

3D Printing in Astronomy

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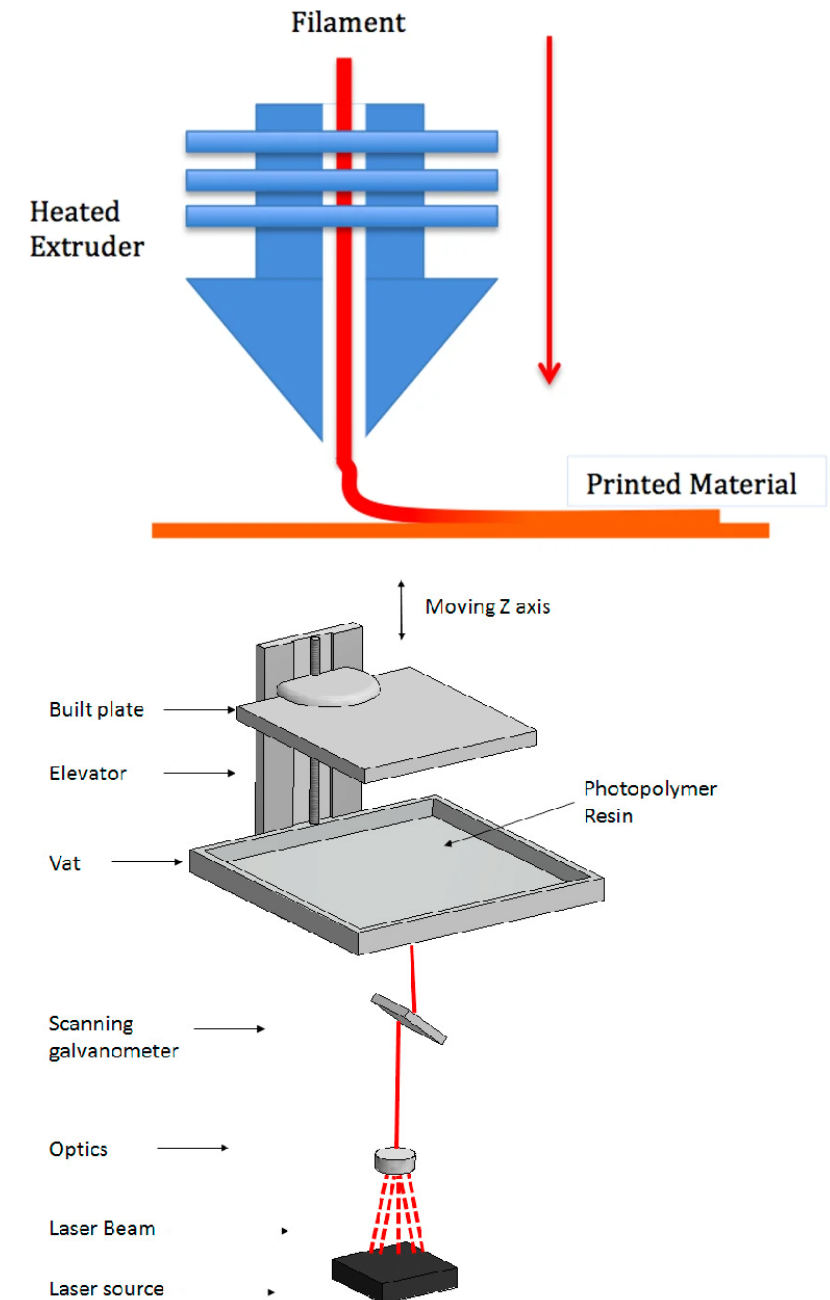
Machine Types

Fused Deposition Modeling (FDM)

- Most popular
- Use different types of plastic
- Uses hot nozzle to melt and lay plastic bead

