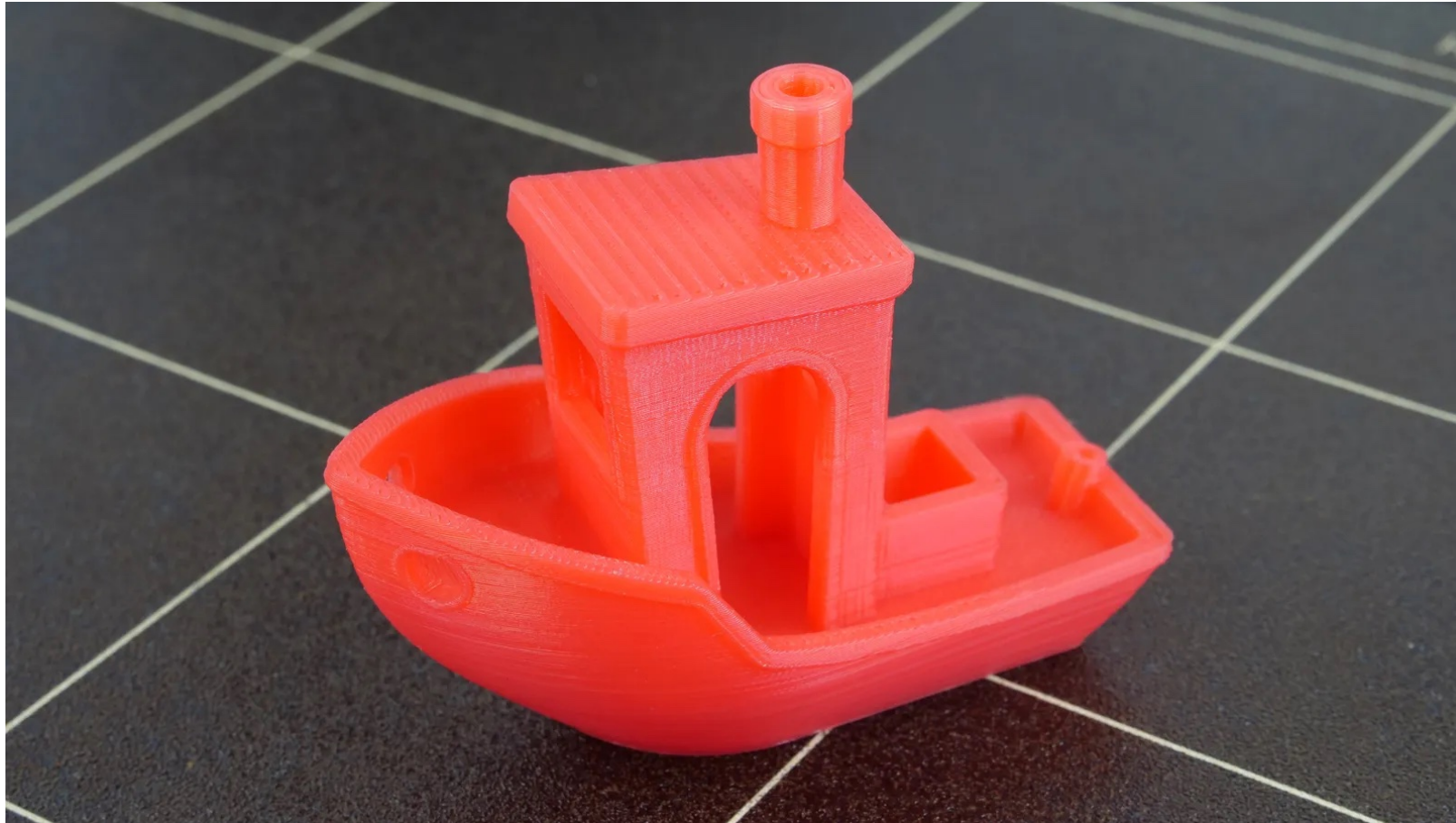


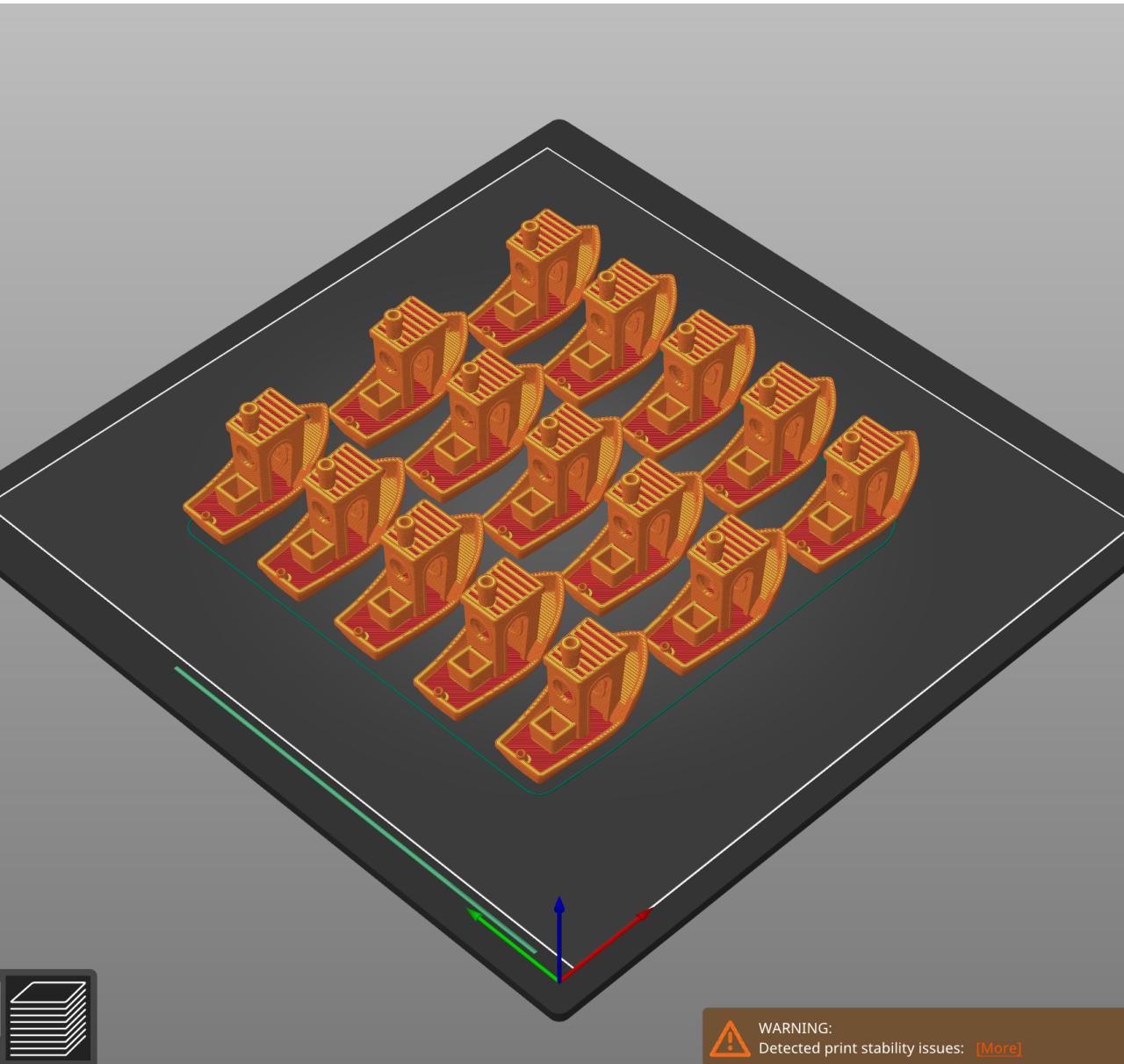
# 3D Printer Demo



# Currently Printing



It's Benchy! Benchy is used for "benchmarking" printers.



All the benchys

# What is 3D Printing?

- It's CNC, Computer Numeric Control
- CNC speaks "gcode". For example,
  - `G1 X5 Y5 E.05`
  - Move the print head to (5, 5) and extrude 0.5mm of wire
- Physical precision determines how close we get to our model



# What's it good for?

- Custom mounts
- Hard to find parts
- Custom games
- Toys/Minifigs
- Prototyping products



# What to buy?

- A printer (duh)
  - Anywhere from \$250 to \$5k+!
  - You get what you pay for, but \$300 is ok
- Filament
  - PLA in multiple colors
  - PETG
  - ABS
- Accessories
  - Tools to modify/fix printer
  - 90% isopropyl
  - Filament dryer



# Printer models

- Prusa
  - Mini+ is cheap, but quite small (\$500ish)
  - MK3S+ is a gold standard printer (\$800ish)
  - Deptment has a MK3S+, MK4 is coming to market
- Creality
  - Ender-3 is very popular (\$300-500, deals possible)
  - Demo printer is an Ender-3 S1, and it's very approachable
- Public printers are often very nice
  - Libraries often have them
  - IUS library has one
  - May have issues with print time allotments



## Side note

- We are looking at FDM (fillament)
- Resin can provide much higher resolution, but is more expensive and *dangerous*
- The Prusa SL1S and Curing chamber kit is \$2600



# Types of filament

- PLA
  - Cheap & strong
  - Brittle & does not handle temperature swings
  - Corn plastic
- PETG
  - More robust than PLA, a bit harder to use
  - Can leave "strings"





