

Gladys Marcus Library



Welcome!

3D PRINTING WITH THE FABLAB

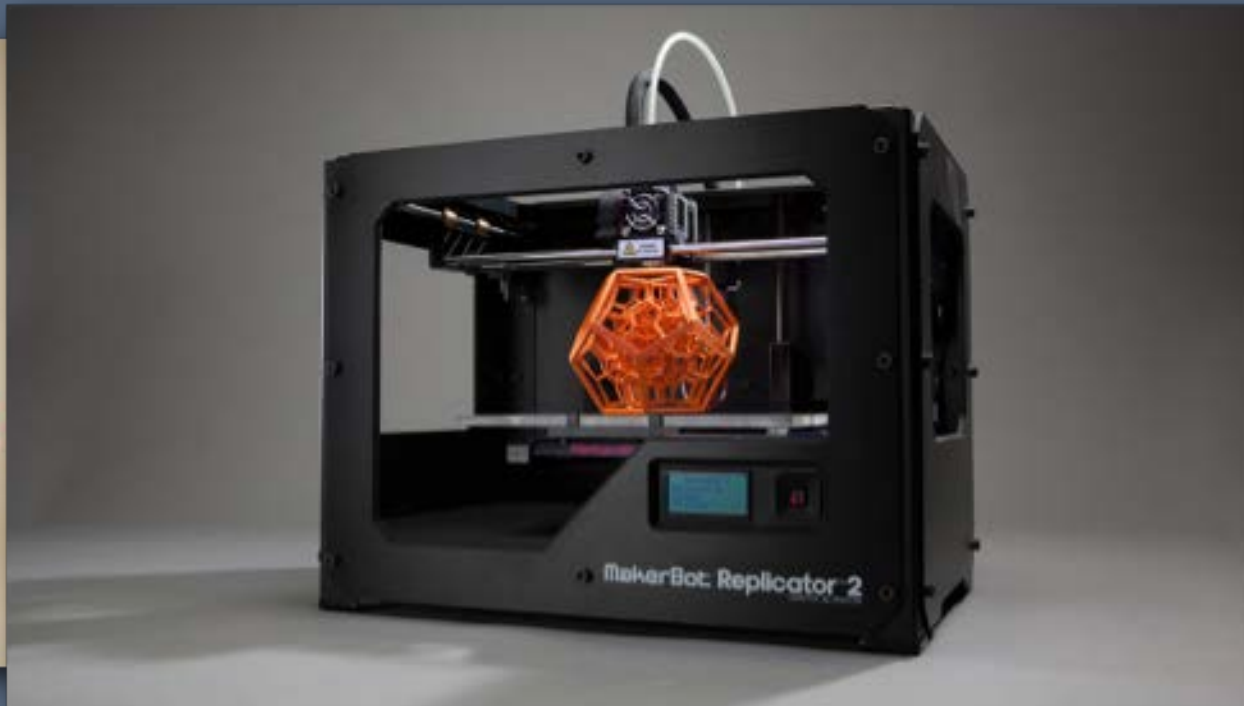
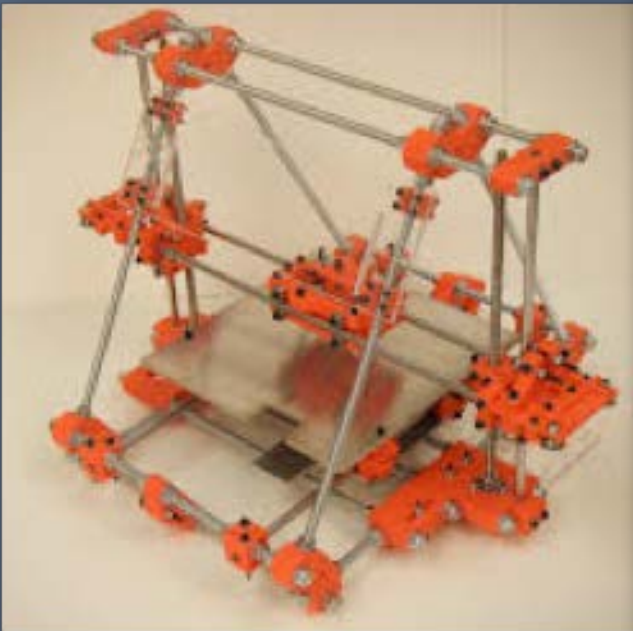
Workshop for FIT Students