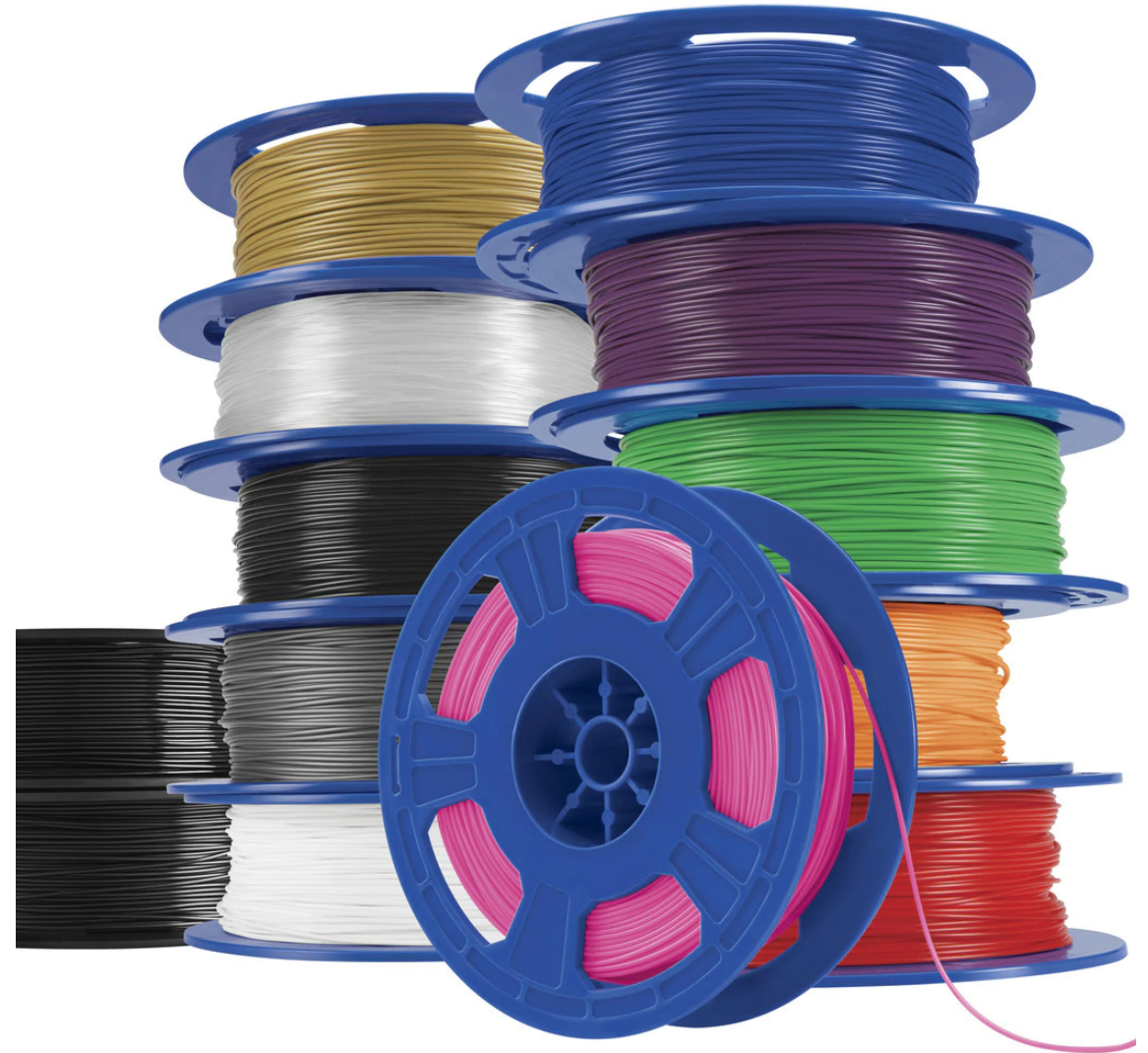
Stereolithography (SLA)

- More expensive
- Uses different types of UV activated resin
- Uses laser to solidify layer of resin material



Materials

- Polylactic Acid (PLA)
 - Most common
 - Biodegradable
- Acrylonitrile Butadiene Styrene (ABS)
 - LEGOs are made of this
 - More tough and ductile than PLA
- Thermoplastic Polyurethane (TPU)
 - Flexible; different durometers
- Nylon
 - Tough and durable
 - Hard to work with
- Other Embedded



Hardware

- Drill and Tap
- Press Fit
- Self-Taping
- Mid-Layer
- Brass Insert



Use in Astronomy

- Replacement Parts
- Focusing Aids
- Special Holders
- Telescope Accessory Mounts
- Lens Caps
- Display/ Teaching Models
- So much more...