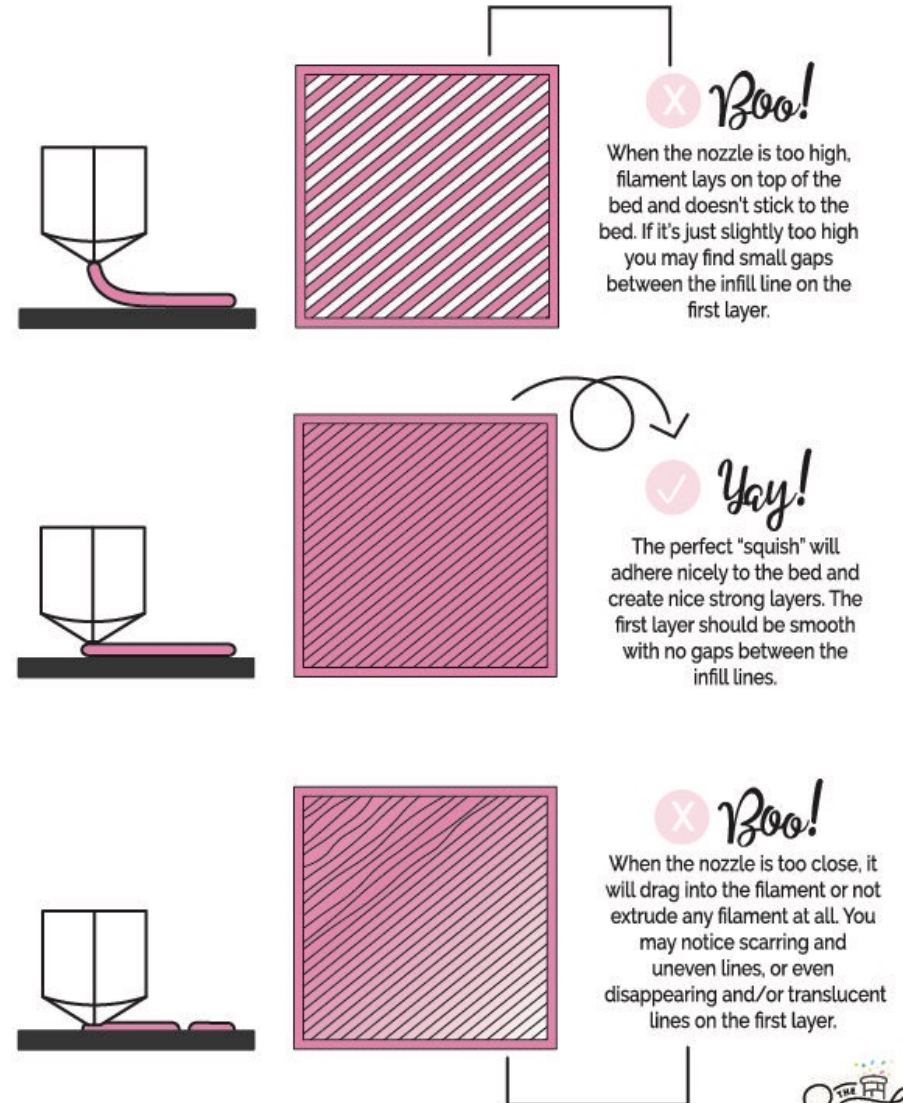
## Types of filament

- ABS
  - Flexible, but much harder to print with
  - Needs direct drive printer
  - Fume extraction necessary
- Many more combinations of food safety, metallics, colors, etc. available.

# Setup

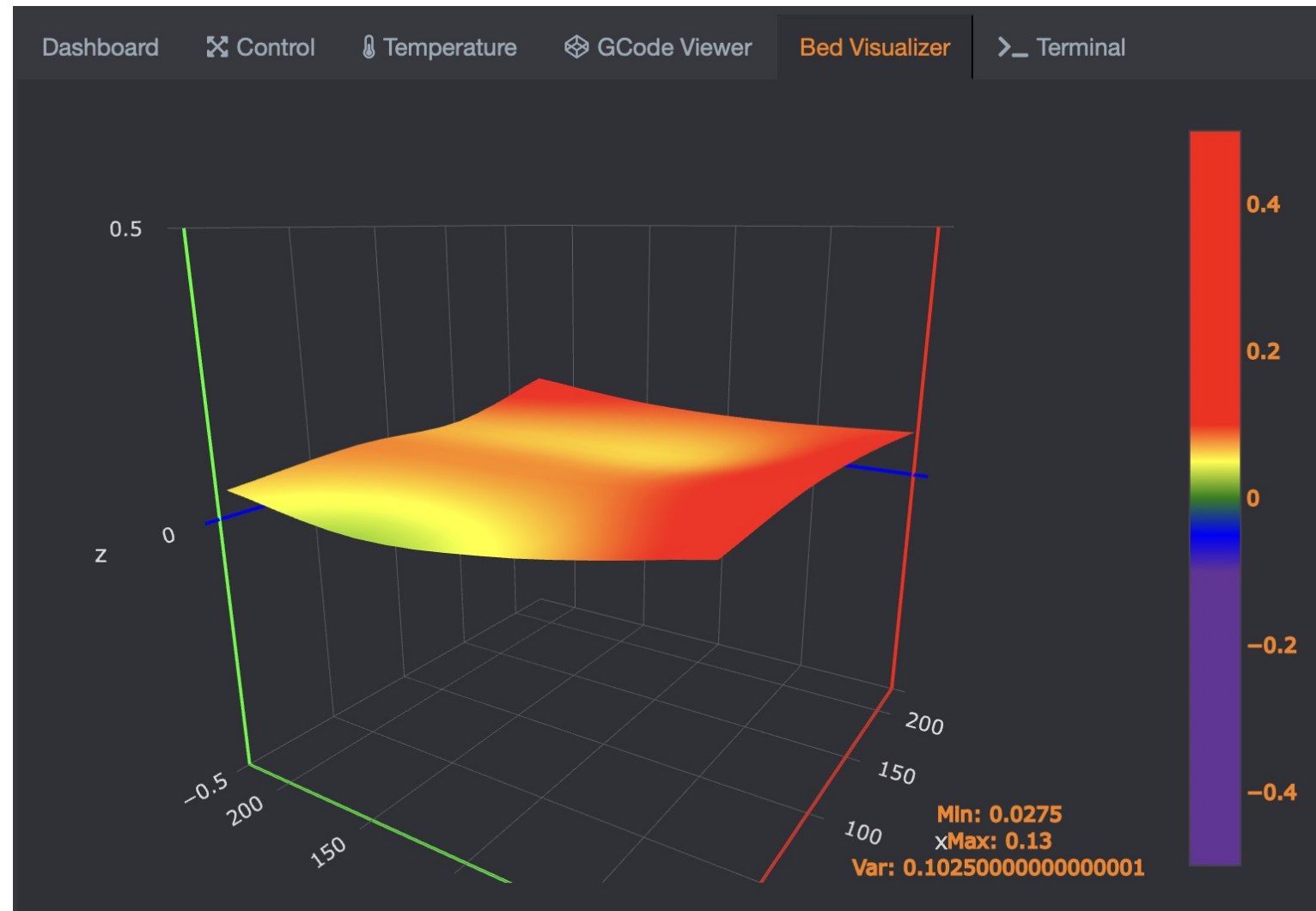
- Leveling
  - The most important step to good prints
  - Auto or "ABL" only finishes leveling the mesh
  - Looking for  $<0.2\text{mm}$  difference across surface, but preferably  $<0.1\text{mm}$
  - That's ~4-8 thousands of an inch
- Load "dry" filament
- Cleaning with isopropyl