JANA DUDA
JASPER LIN
MO SHAHADAT

TOPICS WE WILL BE COVERING TODAY

- THE FIT FABLAB'S 3D PRINTING SERVICES
- 3D PRINTING POLICIES AND PROCEDURES AT THE FABLAB
 - COMMON 3D MODELING PITFALLS

What is 3D Printing?



What is 3D Printing?

Some of the different types of rapid prototyping processes:

- FDM (Fused Deposition Modeling)
- SLS (Selective Laser Sintering)
- Powder/Binder-based Printing
- SLA (Stereolithography)



Fused Deposition Modeling

FIT FABLAB – 3D Printing at the FabLab

- Full-service 3D Printing
- ONE WEEK turnaround time for all jobs (NO RUSH SERVICE)
- PRICE: \$7 per Cubic Inch
- Special considerations for projects and exhibitions



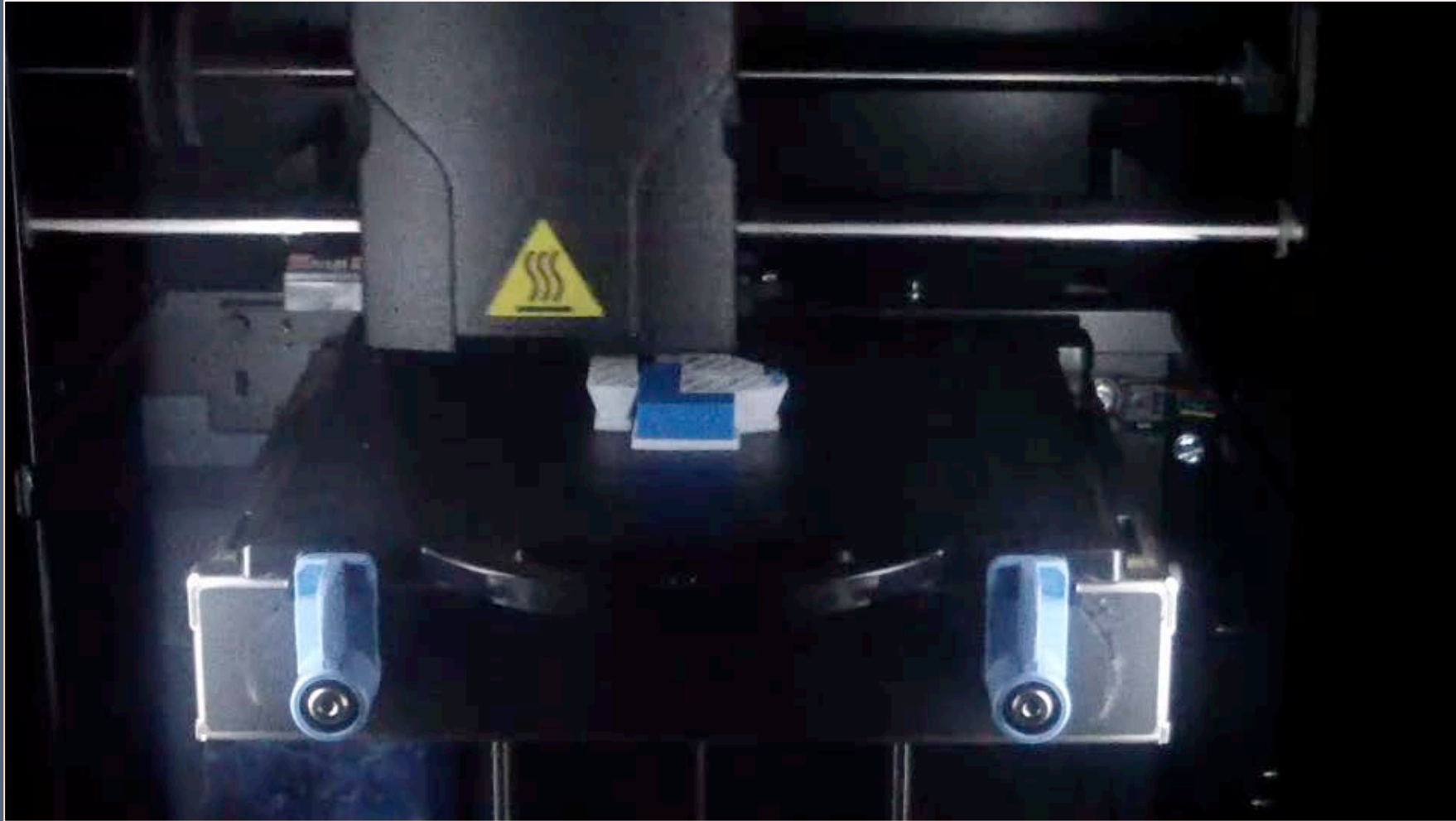
FIT FABLAB – Our 3D Printer

Stratasys uPrint SE Plus

- Offers reliable FDM printing
- 8" x 8" x 6" Bed Size
- .254mm/.010" Layer Thickness
- Build Material: ABS Plastic
- Colors (monochromatic): White, Black, Blue, Red
- Generates its own soluble support material



FIT FABLAB – Our 3D Printer



FIT FABLAB – Policies and Procedures

- One week turnaround time is dependent on a properly filled out order form and an error-free file
- Order forms missing required information will be put on HOLD while we try to contact you
- Delays on orders that have been placed on HOLD will effect overall turnaround time

3-D PRINTING ORDER FORM

fablab

ORDER FORM

3 EASY STEPS

1. Enter Personal Info
2. Enter Job Info
3. Signature

Job Number: _____ Date Received: ____/____/____ Time Received: _____ Received by: _____ Worked by: _____ Qc'd by: _____

RUSH JOBS ☐ **GRAND TOTAL: \$** _____