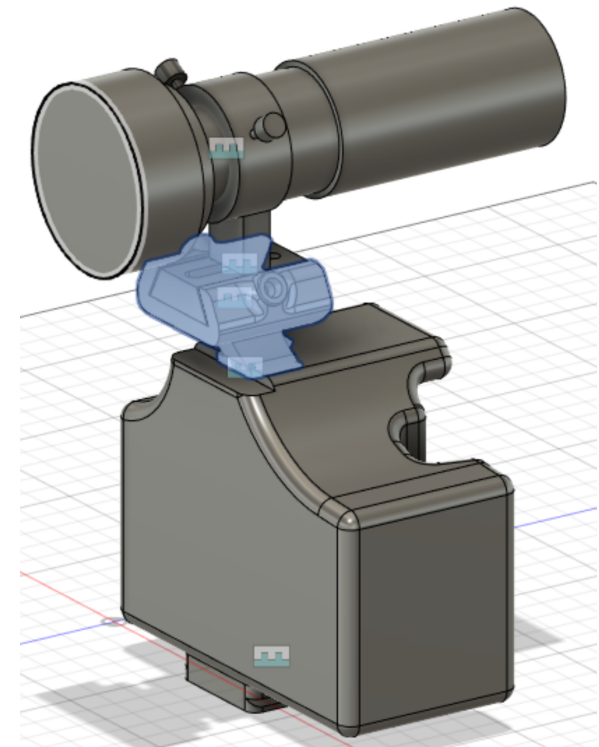


Personal Designs

- <https://www.thingiverse.com/justinwaz/designs>
- Camera Hotshoe Dovetail
- Orion ST80 Mount
- Bahtinov Masks
- Eyepiece Eyecup Extension
- Raspberry Pi Mount
 - Computer
 - Screen
- Soon to come:
 - Eyepiece holder
 - Laser Dovetail Mount

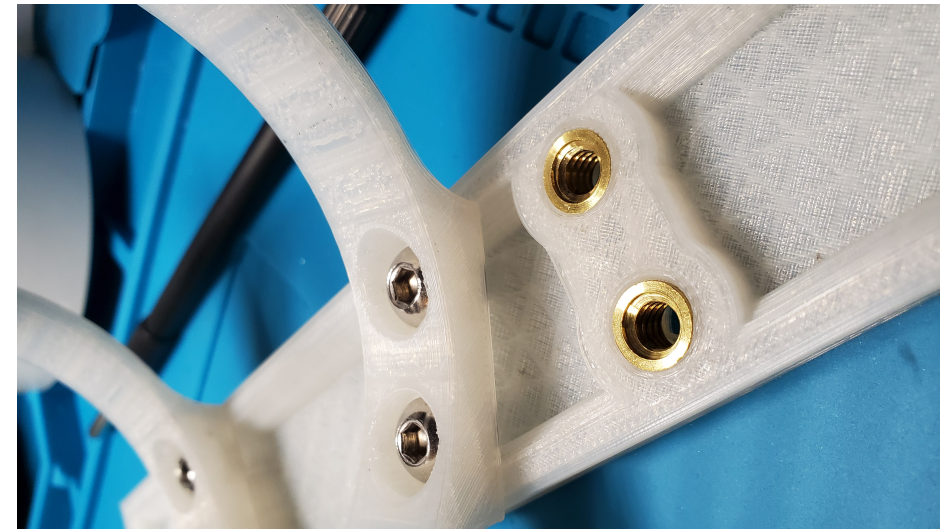
Personal Designs

- Camera Hotshoe Dovetail
 - <https://www.thingiverse.com/thing:4729922>
 - Used brass inserts for tightening screws
 - Required a few iterations for proper fit
 - Use: to mount guide camera to DSLR
 - Can be used to mount any thing with this standard dovetail