## WHAT DOES *correct* NOZZLE HEIGHT LOOK LIKE?



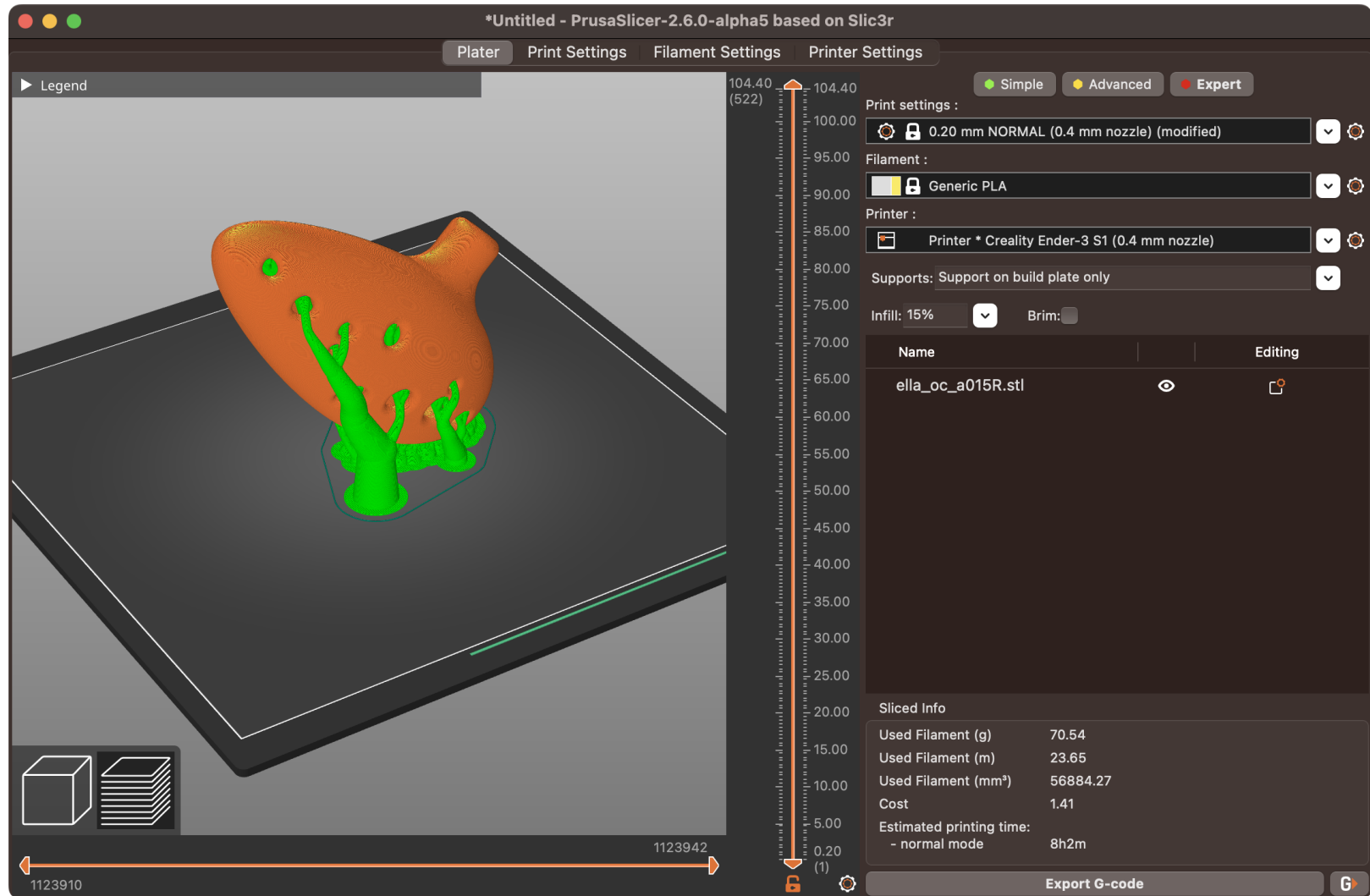
# Octoprint leveling visualization

- Note: this height is [-0.5mm, 0.5mm]
- Total variance of ~0.1mm
- While it might look like a taco, this bed is "level"



