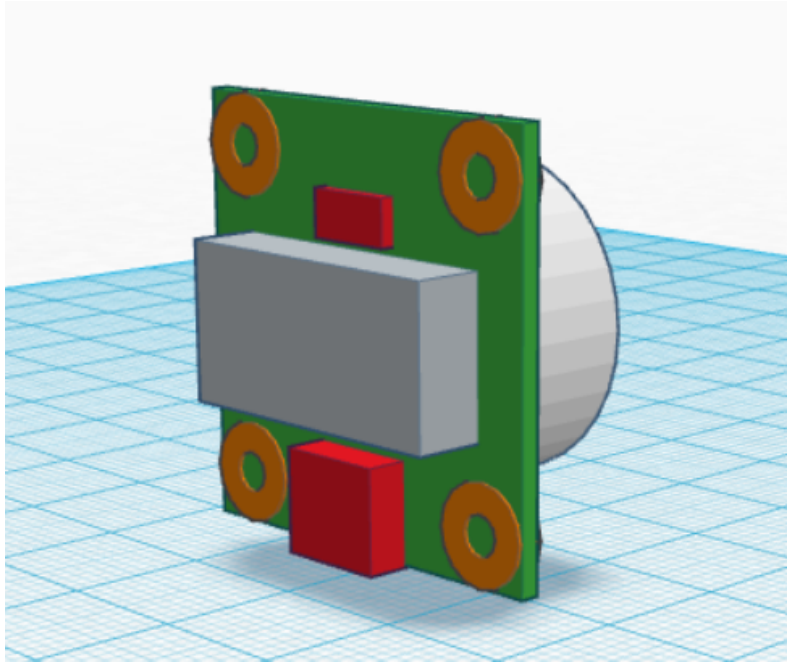
7. DEMONSTRATION OF A PROTOTYPING PROJECT

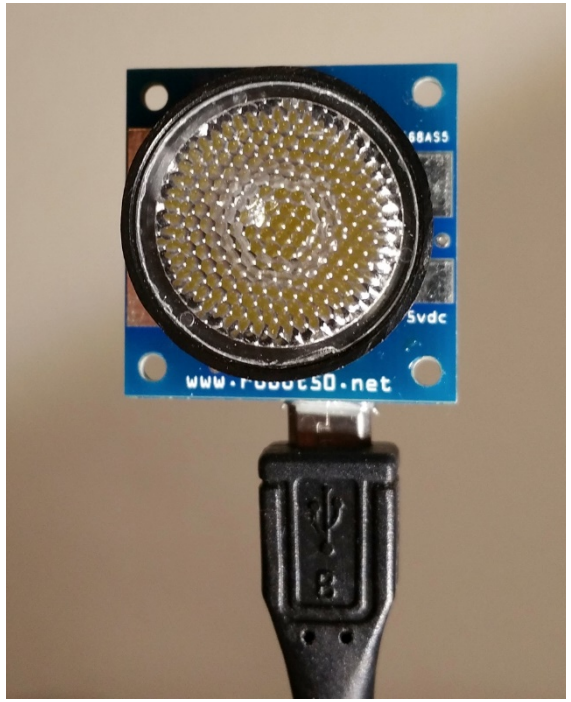
- Goal of the project: to provide 3D printer owners something functional to create with their machine.
- Product: a LED lamp module for sale and accompanying free 3D design files for printing.
- Process (for the LED module):
  - Scan for competing products
  - Paper sketches
  - 3D designed and printed looks-alike prototypes
  - Hand fabricated works-alike prototypes