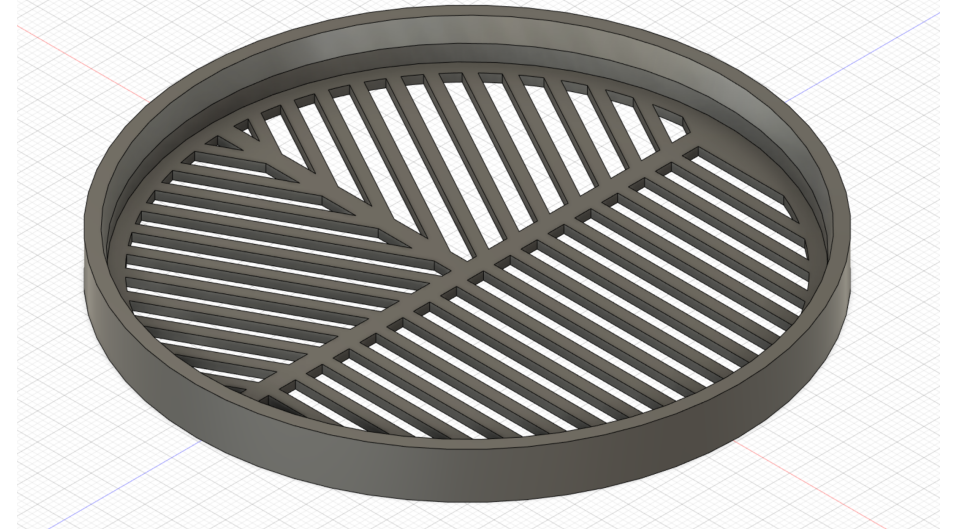
Personal Designs

- Orion ST80 Dovetail Mount
 - <https://www.thingiverse.com/thing:4729898>
 - Heated Brass Inserts



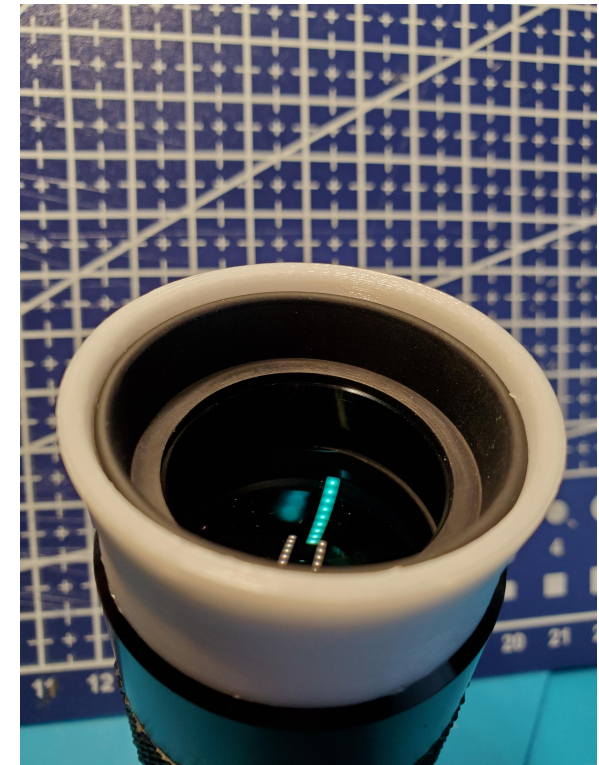
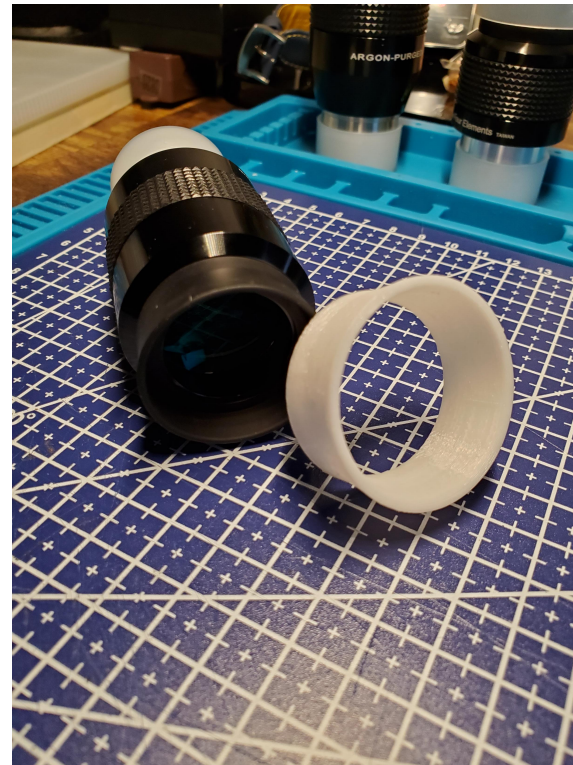
Personal Designs