LAST: Lin **FIRST:** Jasper **PHONE:** 212-217-5470

MAJOR: PrintFX / FabLab **INSTRUCTOR'S LAST NAME:** _____

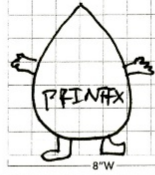

☒ **CALL FOR APPROVAL IF OVER \$30**

Please note that only properly exported STL files will be processed.

2

WHERE ARE YOUR FILES: ☒ GFI100 SERVER ☐ CD/DVD ☐ USB ☐ OTHER _____

WHAT IS YOUR FOLDER NAME: Lin - 3d Files - Feb-15

File Name	Print Dimensions (8"x8"x6" Max)	Copies	File Name	Print Dimensions (8"x8"x6" Max)	Copies	File Name	Print Dimensions (8"x8"x6" Max)	Copies	File Name	Print Dimensions (8"x8"x6" Max)	Copies				
1. <u>ptx - model.stl</u>	6" x 6.5" x 3"	1	2. <u>Deer Head - 3in.stl</u>	3" x 1.5" x 2.25"	1	3. _____	_____	_____	4. _____	_____	_____				
Draw the shape of files: 				Draw the shape of files: 				Draw the shape of files: _____				Draw the shape of files: _____			
\$7.00 Per Cubic Inch		Cost		\$7.00 Per Cubic Inch		Cost		\$7.00 Per Cubic Inch		Cost		\$7.00 Per Cubic Inch		Cost	

3

I agree that this form is filled out to the best of my knowledge, and that Fablab accepts my media with no responsibility for any damages or loss incurred. The staff endeavors to deliver the best results possible for your project. Please be aware however, that due to the nature of our equipment and materials, we can not be responsible for wasted materials or inadequate results. The staff reserves the right to refuse any project based upon its suitability, complexity, materials used or any other factors. FIT is not responsible for the policies of the Fablab. Policies and services subject to change without notice. I have read and understand these disclaimers.