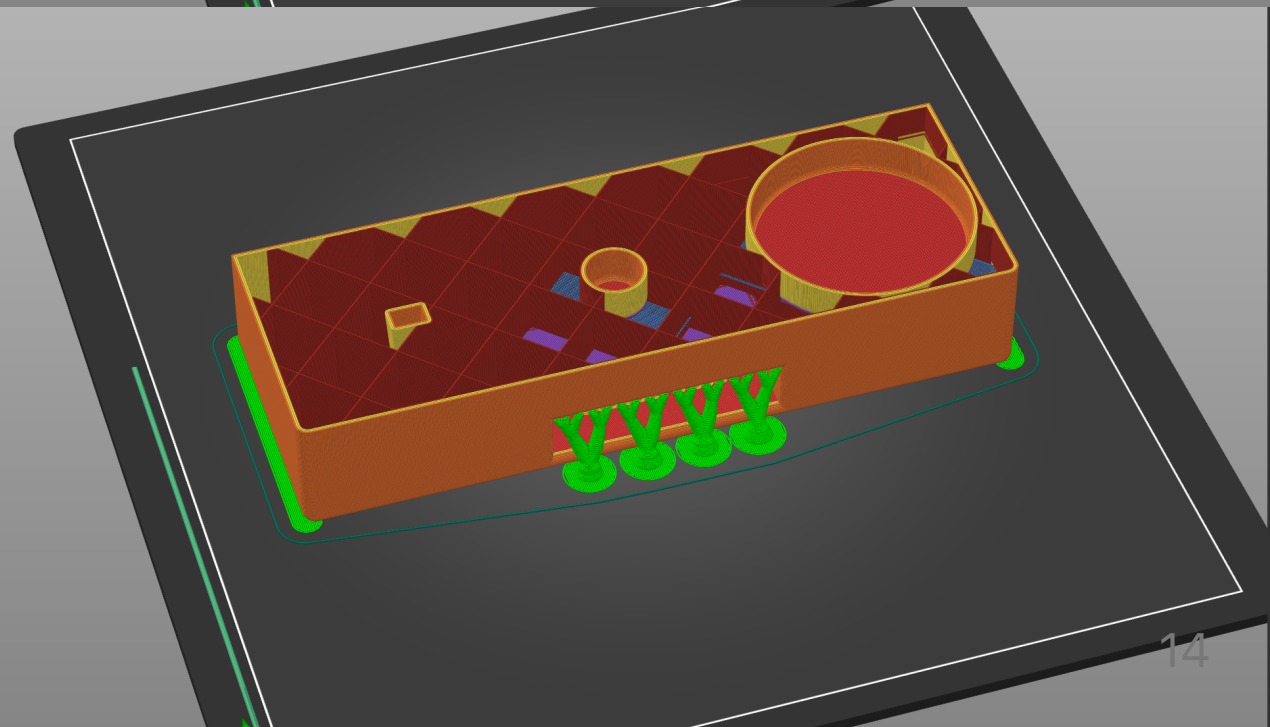
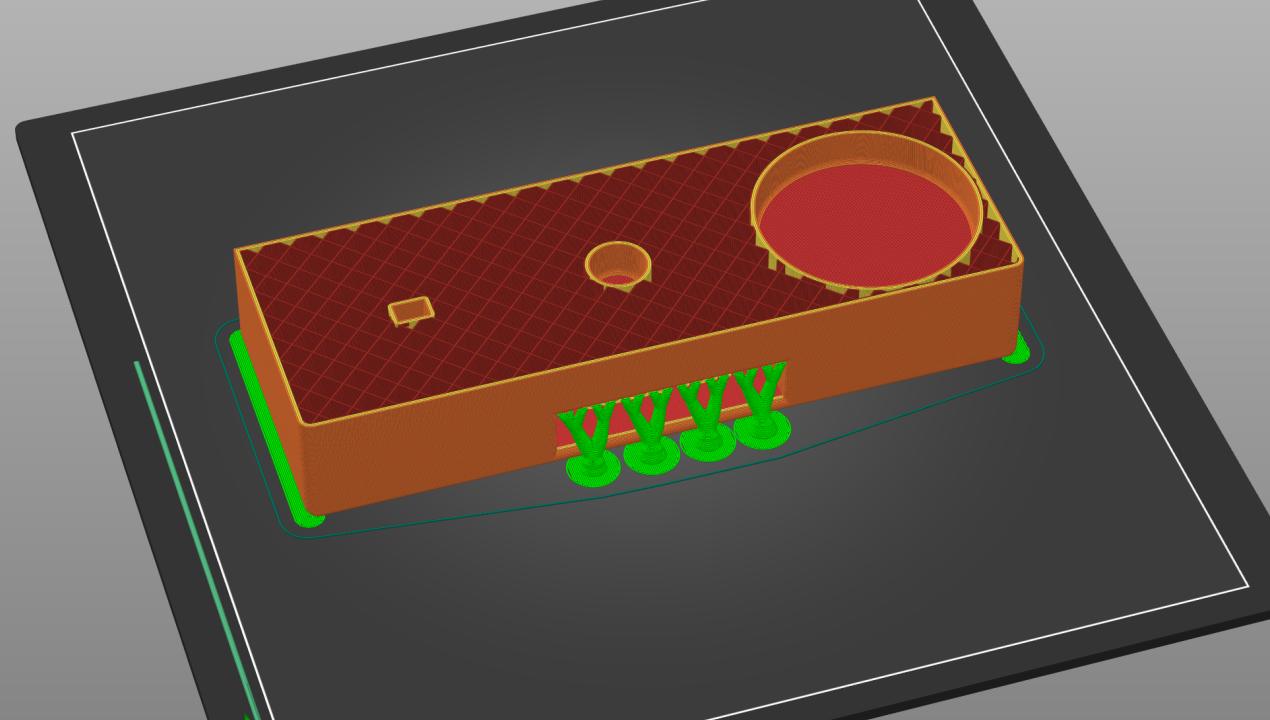
# Slicing