- Bahtinov Masks
 - Multiple sizes for lenses and telescopes
 - Easily scalable



Personal Designs

- Eyepiece Eyecup Extension
 - Made of flexible TPU material
 - Slips over eyecup to extend length of eyecup
 - Ideal for eye relief that is too long



Personal Designs

- Raspberry Pi Mount
 - Attaches mini-computer and screen to tripod.
 - Computer will control autoguiding and plate solving



Print Examples

- CN user Gazpacho
 - ID caps for ES68 and ES82 eyepieces



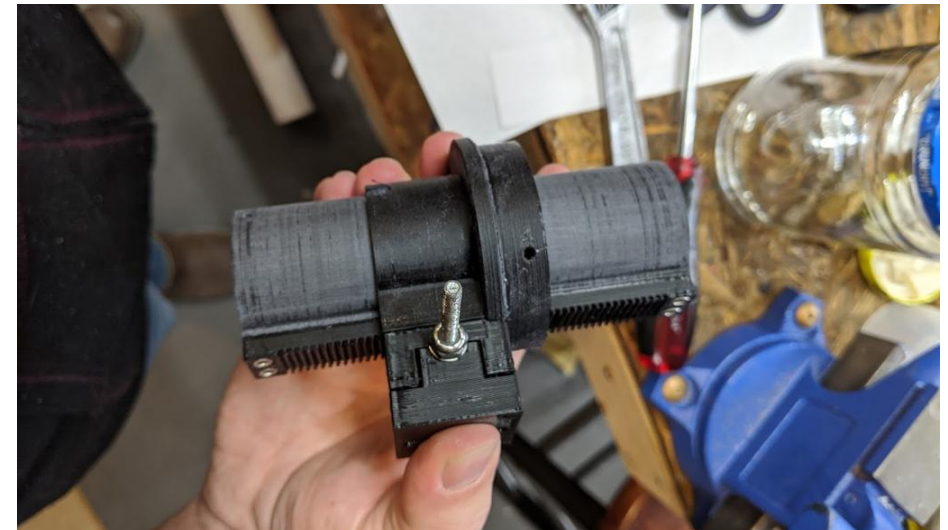
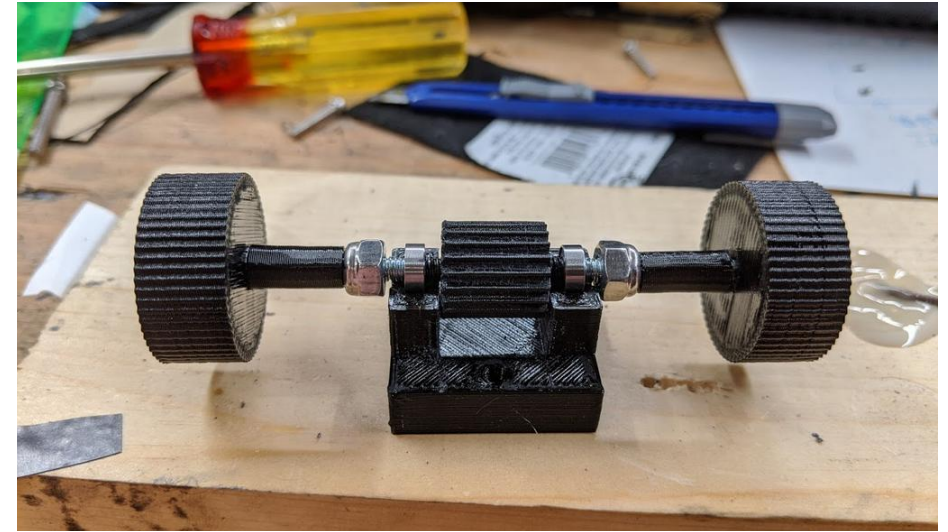
Print Examples

- CN user jerahian
 - Guide scope mount for Orion ST-80 to ES ED127mm
 - Clam shell method



