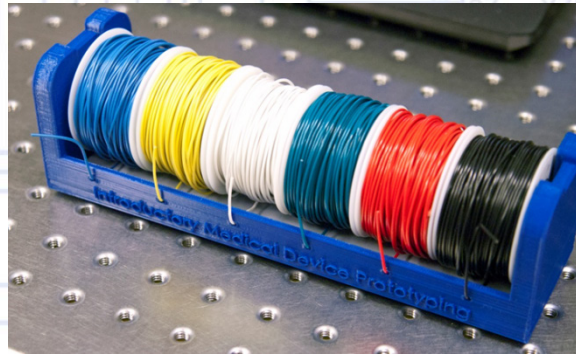
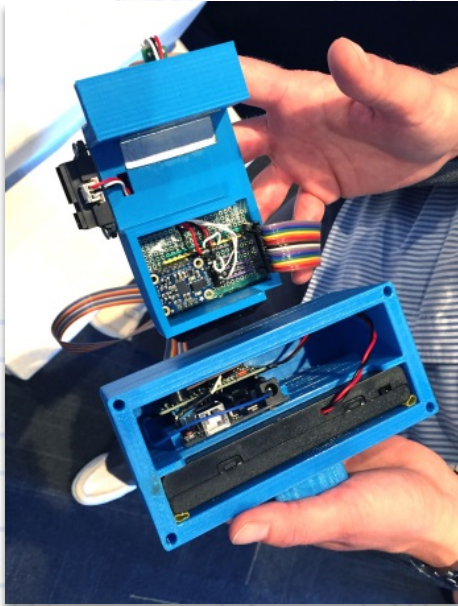


Introductory Medical Device Prototyping

3D Printing – FDM, Polyjet & Bioprinting

Prof. Steven S. Saliterman, <http://saliterman.umn.edu/>
Department of Biomedical Engineering, University of Minnesota

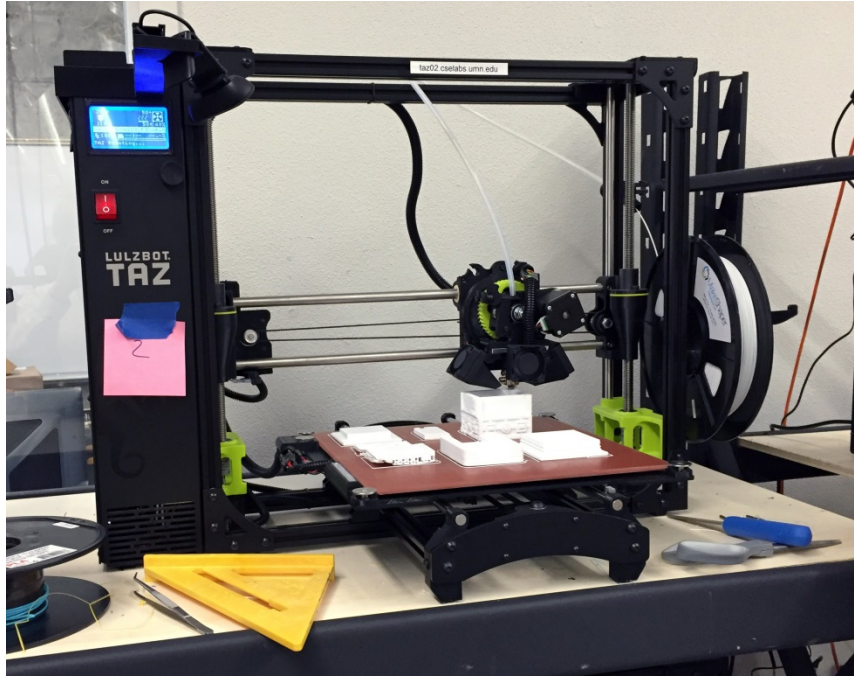


Topics

- Anderson Labs in ME and Earl Baken Medical Devices Center
- Printers & filaments.
- Slicer programs:
 - Cura (you will need to specify your specific printer)
- Making a part:
 - Importing SolidWorks parts.
 - Positioning
 - Optimizing print quality with *Settings*.
 - Printing
- SolidWorks tutorial examples.
- Polyjet printing.
- Biofabrication - Bioprinting

Anderson Labs in Mechanical Engineering...



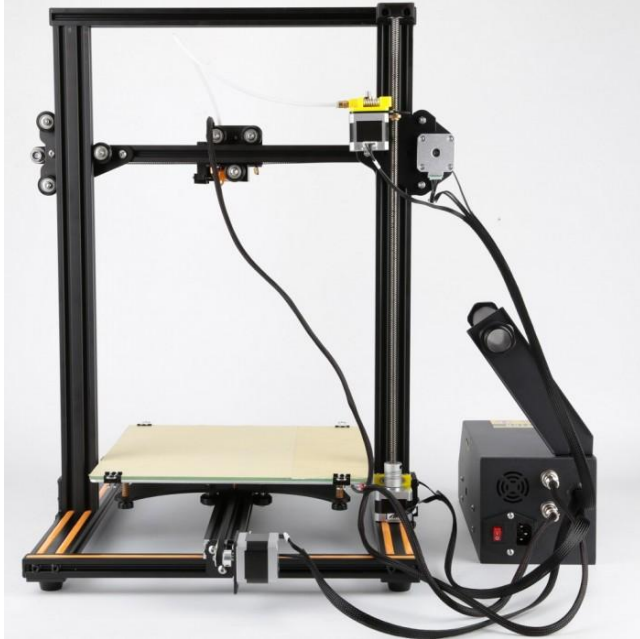


Lulzbot Taz 3D Printer



Bed and Extruder Temperature

Medical Devices Center 3D Printers...