Signature: Jr 2

Customer Notified: _____ Problem: _____

Initials: _____ Time: _____ Date: _____

☐ Resolved / Reprint with new instructions ☐ Resolved / Wait for new file ☐ Resolved / New file on GFI/DISK/USB

☐ Cancel Job ☐ Time: _____ ☐ Resolved / Print anyway

Updated August 2014

fablab

A RESOURCE OF FIT LIBRARY



ORDER FORM

3 EASY STEPS

1. Enter Personal Info
2. Enter Job Info
3. Signature

Job Number: _____

Date Received: ____/____/____

Received by: _____ Worked by: _____

RUSH JOBS
ADDITIONAL CHARGE

CHECK ☐

GRAND TOTAL: \$ _____

STAFF ONLY



Contact Info

1

LAST: Lin FIRST: Jasper PHONE: 212-217-5470

MAJOR: PrintFX / FabLab INSTRUCTOR'S LAST NAME: _____

☒ CALL FOR APPROVAL
IF OVER \$30

Estimate
Notification

Please note that only properly exported STL files will be processed.

2

WHERE ARE YOUR FILES: ☒ GFX100 SERVER ☐ CD/DVD ☐ USB ☐ OTHER _____

WHAT IS YOUR FOLDER NAME: JLin-3dfiles-Feb3-15

File Location

File Name

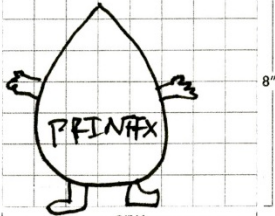

File Name	File Name	File Name	File Name
1. <u>pfx-model.stl</u>	2. <u>DeerHead-3in.stl</u>	3. _____	4. _____

Size of Part

Print Dimensions (8"x8"x6" Max)	Copies	Print Dimensions (8"x8"x6" Max)	Copies	Print Dimensions (8"x8"x6" Max)	Copies	Print Dimensions (8"x8"x6" Max)	Copies
<u>6" x 6.5" x 3"</u>	<u>1</u>	<u>3" x 1.5" x 2.25"</u>	<u>1</u>	_____	_____	_____	_____
Width (X) Length (Y) Height (Z)		Width (X) Length (Y) Height (Z)					

Quantity

Sketch of Part

Draw the shape of files:	Top View	Draw the shape of files:	Top View	Draw the shape of files:	Top View	Draw the shape of files:	Top View
	8"L 8"W		8"L 8"W		8"L 8"W		8"L 8"W

\$7.00 Per Cubic Inch	Cost	\$7.00 Per Cubic Inch	Cost	\$7.00 Per Cubic Inch	Cost	\$7.00 Per Cubic Inch	Cost

3

I agree that this form is filled out to the best of my knowledge, and that Fablab accepts my media with no responsibility for any damages or loss incurred. The staff endeavors to deliver the best results possible for your project. Please be aware however, that due to the nature of our equipment and materials, we can not be responsible for wasted materials or inadequate results. The staff reserves the right to refuse any project based upon its suitability, complexity, materials used or any other factor(s). FIT is not responsible for the policies of the Fablab. Policies and services subject to change without notice. I have read and understand these disclaimers.

