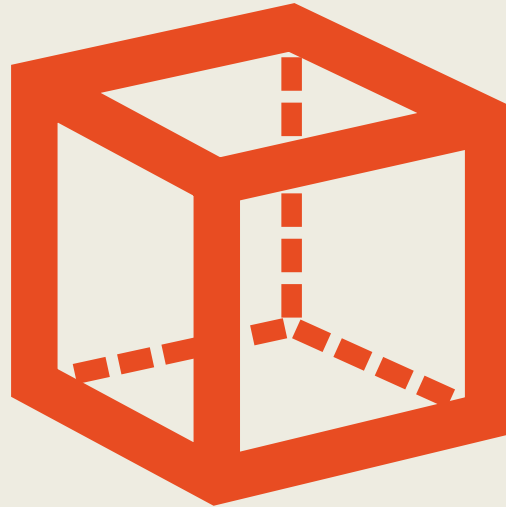


3D RESIN PRINTING



MAX BAREISS
JOHN HUTCHINSON
FOR HACKSBURG

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AGENDA

Types of 3D Printing

3D Printing Steps

Resin Printing Differences

Computer-side Demo

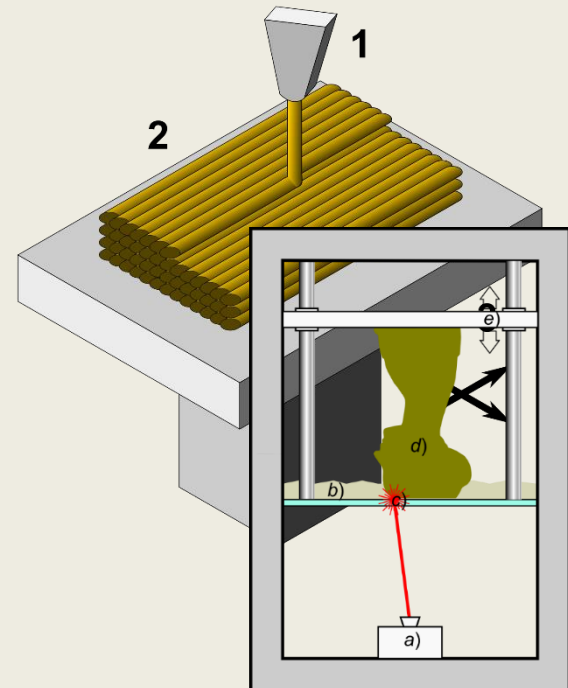
Printer-side Demo

3D PRINTING

- Building an object from nothing, instead of removing stuff from a chunk
- Useful for:
 - Rapid Prototyping
 - Making internal voids/passageways
 - Making really complicated things

TYPES OF 3D PRINTING

- **Fused Deposition Modeling**
- **Vat photopolymerization**
- Material jetting
- Binder jetting
- Powder bed fusion
- Directed energy deposition
- Sheet lamination



FUSED DEPOSITION MODELING

- Fast
- Strong Parts
- Big Parts
- “Real” Materials
- Cheap (\$XXX)
- Low Temperature Tolerance (depends)
- Minimal Detail



<https://www.matterhackers.com/store/l/c/reality-cr-10-s5-3d-printer/sk/MVK3ZJSV>

VAT PHOTOPOLYMERIZATION

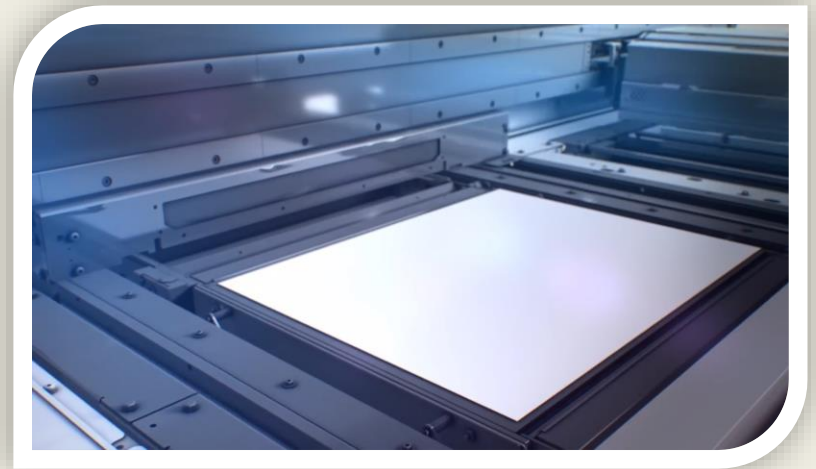
- High Detail Parts
- Very Small Parts
- Good temperature tolerance
- Weird Resins
- Curing
- Expensive (\$X,XXX) but cheaper ones (\$XXX) are becoming available