Creality3D CR-10

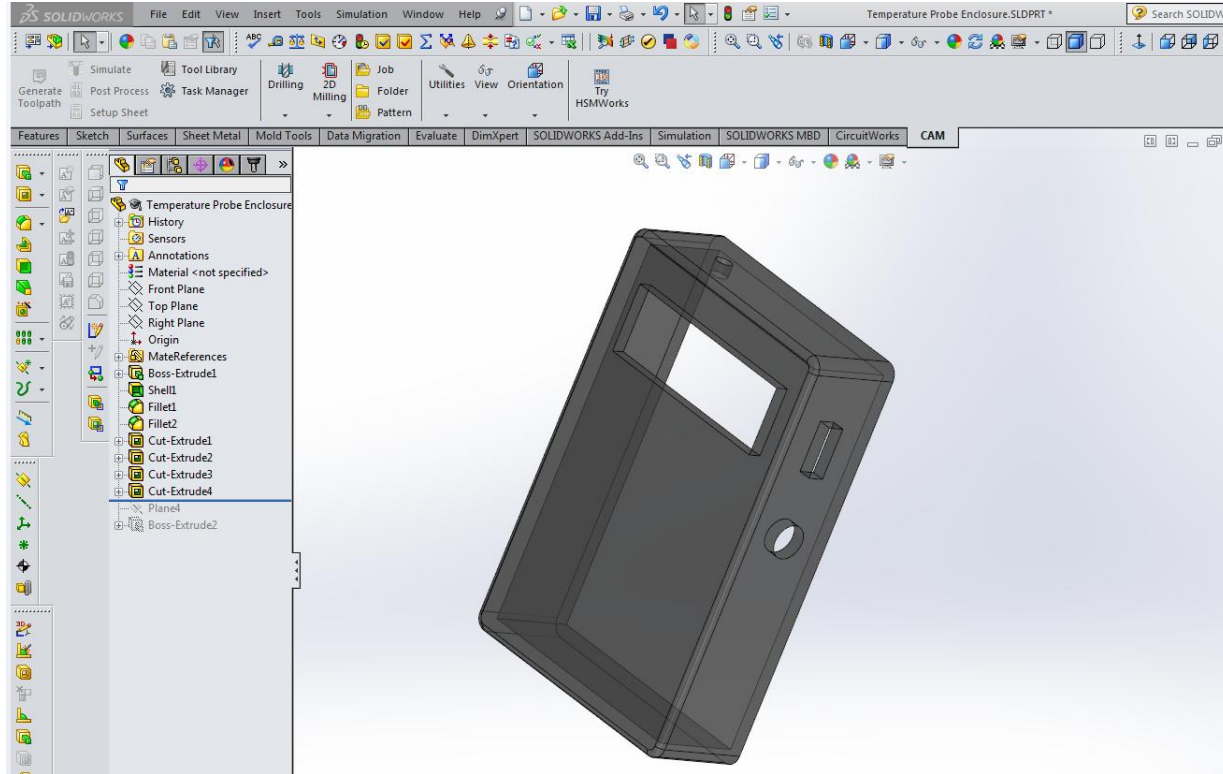


Monoprice MP Select Mini 3D Printer V2

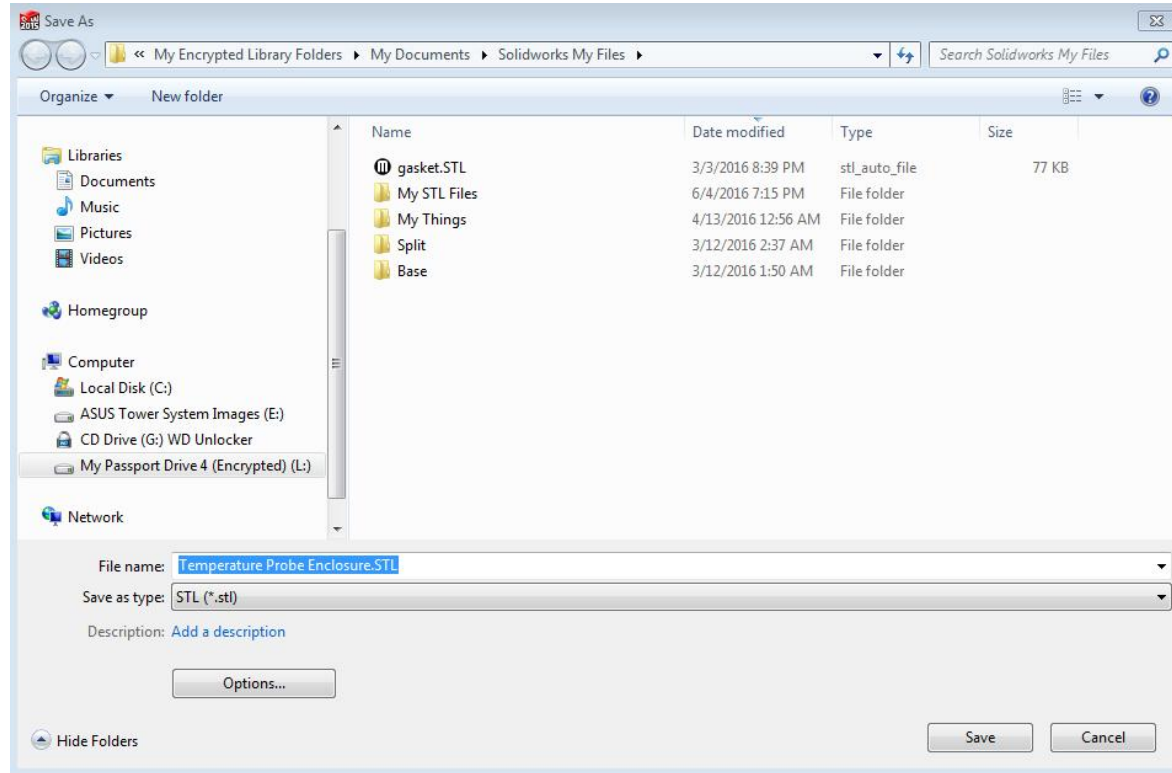
Filament – ABS or PLA



Printing a SolidWorks Part



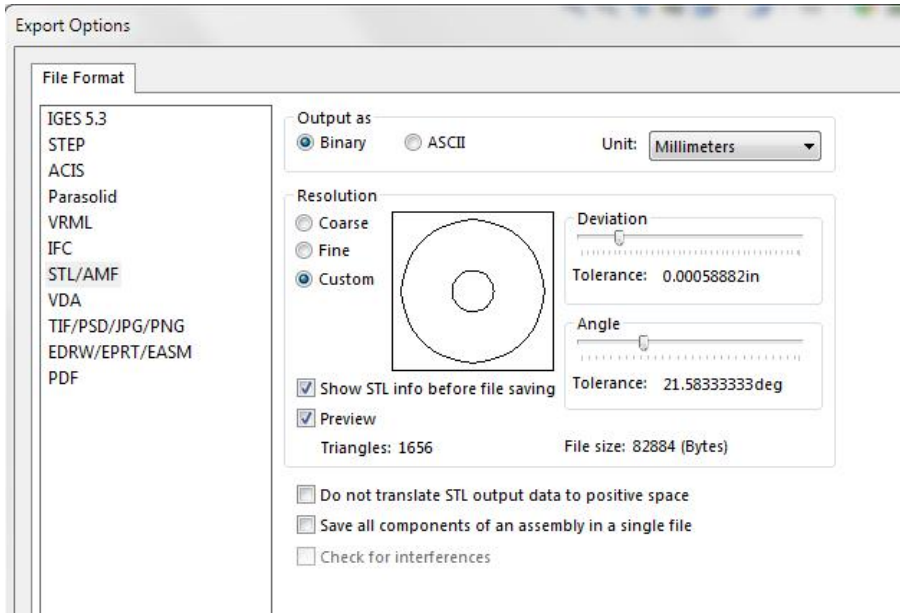
Save as .STL File...



What is an STL File?

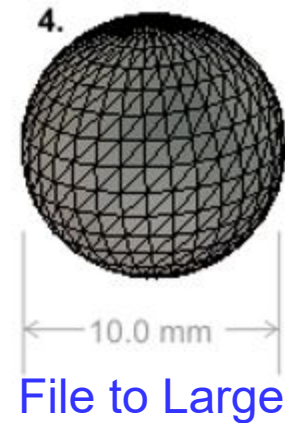
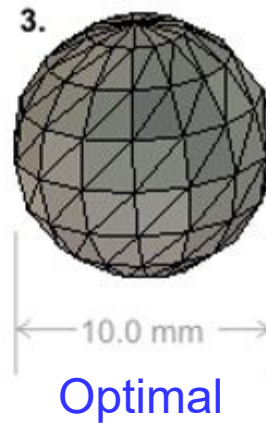
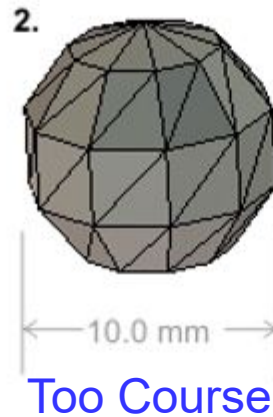
- *Standard tessellation/triangulation language* is a 3D file format which uses a series of triangles to describe the outer surfaces of a 3D model.
- Industry standard.
- There is no color, texture or additional attributes i.e. features.
- You can improve the “resolution” or accuracy by selecting “Options” and changing the settings.

SolidWorks STL Settings (Options)...



- *Binary* files are smaller.
- *Deviation* is expressed as a linear dimension and refers to the maximum distance that the facet of the .stl file is permitted to be away from the original geometry.
- *Angle* refers to the angular deviation allowed between adjacent triangles,

Resolution Settings...