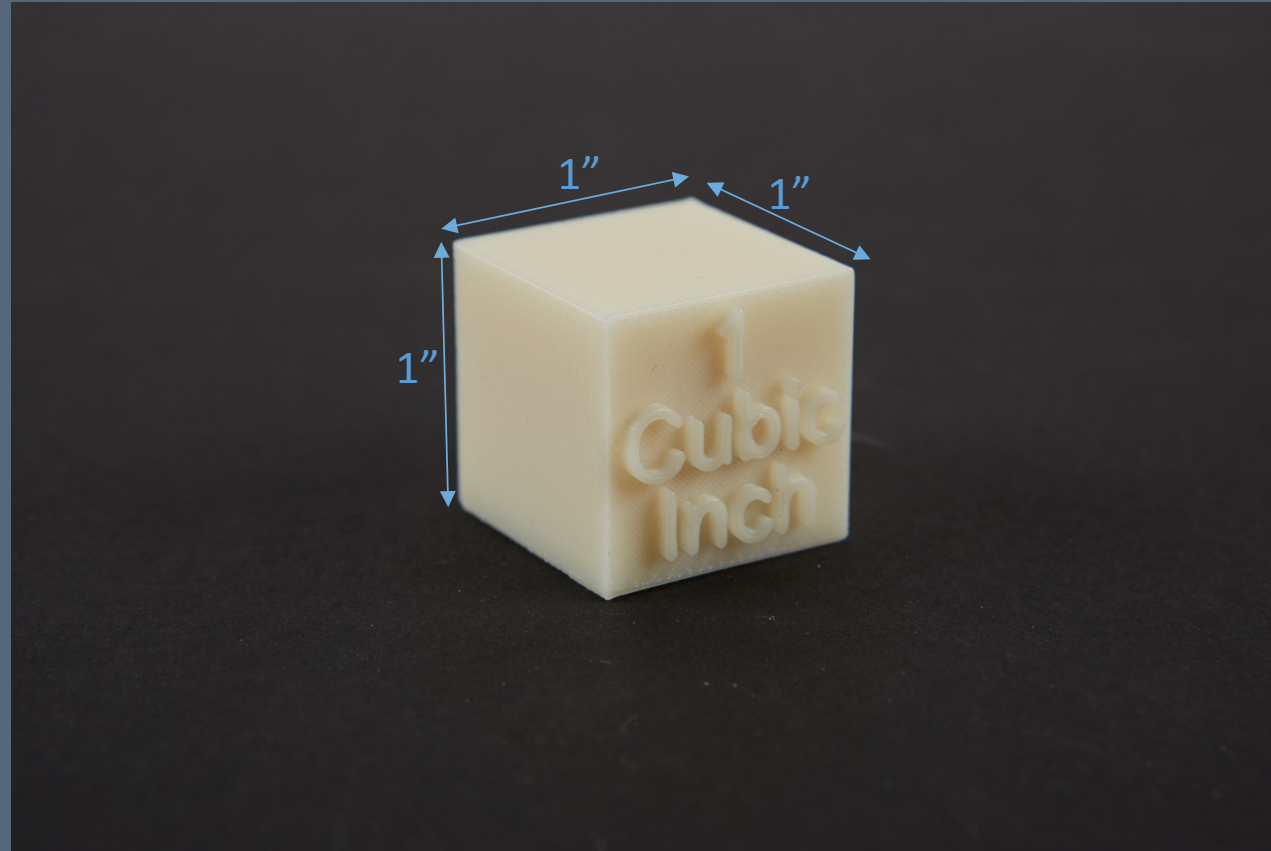
Signature Jr 2

Customer Notified _____ Problem _____
Initials Time Date

☐ Resolved / Reprint with new instructions ☐ Resolved / Wait for new file ☐ Resolved / New file on GFX/DISK/USB
☐ Cancel Job Time: _____ ☐ Resolved / Print anyway