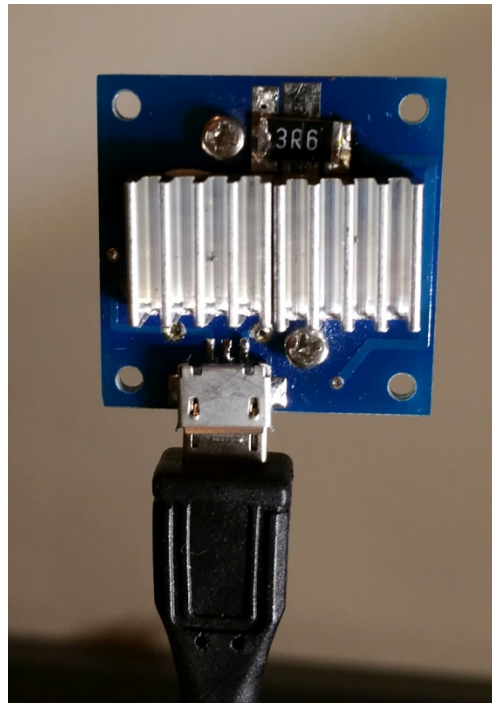
6. ONLINE 3D DESIGNS / PRINT SERVICES

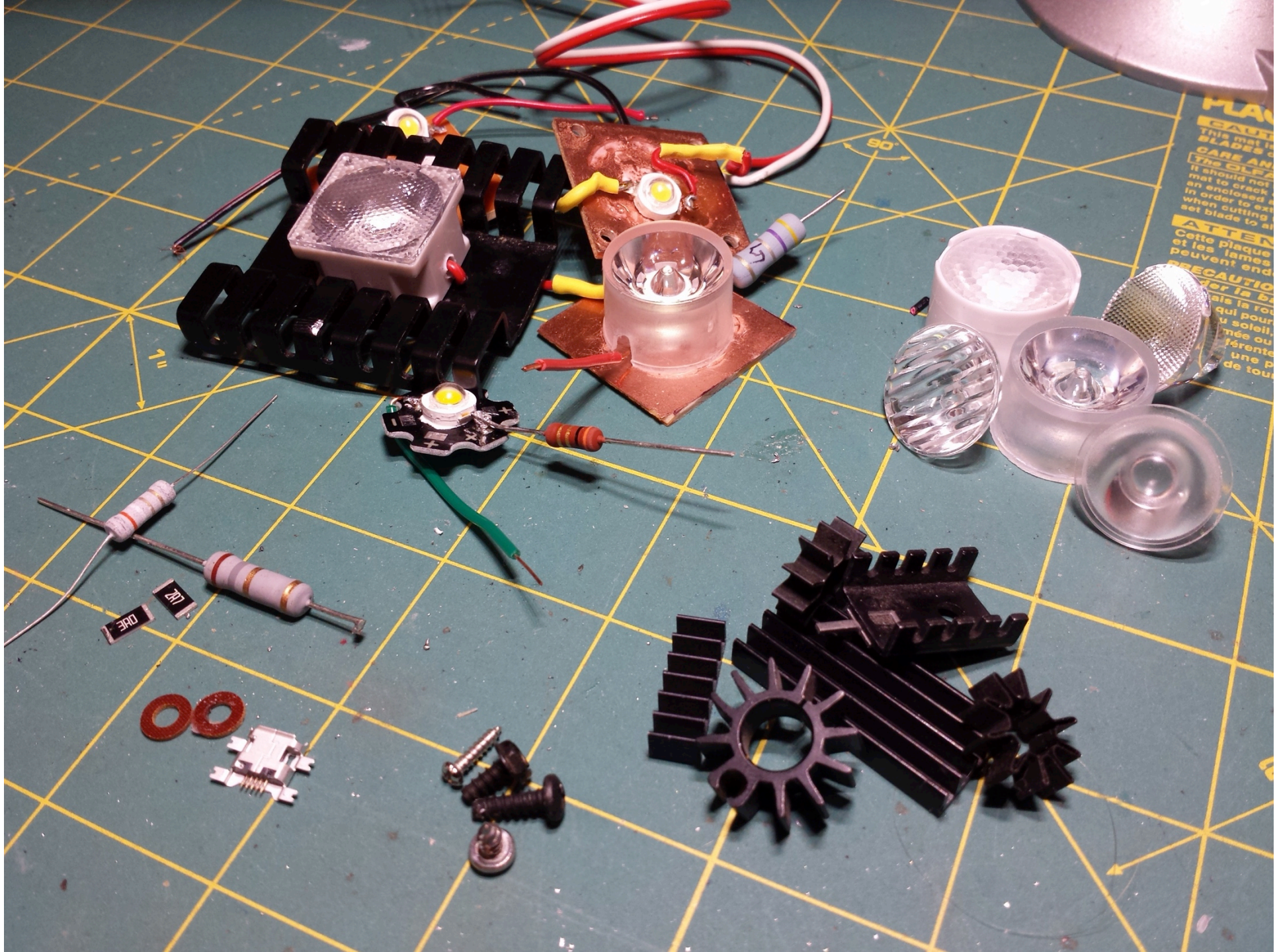
- Thingiverse http://www.thingiverse.com/
  - creative commons licensing
  - customizer
- Other download sites https://all3dp.com/best-sites-free-stl-files-3d-printing/
- Shapeways http://www.shapeways.com/
- UPS https://www.theupsstore.com/print/3d-printing

- Iterating prototypes of the LED module to balance:
  1. Small size
  2. Low cost
  3. Minimal part count
  4. Design for manufacturing
  5. High light output
  6. Neutral light color
  7. Good light dispersion
  8. Appropriate power consumption
  9. Acceptable heat generation
  10. Flexibility for different applications
  11. Ease of use









- Individual prototypes were made for:
  1. Electronics schematic
  2. Component placement (switch, USB jack)
  3. Color of LED emitter
  4. Lens spread and surface pattern
  5. Heat sinks
  6. Overall size
  7. 3D printed mounting rings
  8. 3D printed lamp components