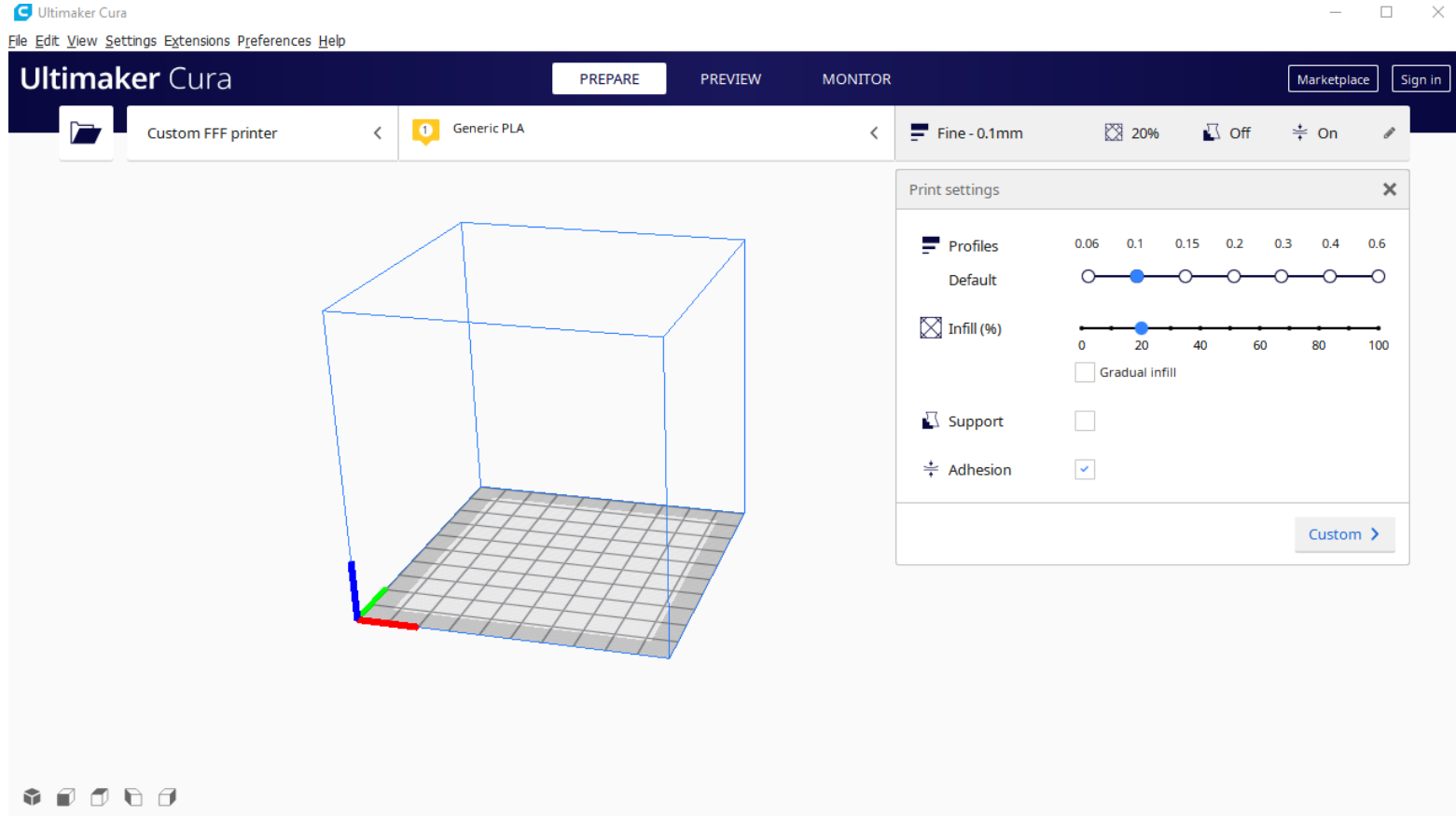


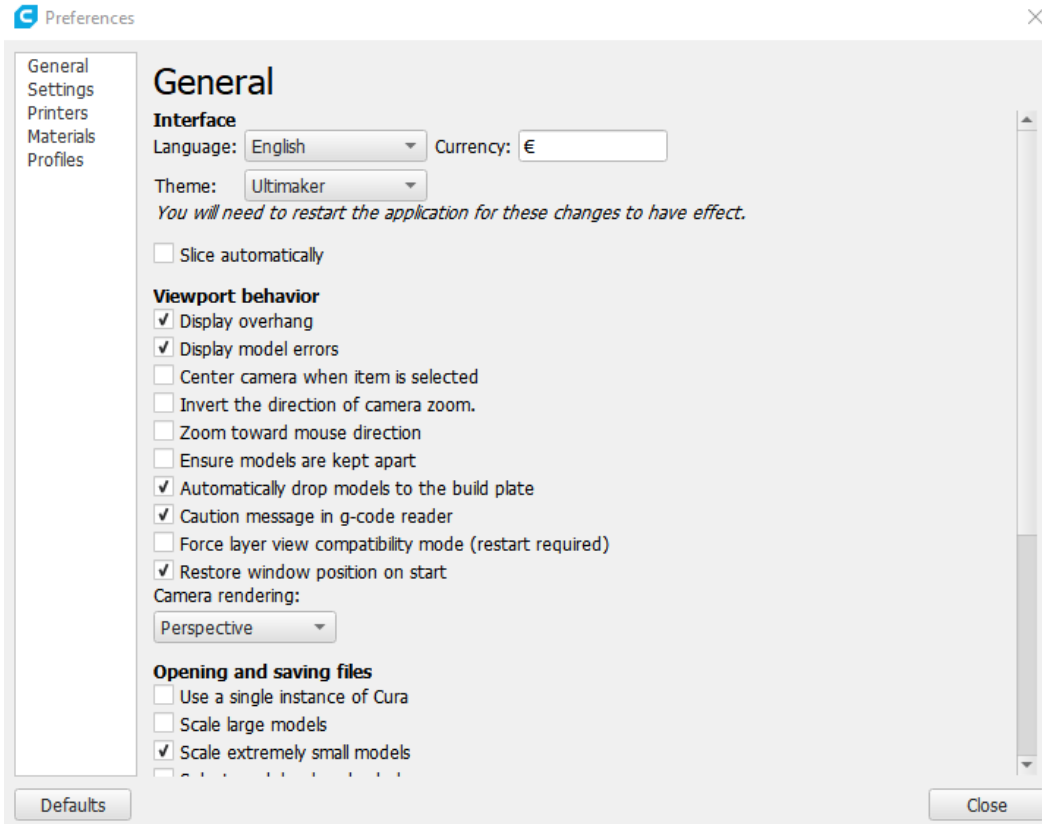
The optimal setting is going to be printer dependent, and requires some experimentation.

Slicer Software Options

- Anderson Labs - Lulzbot Taz Printers
 - Cura Software
- MDC – Creality & Monoprice Select Mini & Maker Pro Printers
 - Creality Software

Ultimaker Cura 4.8.0





Cura Tutorial...

3D x Pro Uni Mo Por 202 ^VI Am can Uni Eas My Log J4M Fin +

all3dp.com/1/cura-tutorial-software-slicer-cura-3d/

Apps Analytics Settings 3D Printers Adobe Premier Altair & IMSAI Attic Attic Mold Basketball Court Other bookmarks