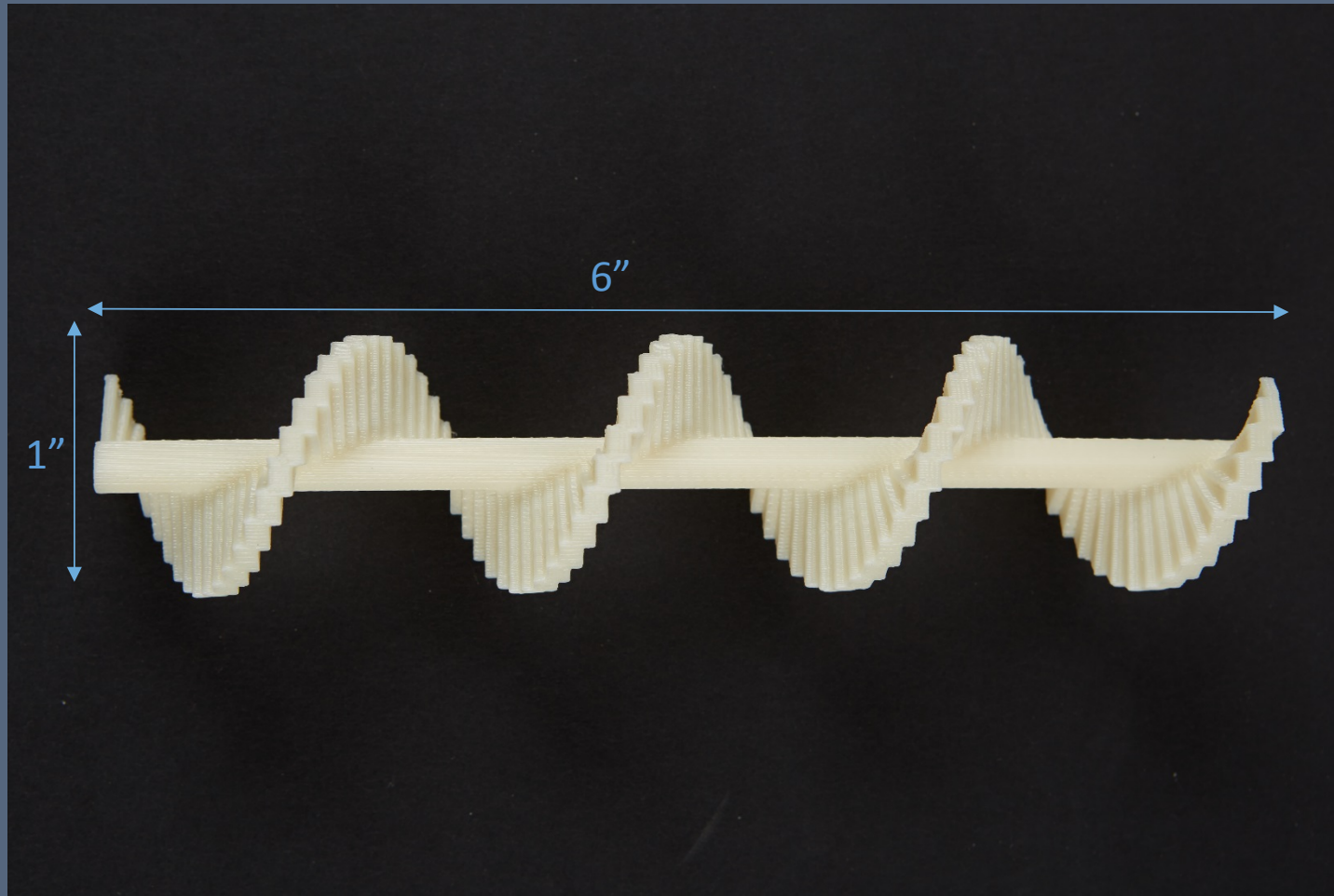
FIT FABLAB – Cost of a 3D Print

- \$7 PER CUBIC INCH OF MODEL AND SUPPORT MATERIAL



