

# 3D Printing for the Undergraduate Lab

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The  
Potential...





We aren't there yet.



# For reasonably-priced printers, we can currently:

- ✦ print small parts, slowly.
- ✦ print parts that don't have significant overhangs.
- ✦ print with a handful of types of plastic.
- ✦ print one (or maybe two) materials at a time.



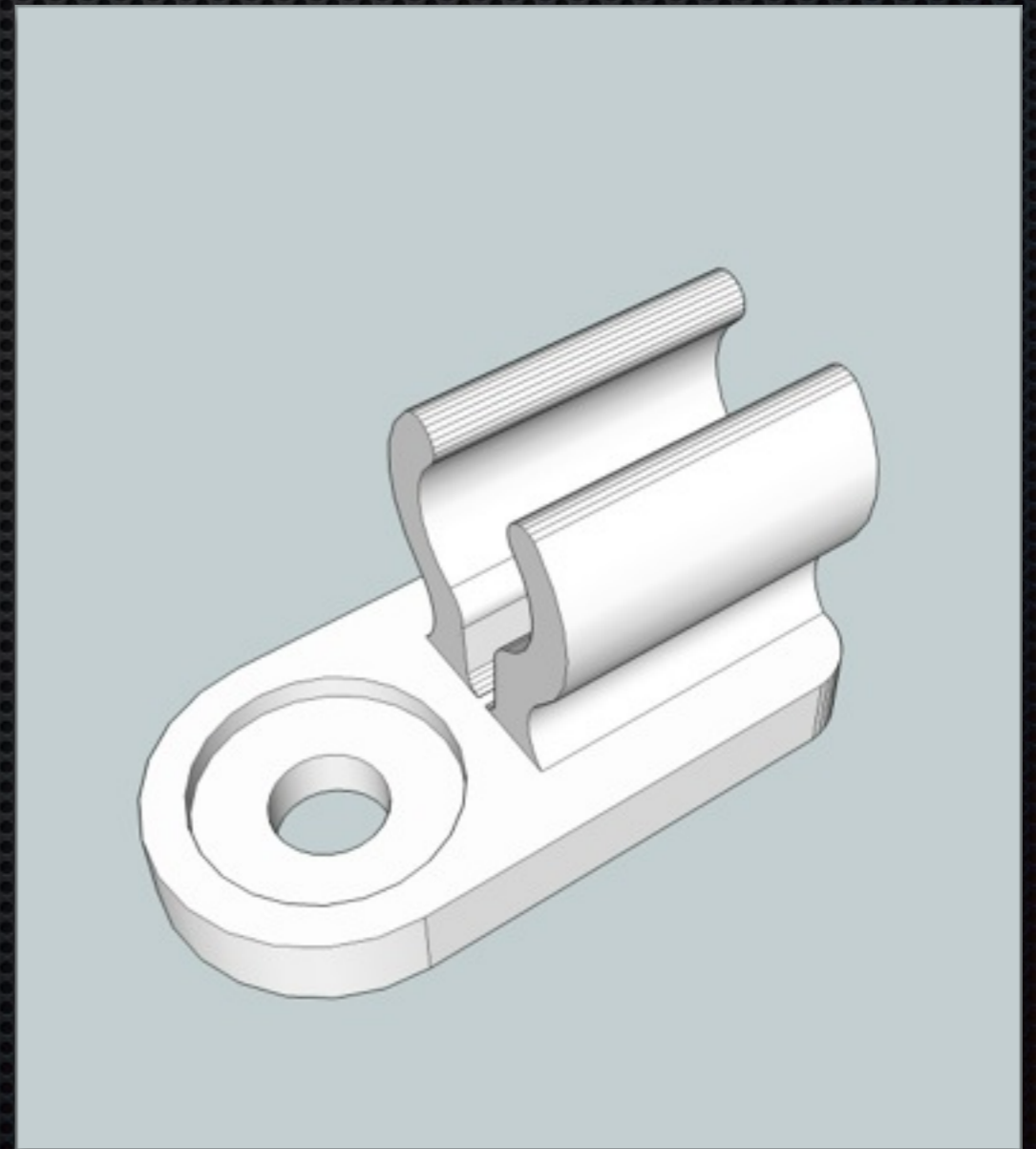
# Materials Available

- ✦ Acrylonitrile Butadiene Styrene (ABS): “Lego plastic” Requires high temperature, smells bad while hot, difficult to print consistently, but relatively strong.
- ✦ PolyLactic Acid (PLA): easier to work with, non-toxic, more brittle and sags at an inconveniently low temperature.
- ✦ Nylon, other plastics in development.
- ✦ Metals still in *very* early development.
- ✦ Chocolate?