All3DP PRINTABLES MORE PRO GET IT 3D PRINTED Craftcloud

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Slice and Dice

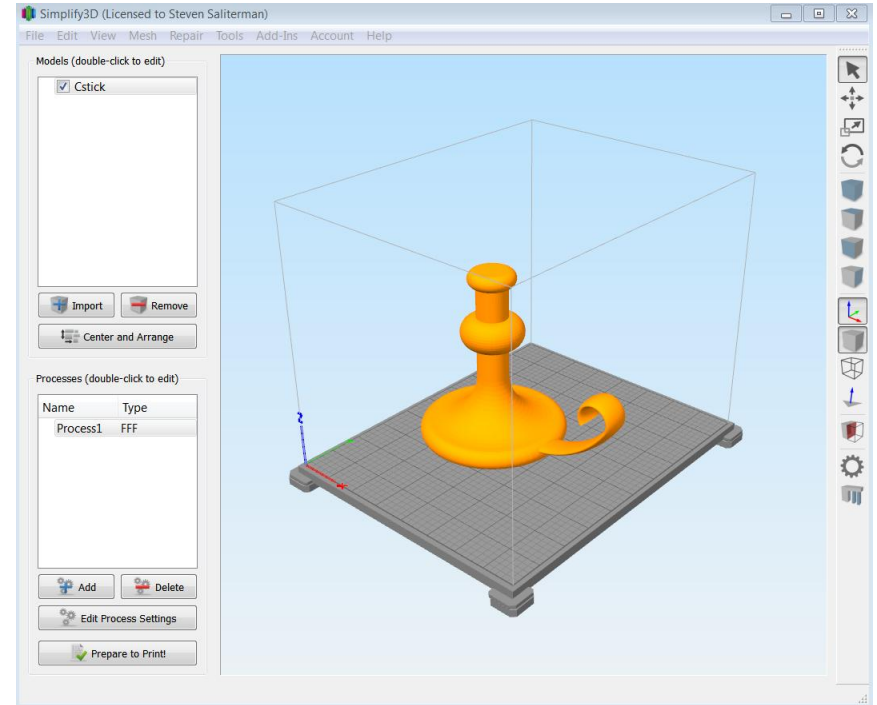
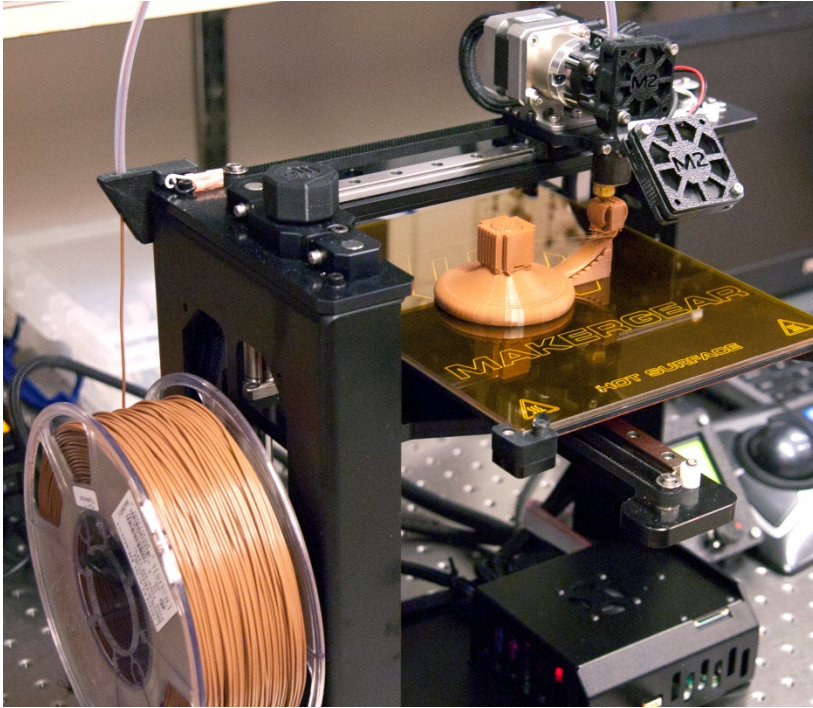
Cura Tutorial: Master Cura Slicer Software Settings

by Ditya Chakravorty
January 14, 2020

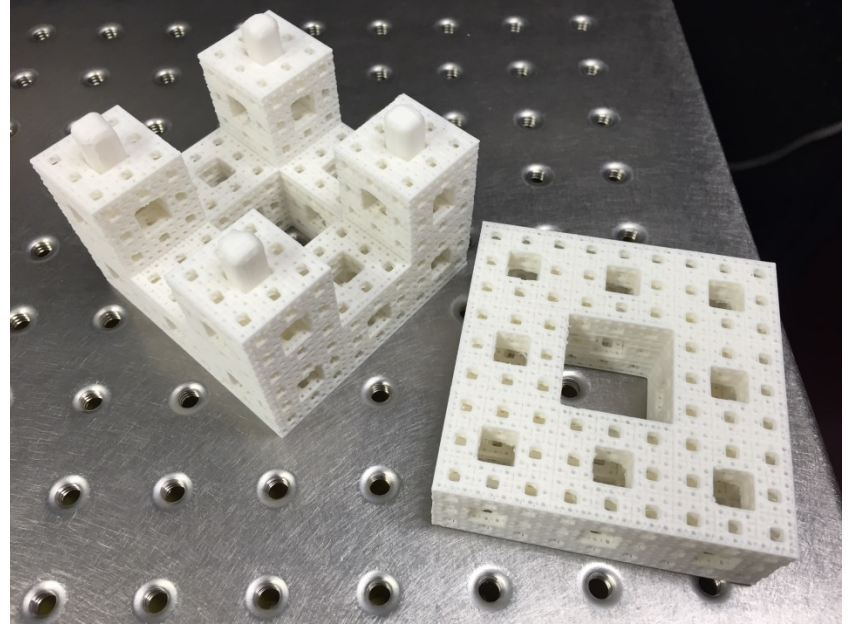
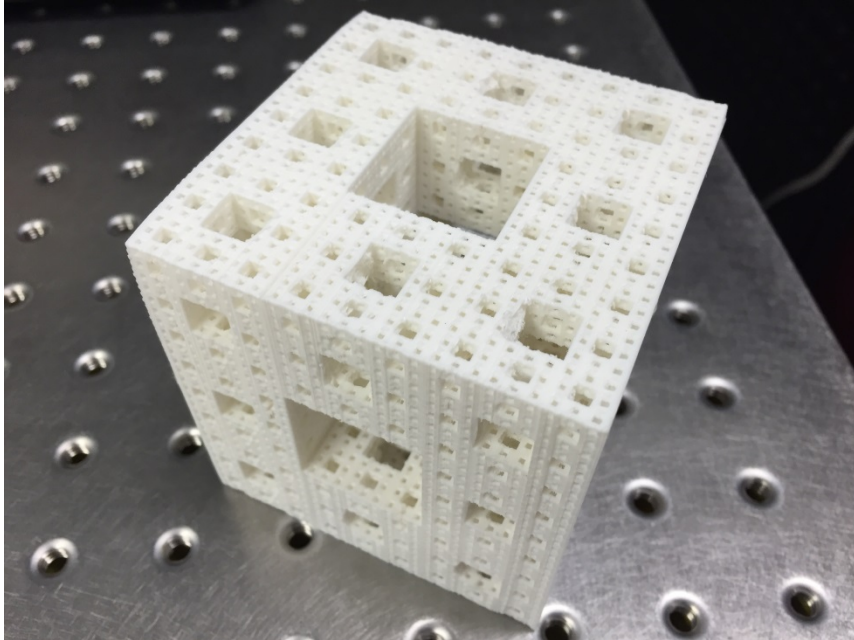
Example Assembly...