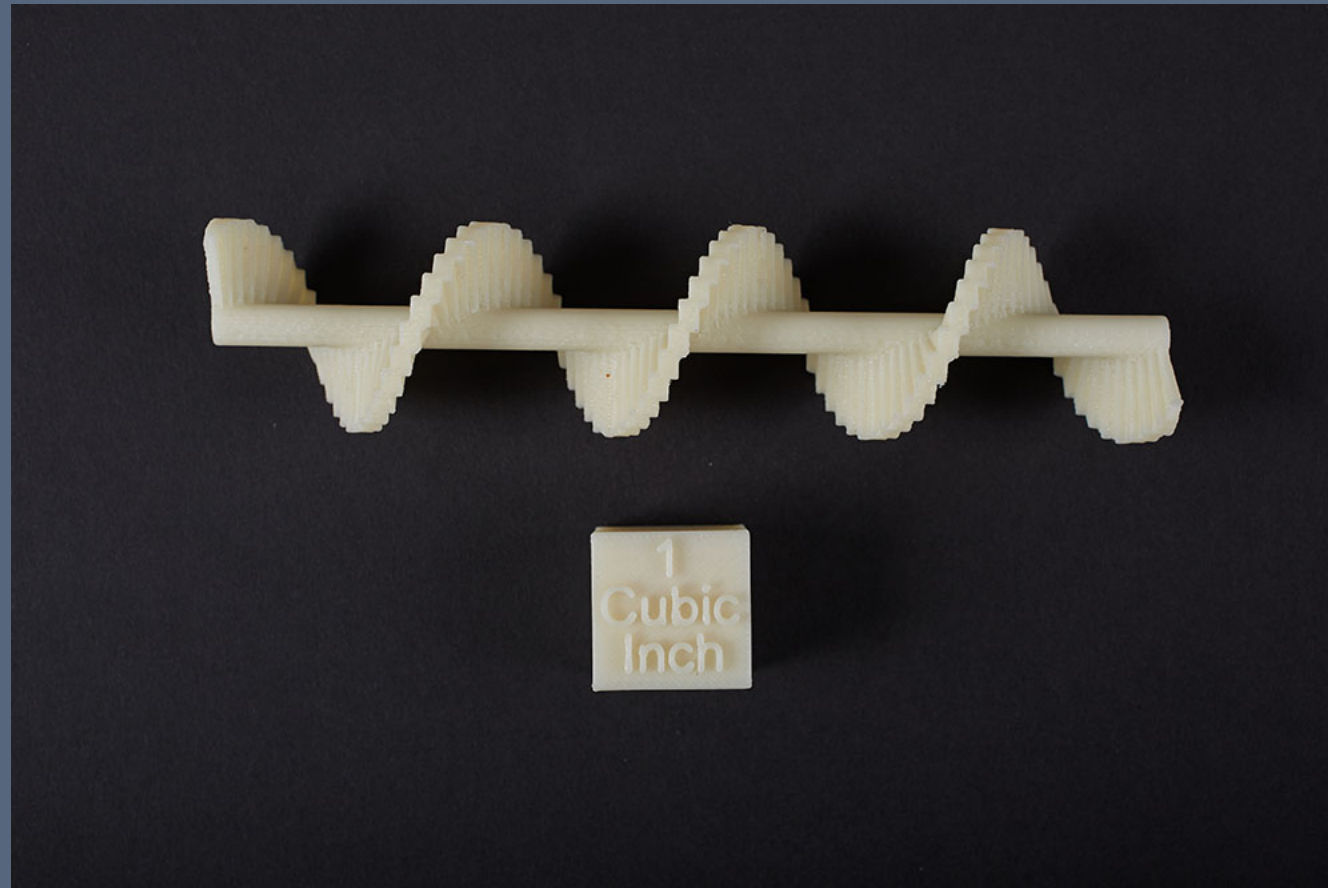
FIT FABLAB – Cost of a 3D Print

- \$7 PER CUBIC INCH OF MODEL AND SUPPORT MATERIAL



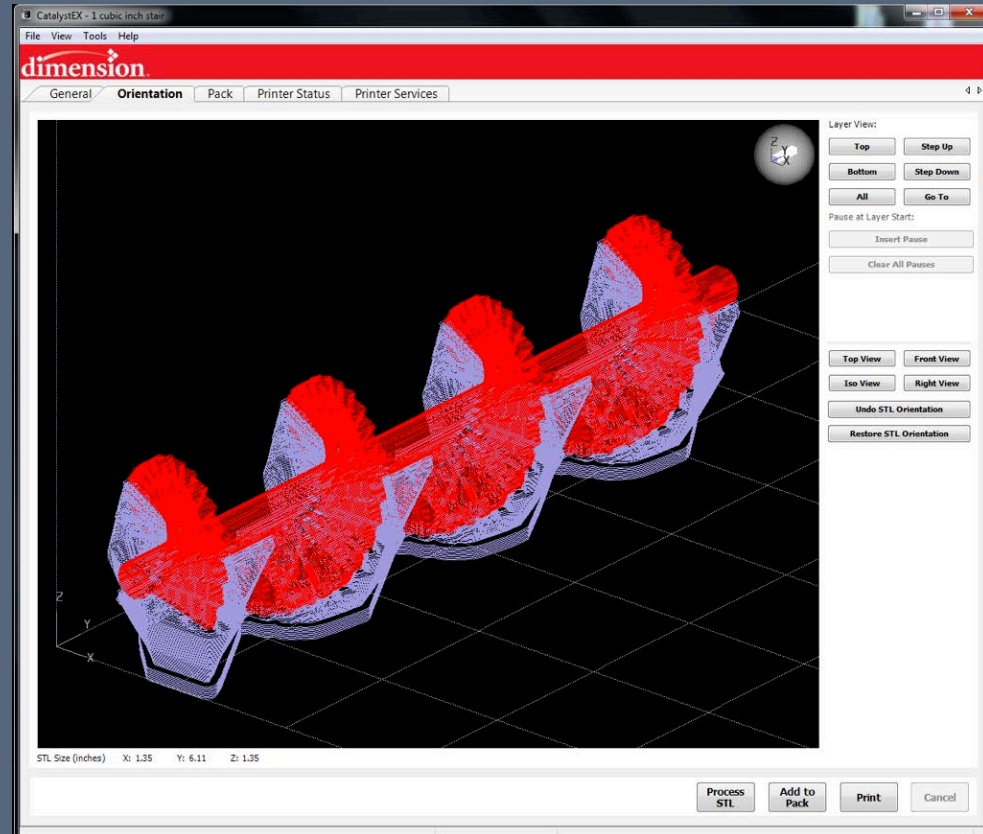