<https://formlabs.com/3d-printers/form-3/>

BINDER JETTING

- High Detail Parts
- Very Small Parts
- Good temperature tolerance
- Almost no design constraints
- “Real” Materials (Nylon and PP)
- Lots of postprocessing
- Enormously expensive (\$XXX,XXX)



<https://youtu.be/VXntl3ff5tc>

DIRECTED ENERGY DEPOSITION

- High Detail
- Ultra-High Strength
- Extreme temperature tolerance
- Very Small Parts
- No printing limitations
- Enormously expensive (\$XXX,XXX)

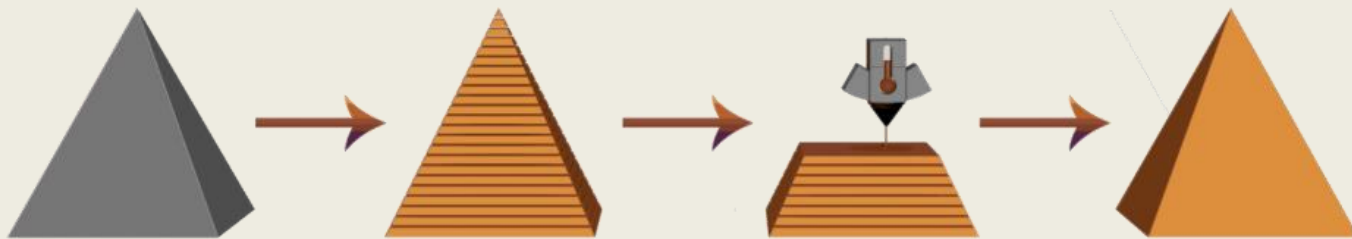


https://www.trumpf.com/en_US/products/machines-systems/additive-production-systems/truprint-series-1000/

MELD!

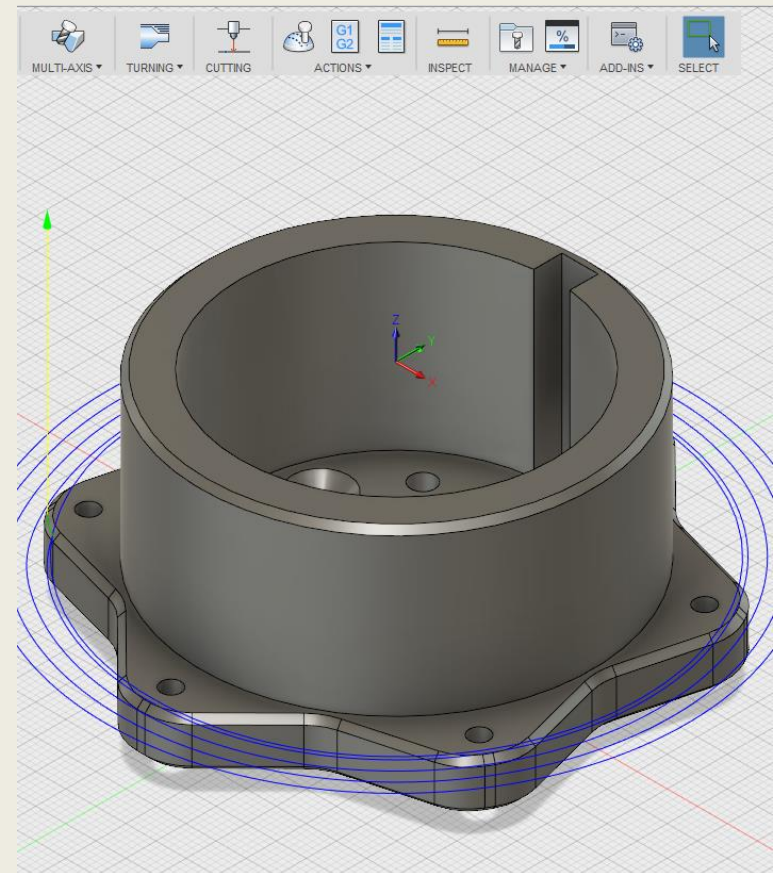


3D PRINTING STEPS



3D MODELING

- Create your own models
 - Traditional CAD
 - FreeCAD, Inventor, Solidworks, Fusion 360, Alibre Design, OnShape, NX, Catia, etc.
 - OpenSCAD
 - TinkerCAD
 - Blender
- Download models
 - Thingiverse
 - CGTrader
 - MyMiniFactory





RESIN (SLA) PROCESS

SLICING AND G-CODE GENERATION

- There are many slicing tools, several of which are free
- PrusaSlicer
 - Developed from Slic3r for Prusa printers
 - Works for any printer, used at Hacksburg
 - Advanced features like multi-material, variable layer height, SLA
- Chitubox
 - Many slicers derived from this
 - Good performance, antialiasing
- Vendor Tools
 - PreForm, Photon Workshop