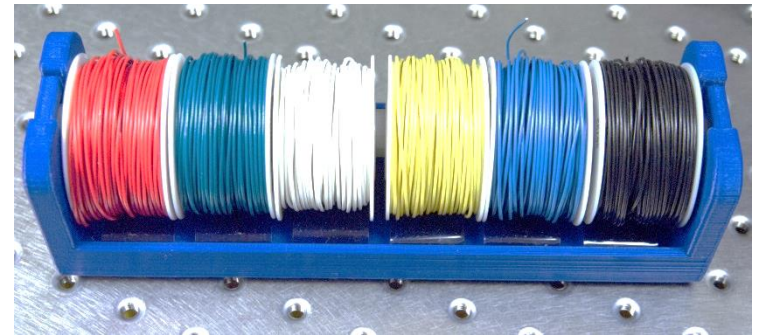
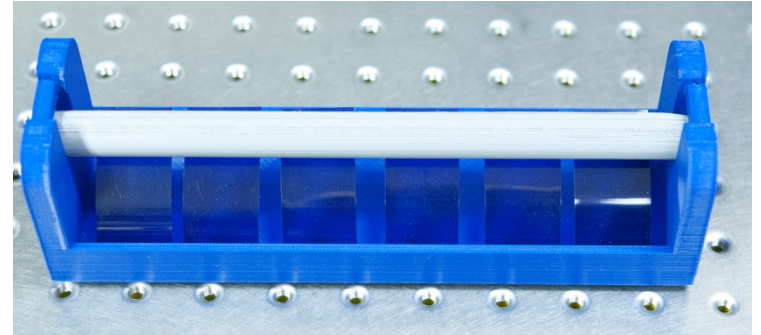
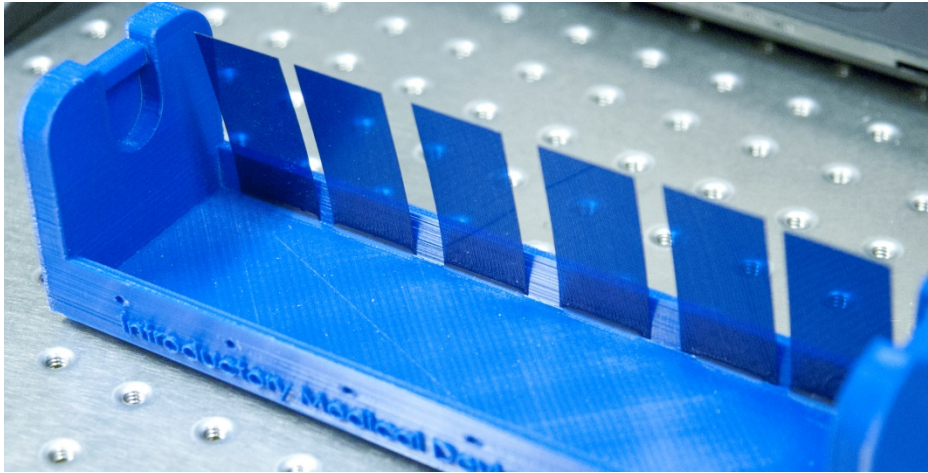
Solidworks Tutorial & Simplify 3D Software...



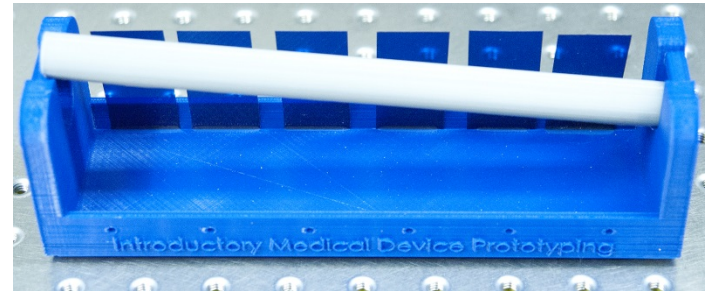
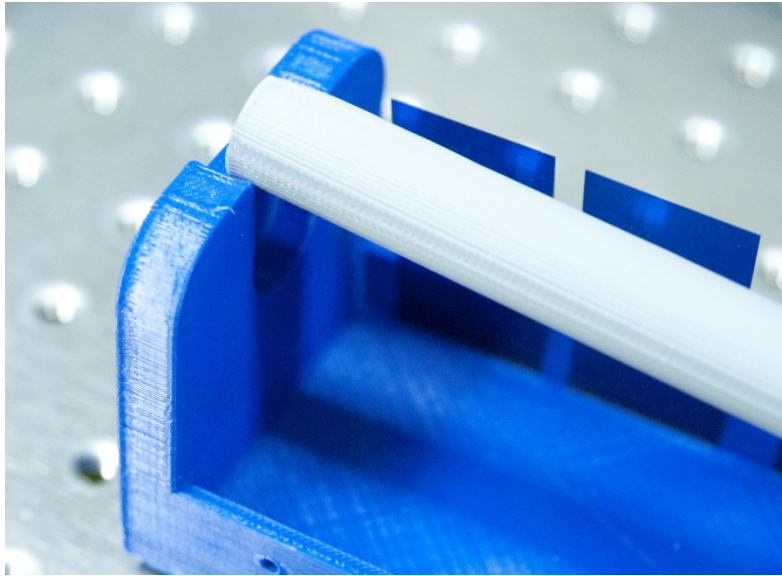
Menger or Sierpinski Sponge ...