Print Examples

- CN user jessebear
 - Rack and Pinion focuser



Print Examples

- CN user intercipere
 - EQ Split Ring DSLR Tracker and Autoguiding Mount



Print Examples

- Thingiverse user Fatalik
 - ABSDBS-8"
 - 8" Newtonian Telescope made from ABS
 - Weighs 5.5 kg (12.12 lb)
 - Files to print own available on Thingiverse
 - <https://www.thingiverse.com/thing:2492121>
- Other telescopes
 - <https://all3dp.com/2/3d-printed-telescope-projects/>



Work Flow



Model

Share site
Computer Aided
Design (CAD)
Export as .stl



Slicing

Cura
Export .gcode



Printing

Run .gcode
Ensure first layer
Check often

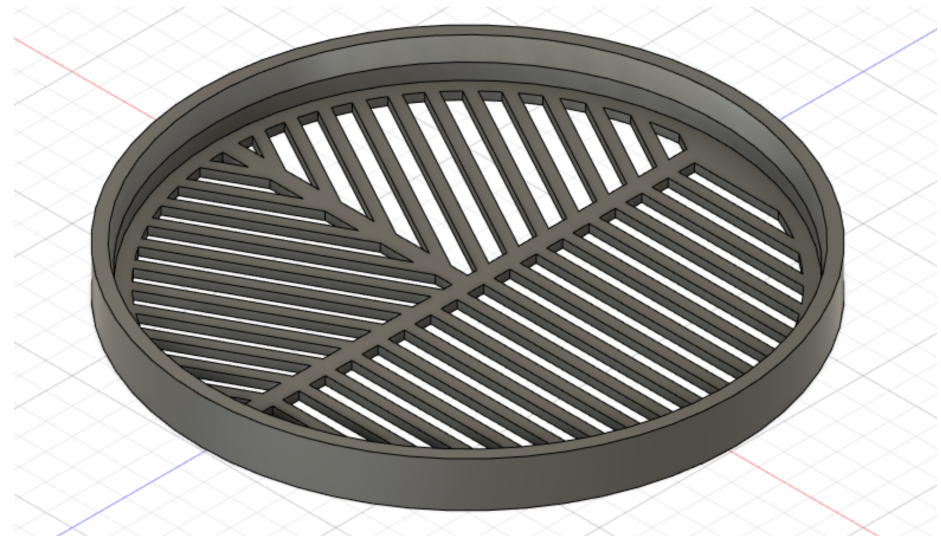
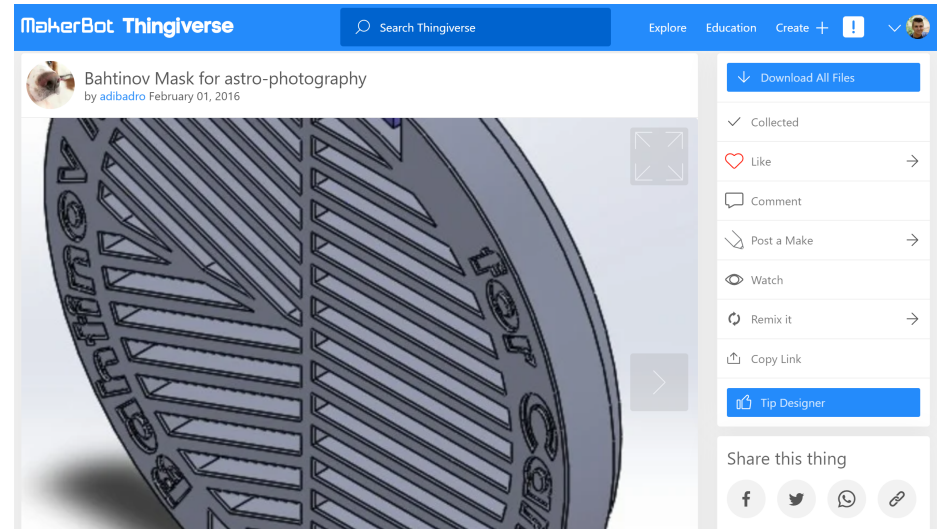