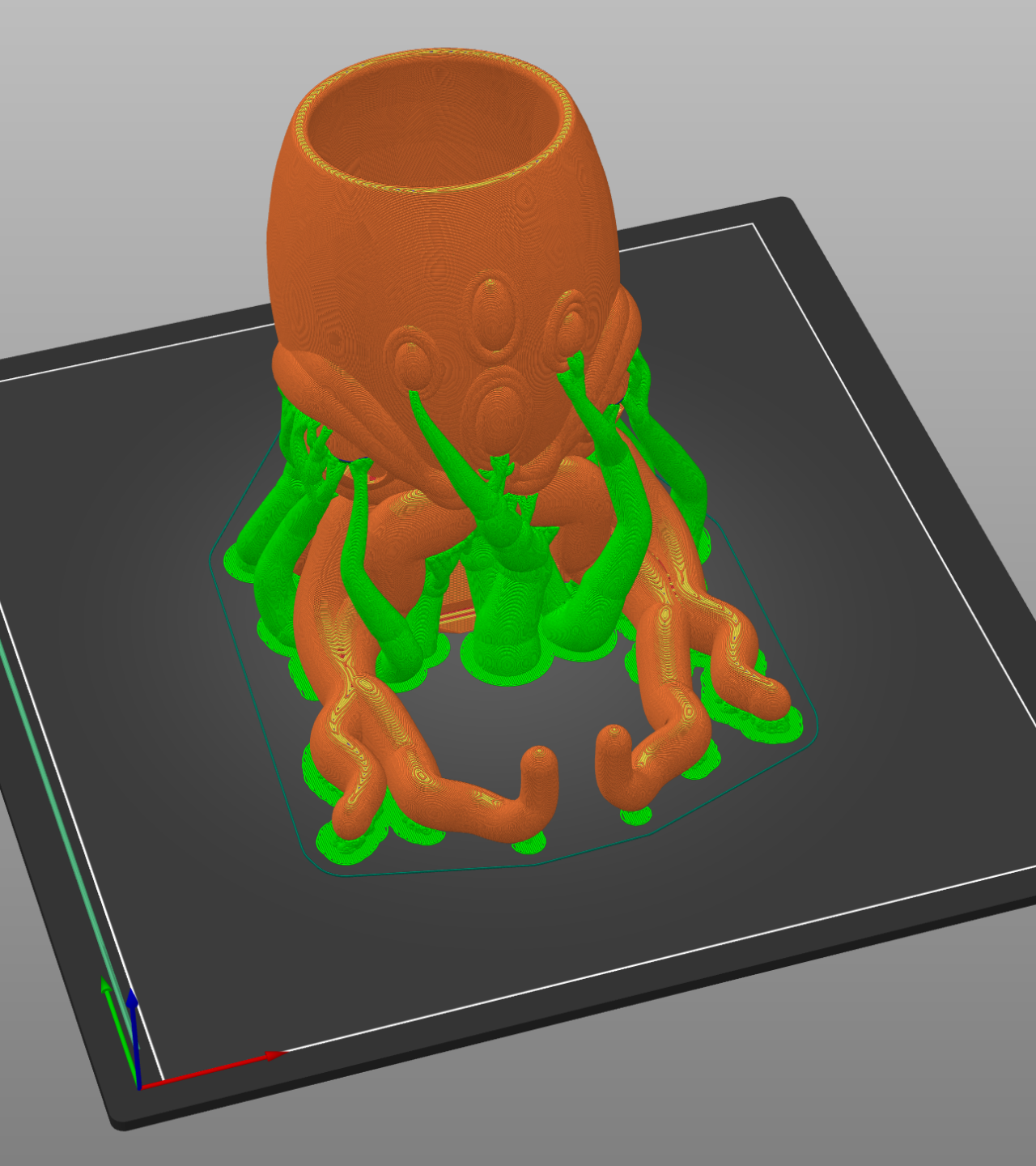
- Software
  - Prusa Slicer
  - Utilimaker Cura
  - Slic3r
  - Many more



# Infill options

- 15-20% is very normal, sometimes 100% needed for small objects
- Many geometries for different strength characteristics