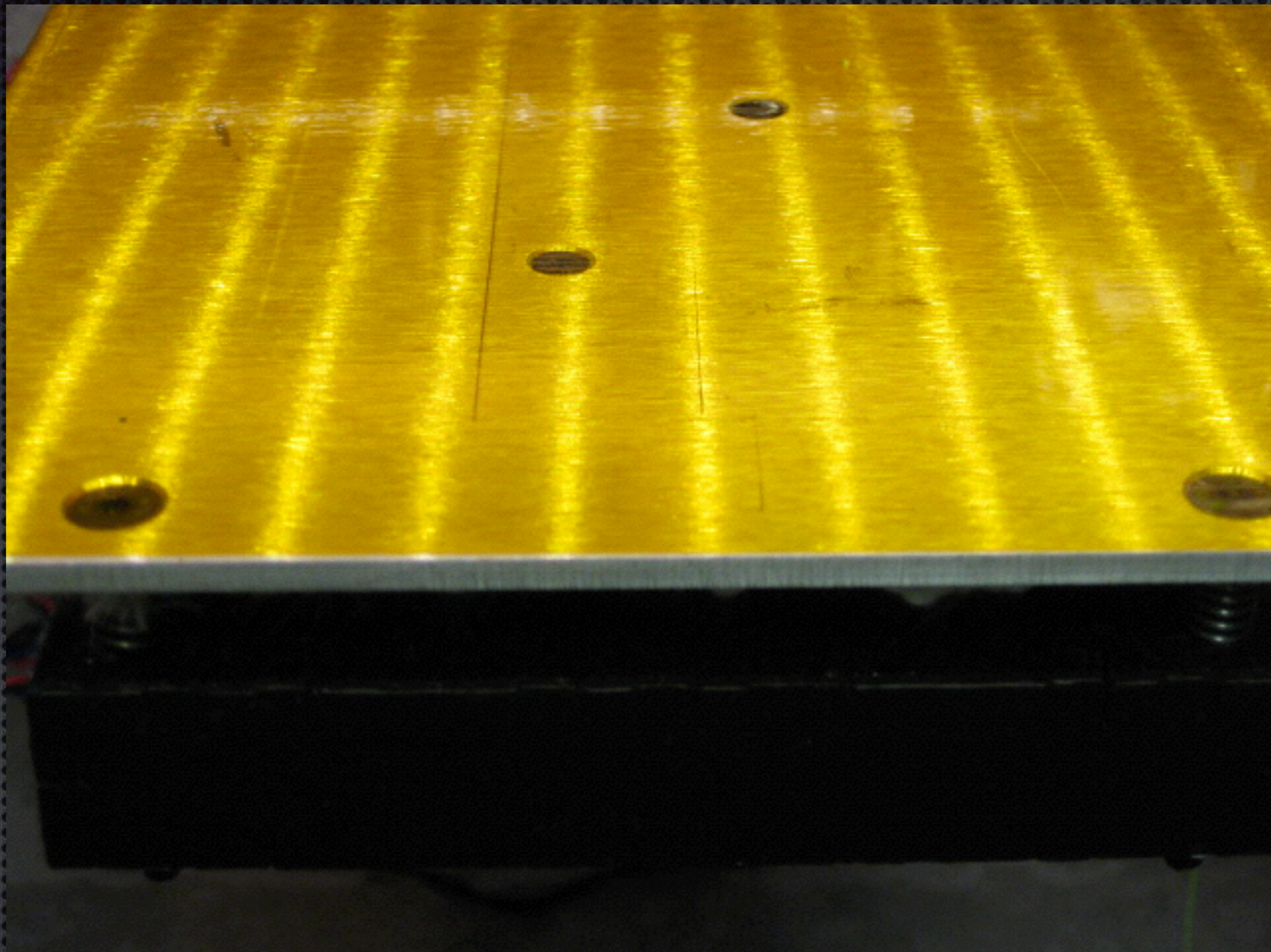


# Thermometer Holder

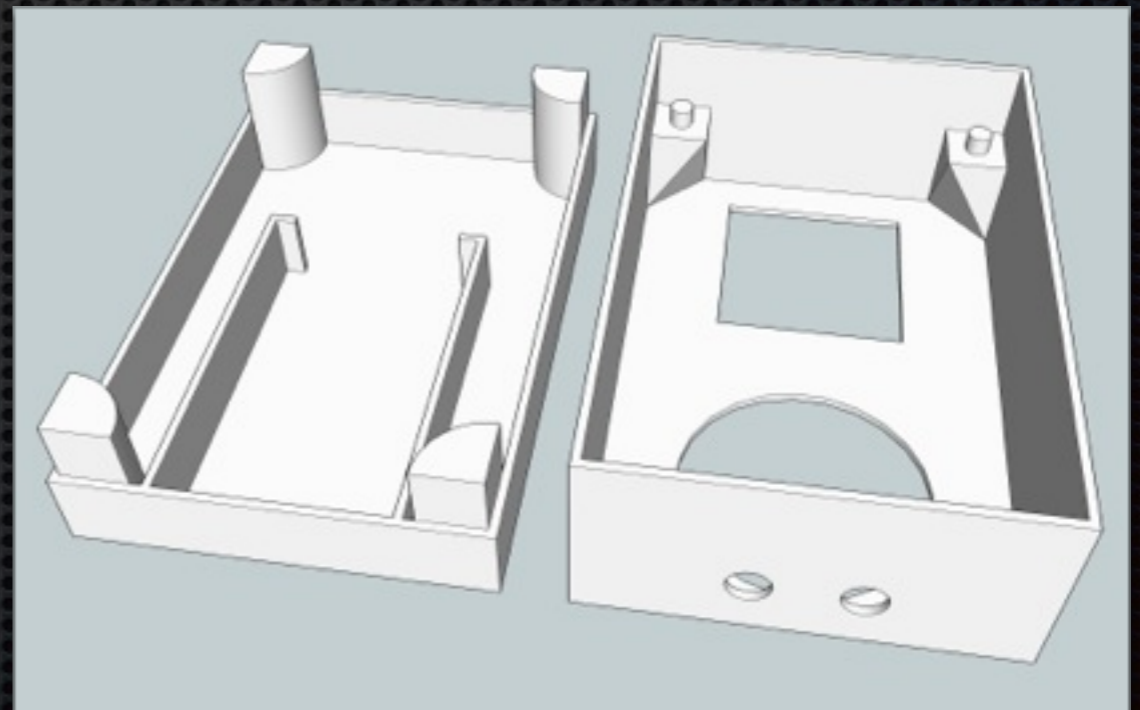