Cleaning

Remove support
Clean excess
Drill holes
Sand surfaces

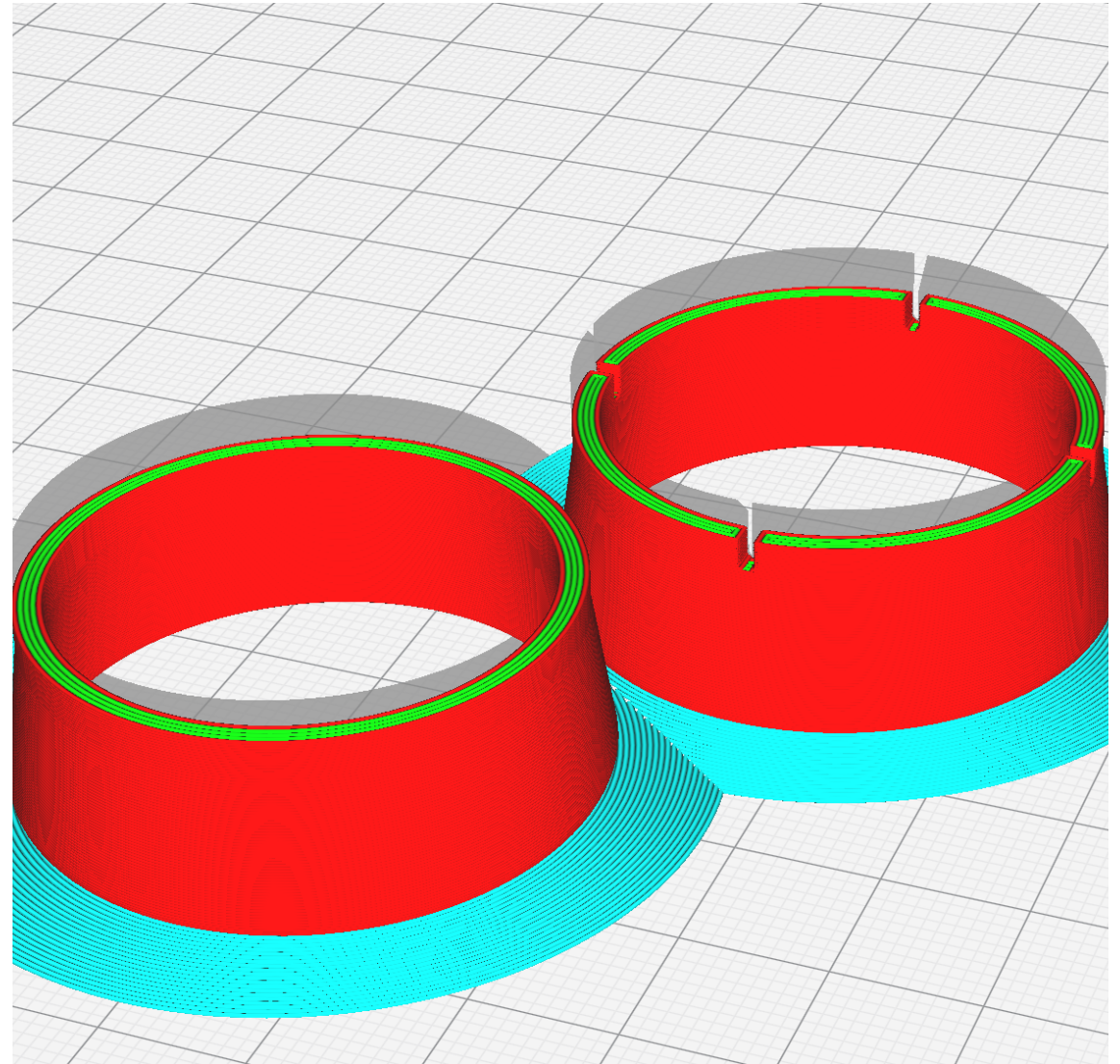
Model

- Share site
 - Thingiverse
 - GrabCAD
- Computer Aided Design (CAD)
 - Fusion 360
- Export/Download as .stl



Slicing

- Cura
 - Placement
 - Modify Settings
 - Wall Thickness
 - Infill
 - Material Type
 - Support
- Export gcode