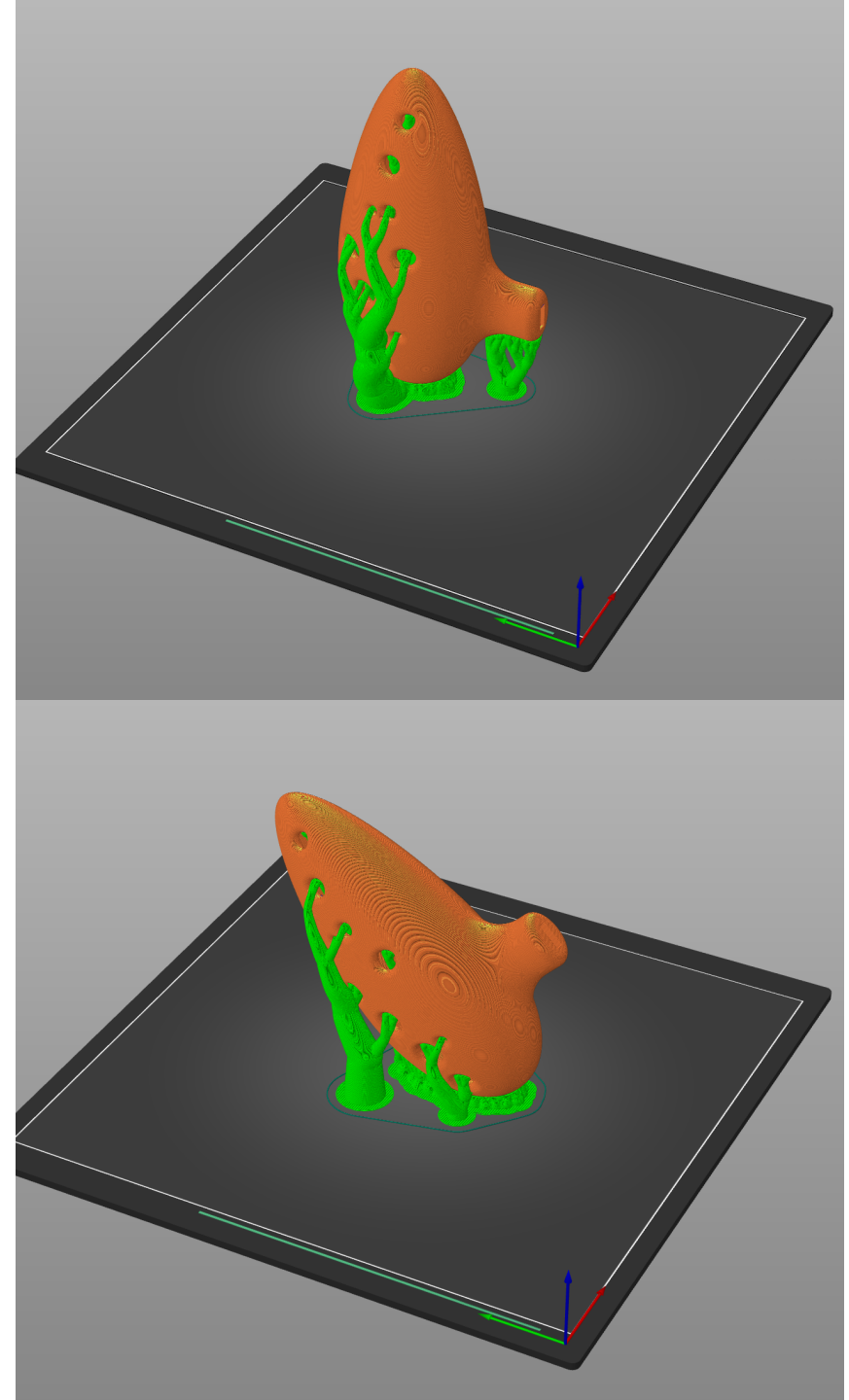


## Support options

- Anything overhanging likely needs support
- Many support types result in more support or ease of removal
- Can leave unsightly marks

# Rotation & positioning

- Fewer supports are better, so orient your print carefully
- Having a good "base" keeps your print from falling over
- Printers usually print "best" in the center







# When things go wrong

And they will.



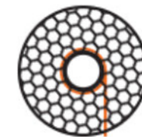
## When things go wrong

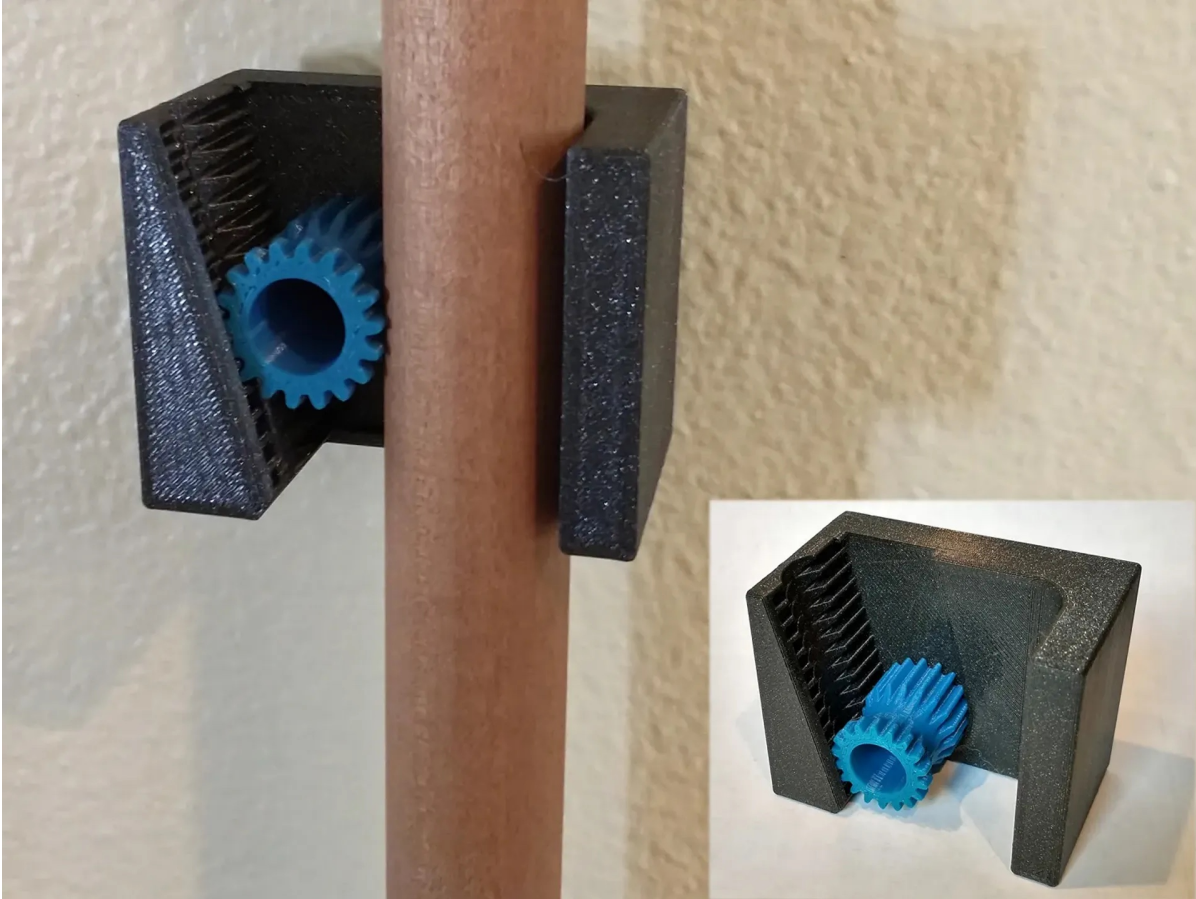
So very wrong it could cost (some) money!