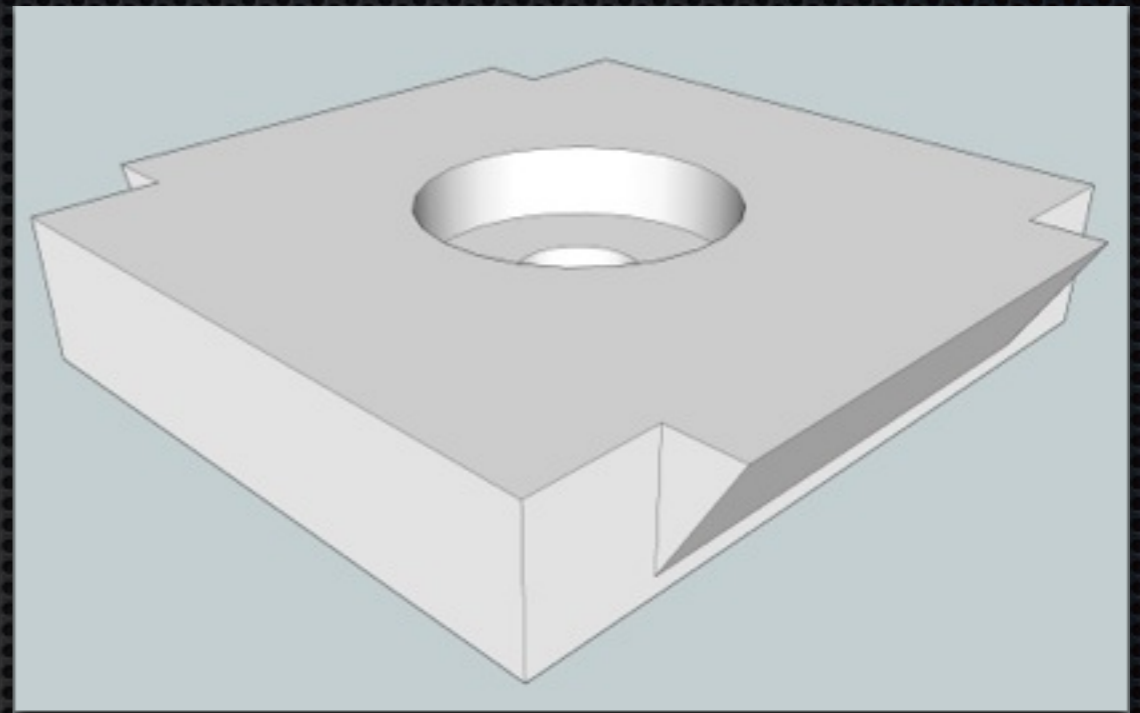
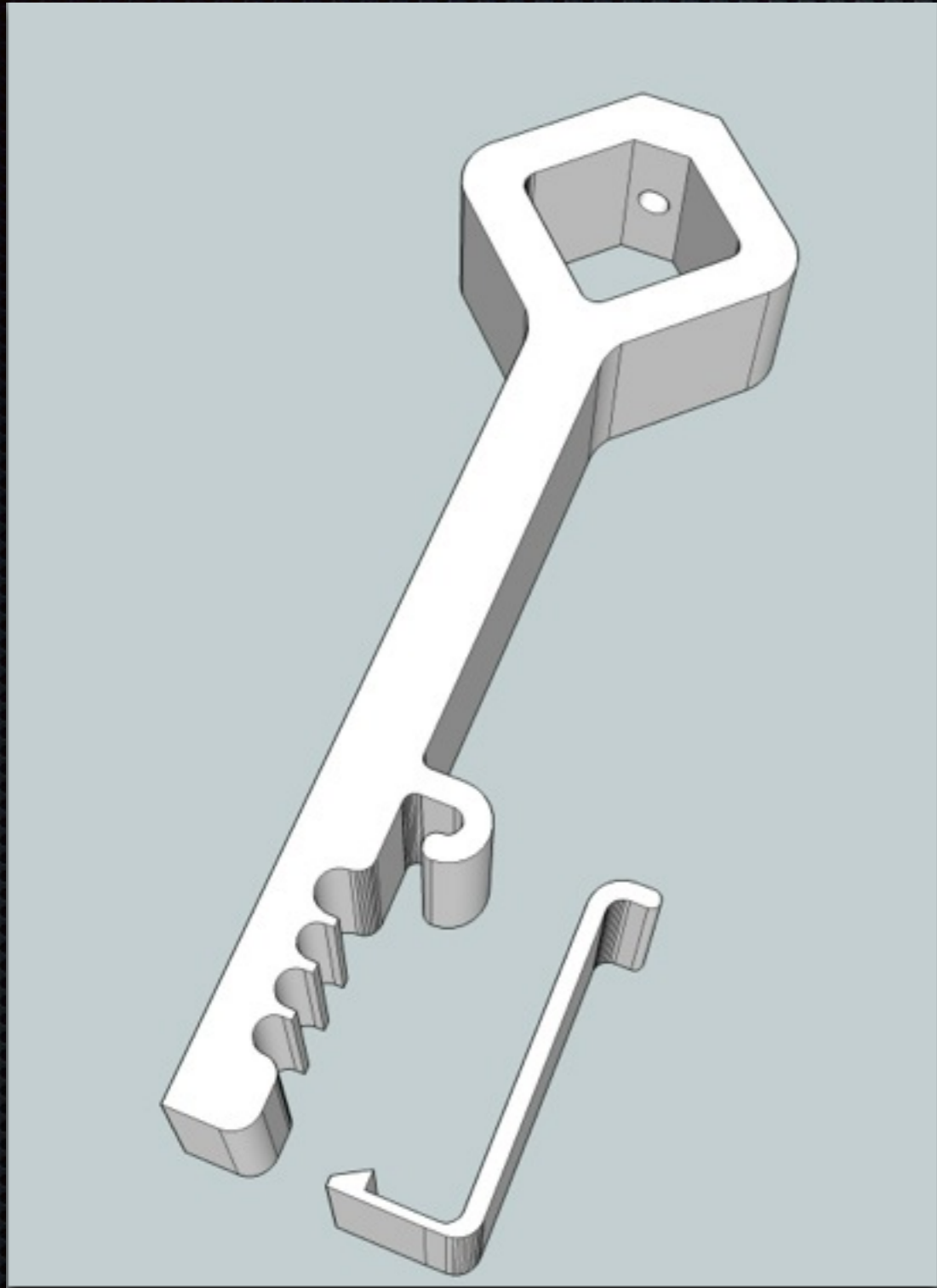
- ✦ Design: Google Sketchup (Free!)
- ✦ Exported to .stl format with a free Sketchup plugin
- ✦ Material: ABS (Better “shape memory”, less brittle than PLA)