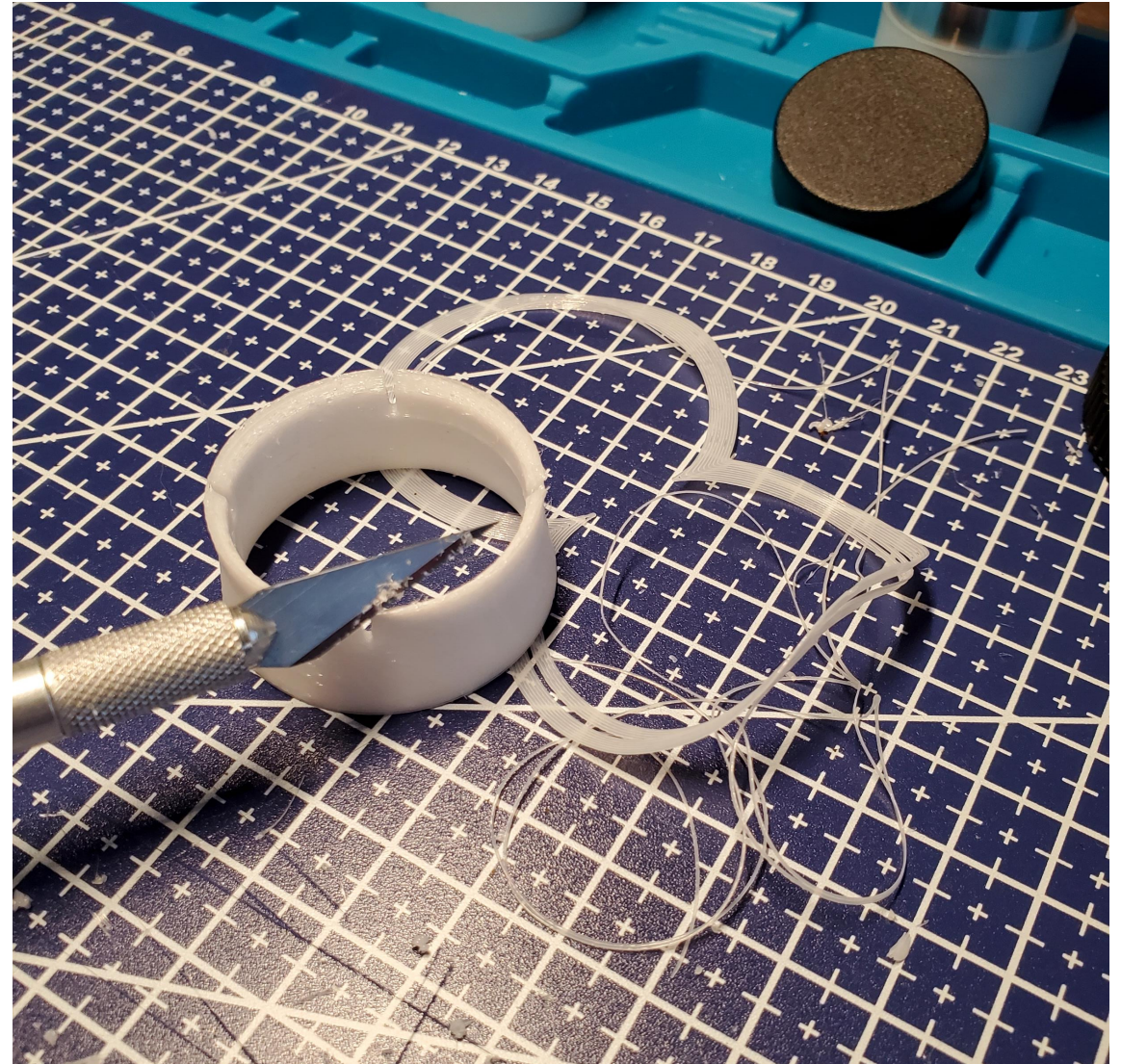
Printing

- Run gcode
- Ensure good first layer
- Check on often
 - Prints to not know when they have messed up
 - They do exactly what you tell them to do; no questions asked



Cleaning

- Remove support
- Clean excess material
- Drill holes to size
- Sand required surfaces





Contact

Feel free to contact for questions or to chat about
Astronomy and/or 3D Printing!

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