SLICING PROCESS

- **Import 3D Model**
- **Place on plate**
- **Adjust settings**
 - **Layer height:** the precision of the model. Smaller layers = more detail and more time
 - **Supports:** automatic supports, then check and modify
 - Overhangs less than 45 degrees can be printed
 - **Hollowing:** Set wall thickness to reduce material usage. Make sure to add vent hole
 - **Exposure time:** Make sure this is set correctly for your material
 - https://docs.google.com/spreadsheets/d/1crvzMnt_8NjXAsABinoIhcOjE8I3h7s0L82ZlhIvkL8/edit#gid=0
- **Slice model**
- **Convert file format (PrusaSlicer only)**
 - <https://github.com/fookatchu/SLItoPhoton>
 - Already present on laser computer

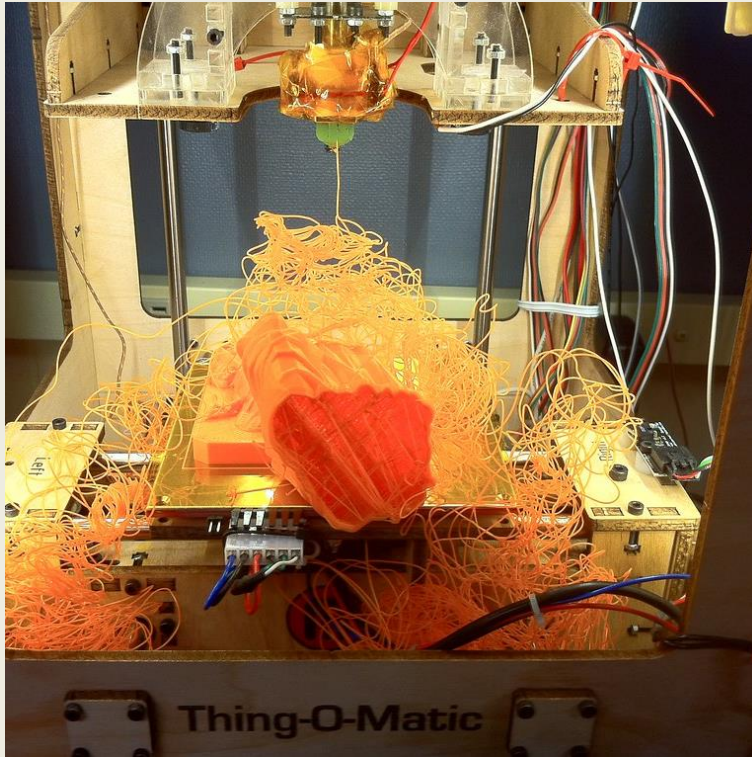
SLA MATERIALS

- 405nm UV Cure Resin
- Mostly Urethane
- Mostly Alcohol-soluble,
some water-soluble

SLA MATERIALS

- “Normal”
- Durable
- Clear
- Wax Castable
- High Temperature
- Ceramic Filled
- Flexible

PRINTING



- Pause the print once the raft is done. Is the part still stuck to the bed?
- Continue to monitor for
 - Print becoming unstuck
 - General failure

POST-PRINTING

- Same resin as before? Just leave it there
- Switching resin?
 - Pour back into original bottle with a filter
 - Wipe out resin tank with alcohol
 - Pour in new resin



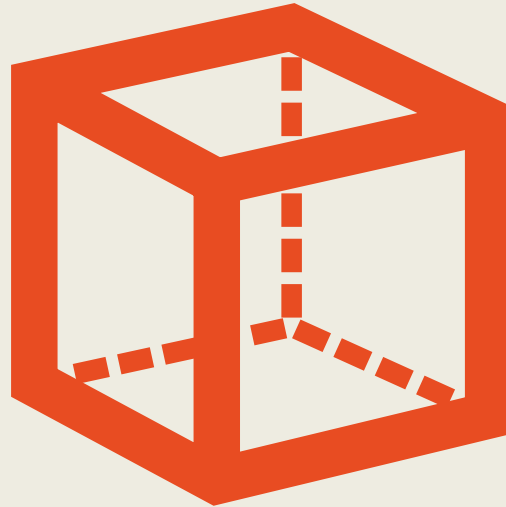
HACKSBURG PRINTER

HACKSBURG 3D PRINTER

- Anycubic Photon
- 115x65x155mm working area
- Roughly 8-second layers
- https://wiki.hacksburg.org/wiki/Tools/3D_Printing/Anycubic_Photon#Instructions



3D RESIN PRINTING



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2 / 20 / 22

NO RSVPS

- There was no one here, and only one tentative RSVP, so the class has been canceled.
- If you want 3D printer instruction, please email board@hacksburg.org to set up a one-on-one meeting.
- If you want CAD practice, make this part: <https://www.mcmaster.com/91251A542/>
 - See link in chat
 - I can share my part file with you if you want to compare with