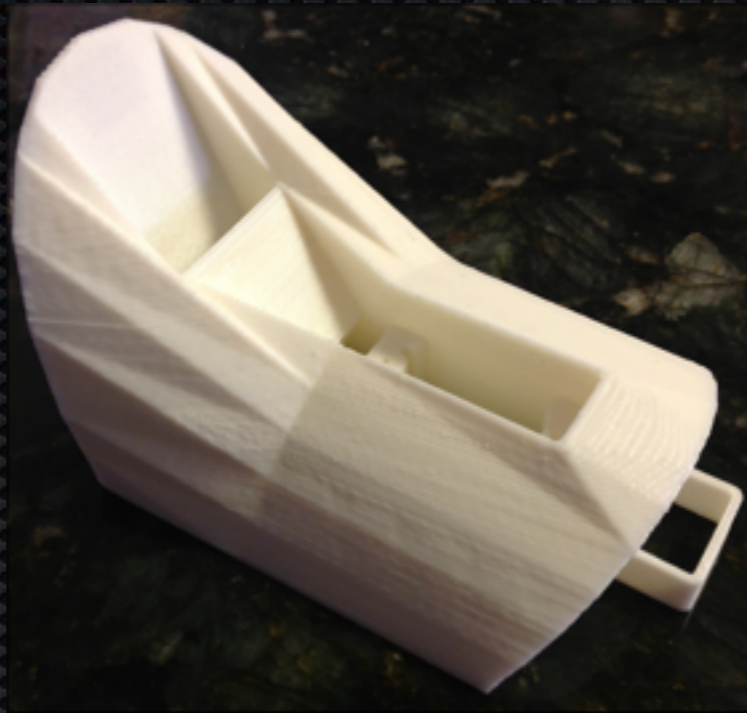
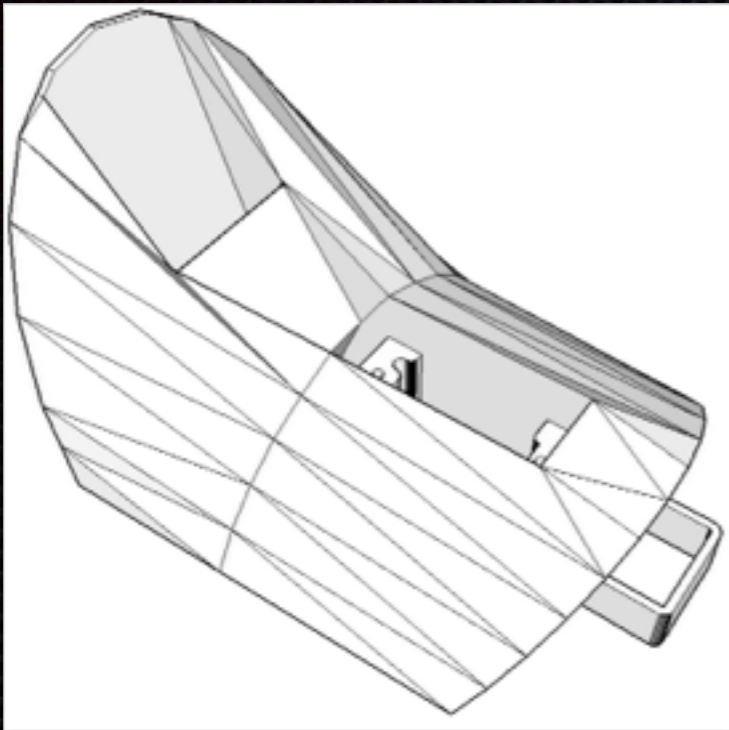