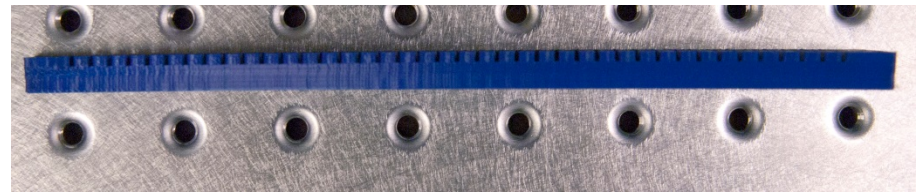
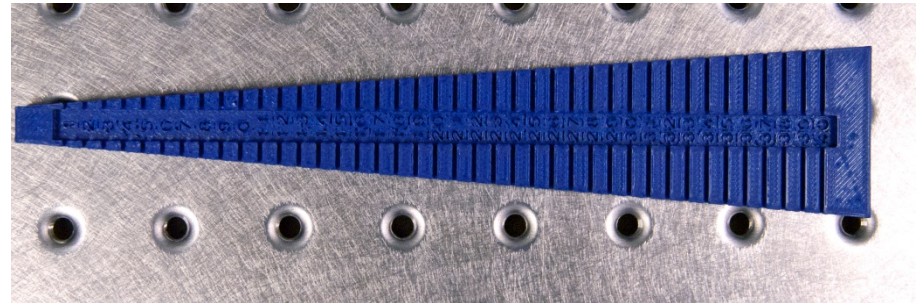
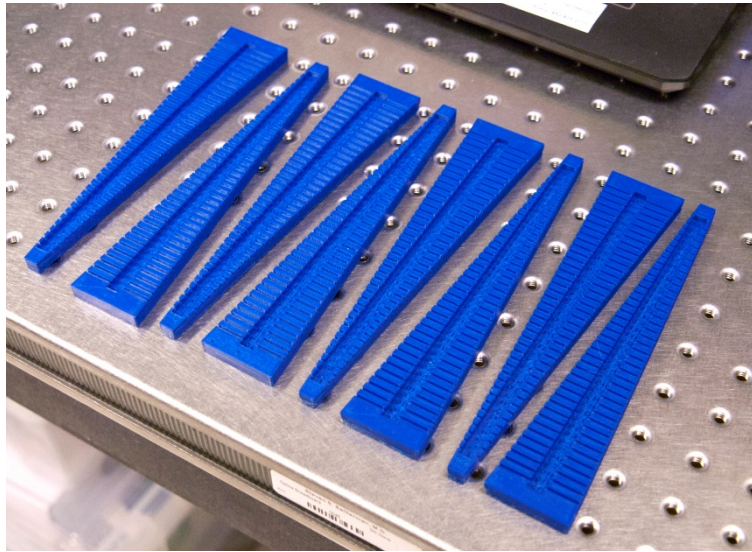
Hookup Wire Holder...



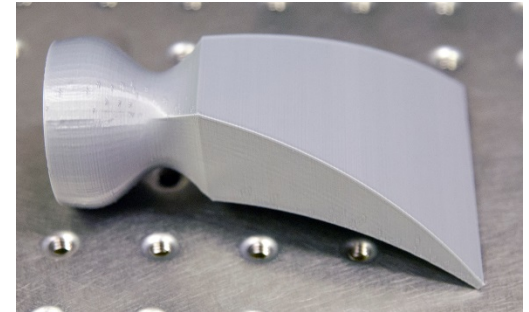
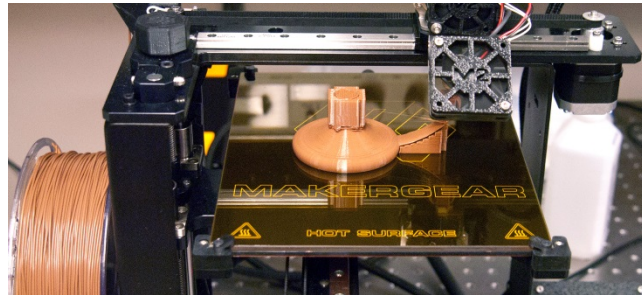
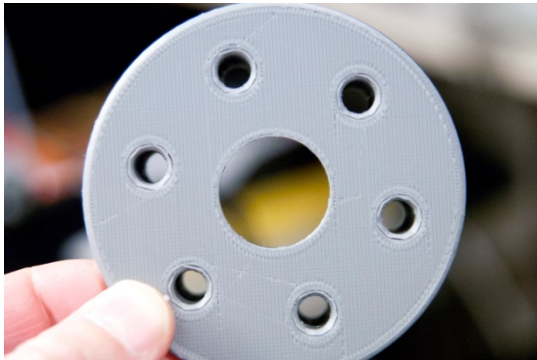
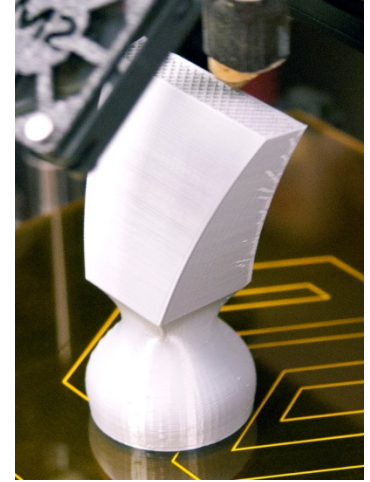
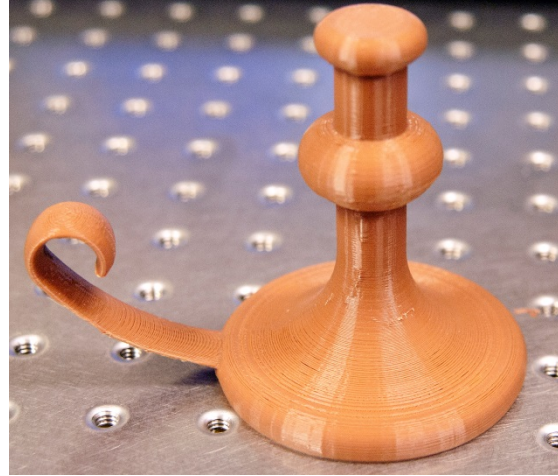
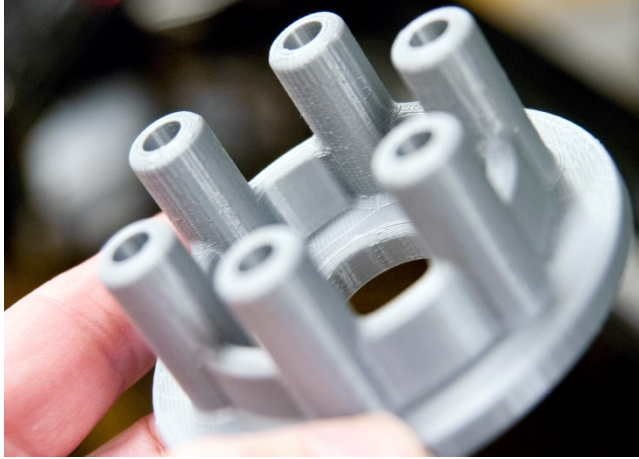
Snap-in Support Bar...