# Free Models

Usually, I like [Printables](#), but [Thingiverse](#) is also popular. Never pay for models without checking these sites. Some folks do sell models, but some also just illegally resell open source models.

Examples with QR codes incoming!





## Gravity Broom Holder





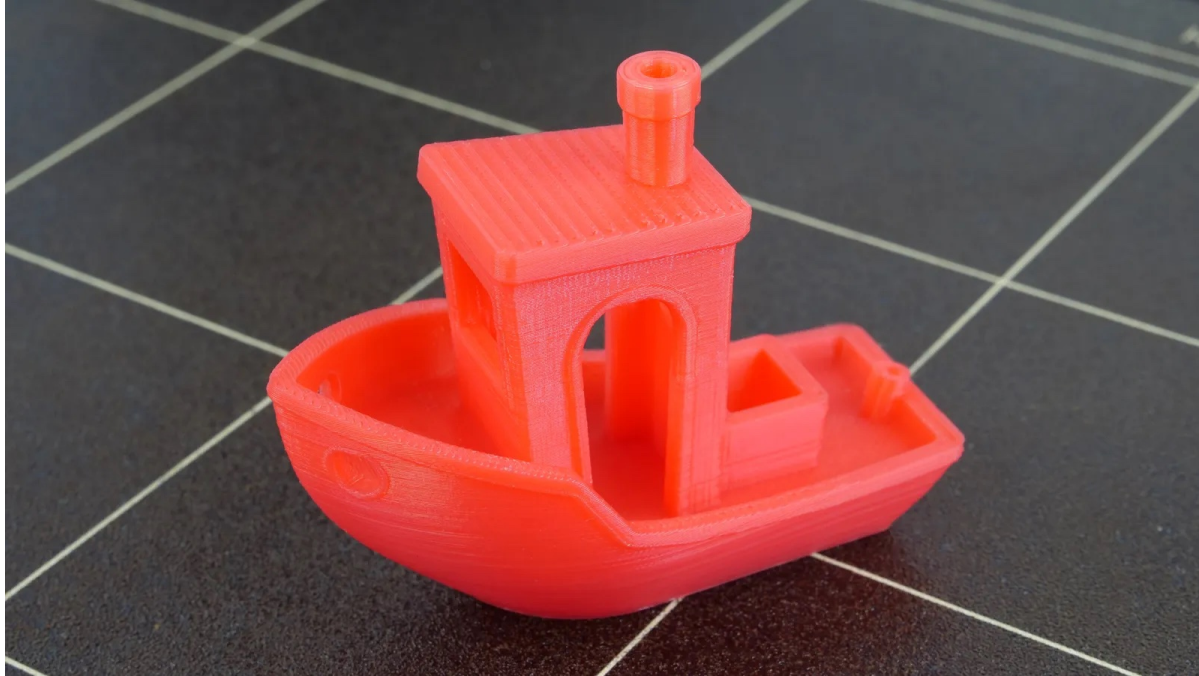
## Cthulhu Tower





## Playable Ocarina





## Benchy





## Nature's Helicopter











## IU Keychains




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 Lvl 11
   
**Chris**
  
 ↓ 90    ♥ 20
   
 0 followers    0 following




  
 Brass    Beginner    Star


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**Crokinole 20 Holder**

♥ 0    ☆ 0    ↓ 5




**Yahtzee To go**

♥ 2    ☆ 0    ↓ 5




**Triscuit (the cat) Guard**

♥ 2    ☆ 0    ↓ 1




**Customizable Screwdriver Holder**

♥ 10    ☆ 0    ↓ 43



**Customizable Pliers Rack**

♥ 4    ☆ 0    ↓ 20



**Shelf bracket pin**

♥ 2    ☆ 5    ↓ 16

# My models



**Q/A, Link to this presentation**