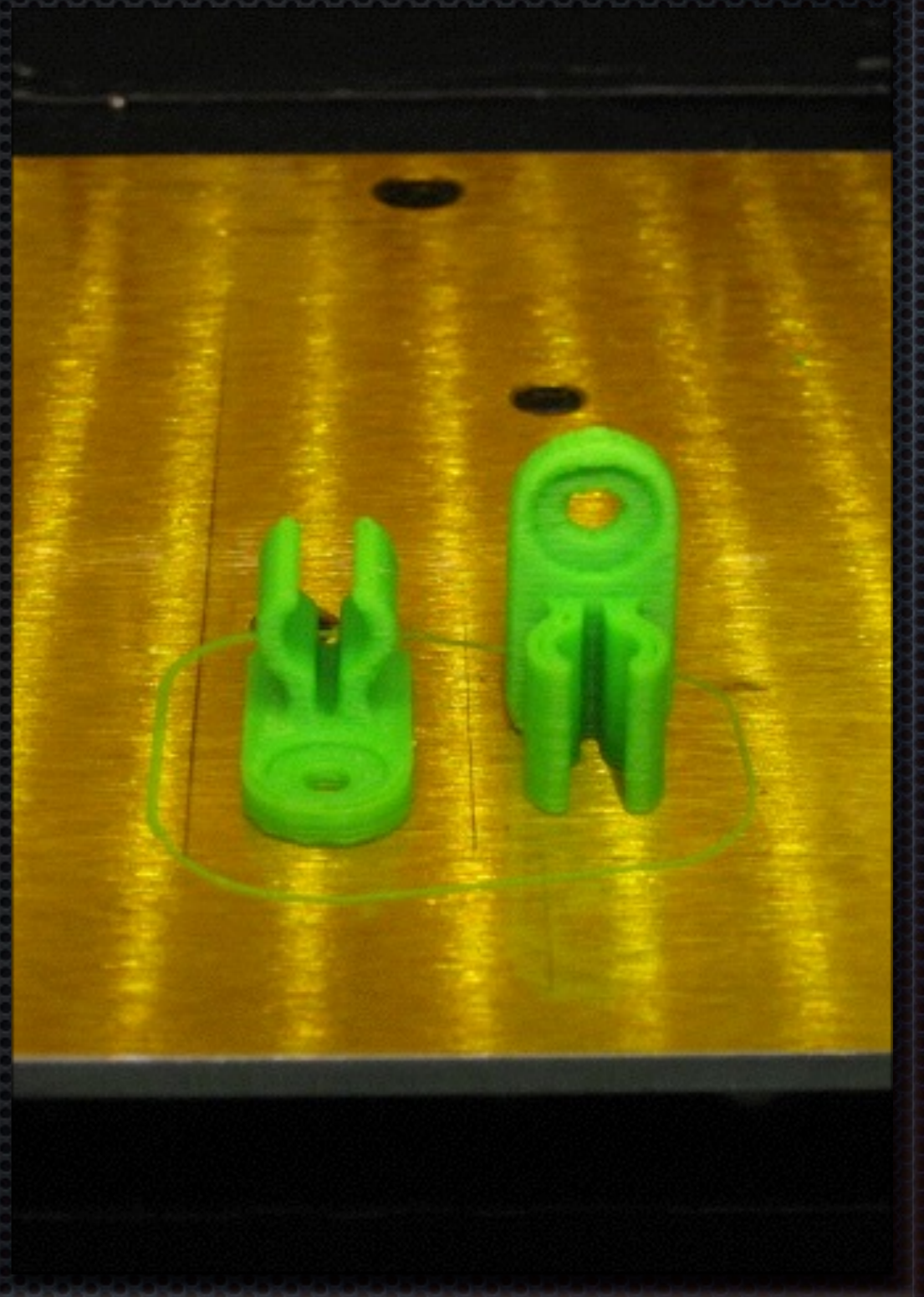






# One complication: “Grain”

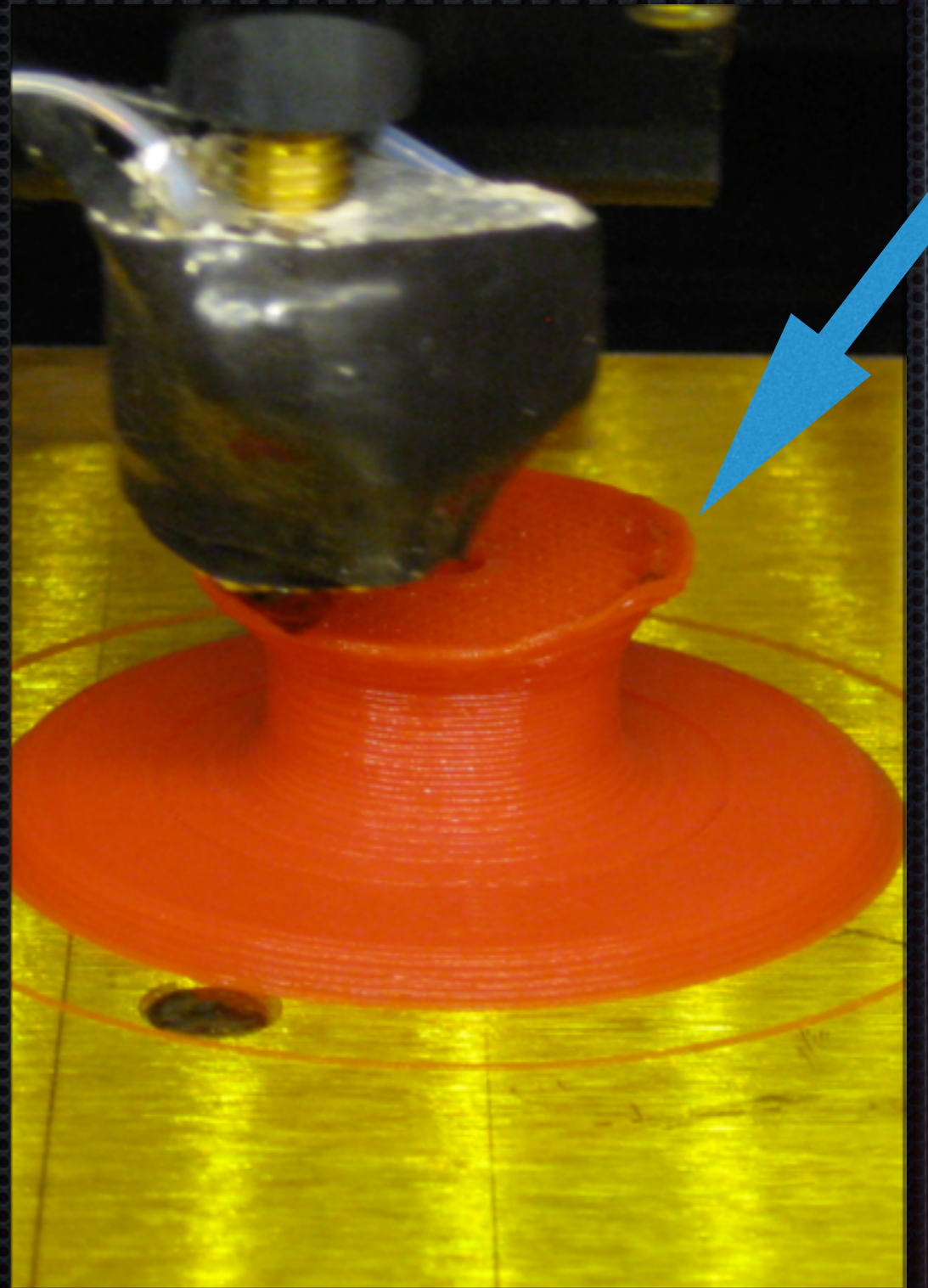
The clip on the right works great, the one on the left failed immediately.





# Another complication: Overhangs

45° is a 50/50 proposition.





# My printer: a “Solidoodle”

- ✦ \$500 — Donated to my department
- ✦ 15cm x 15cm x 15cm print area, enclosed
- ✦ “VW Beetle equivalent”
- ✦ ... and if I had the budget to buy one myself I’d consider a better one, if I knew for sure what was better!



# Yes.

- ✦ Will 3D printers get better?
- ✦ Will they get cheaper?
- ✦ Are they a reasonable tool to purchase for a lab at this point in their development?
- ✦ Am I happy to answer any questions if you decide to add 3D printing to your lab-fab skills?  
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