Wire Lead Bender Tool



SolidWorks Tutorials



Stratasys 3D Polyjet Printer



Head & Neck Anatomy...



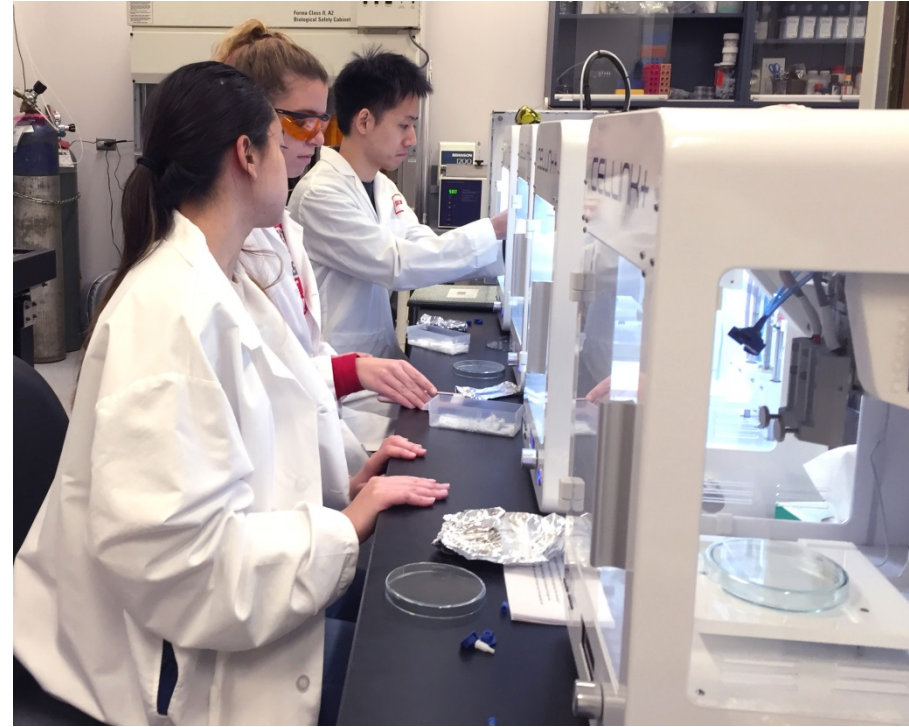
Heart – Inside and Outside...



Hand & Wrist...



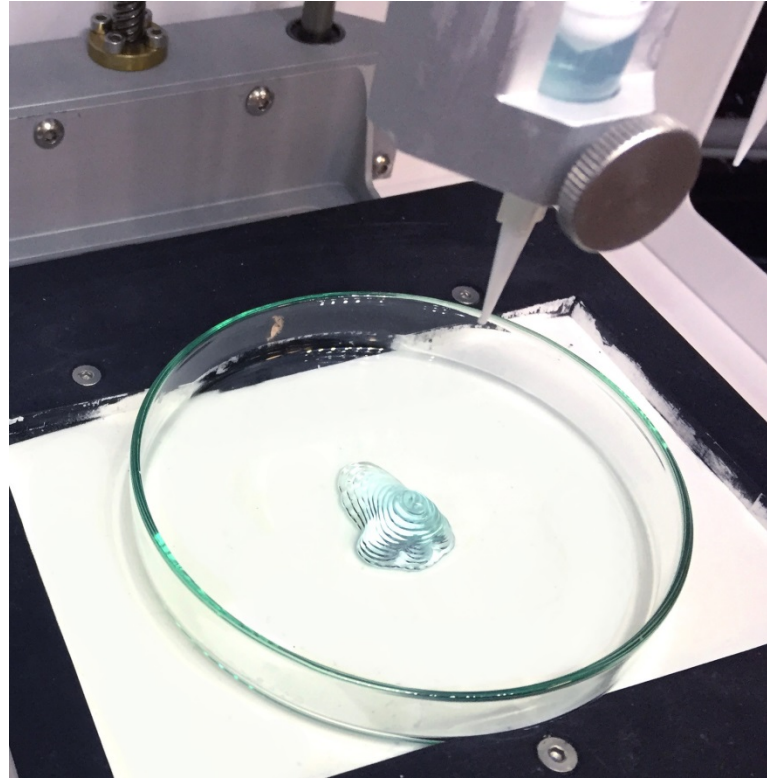
Bioprinters



Prof. Steven S. Saliterman

Prof. Angela Panoskaltis-Mortari's BME 5920, Special Topics in 3D Bioprinting

Making a Nose...



Advantages of Bioprinting...

- Anatomically correct constructs from medical imaging data.
- Porous structures.
- Co-culturing of multiple cell types.
- Precise patterning of cells and ECM.
- Controlled deliver of growth factor and genes.
- Potential for high-throughput fabrication.
- Suitable vascularization - eventually! *Remember the need for a vascular network in relationship to the diffusion length of oxygen.*

Summary

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