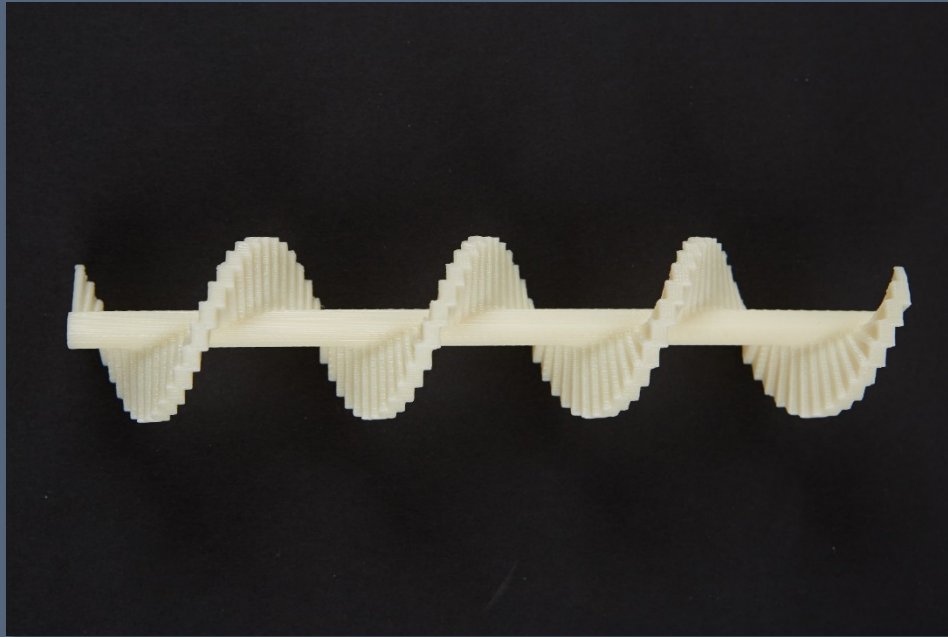
FIT FABLAB – Cost of a 3D Print

- \$7 PER CUBIC INCH OF MODEL AND SUPPORT MATERIAL

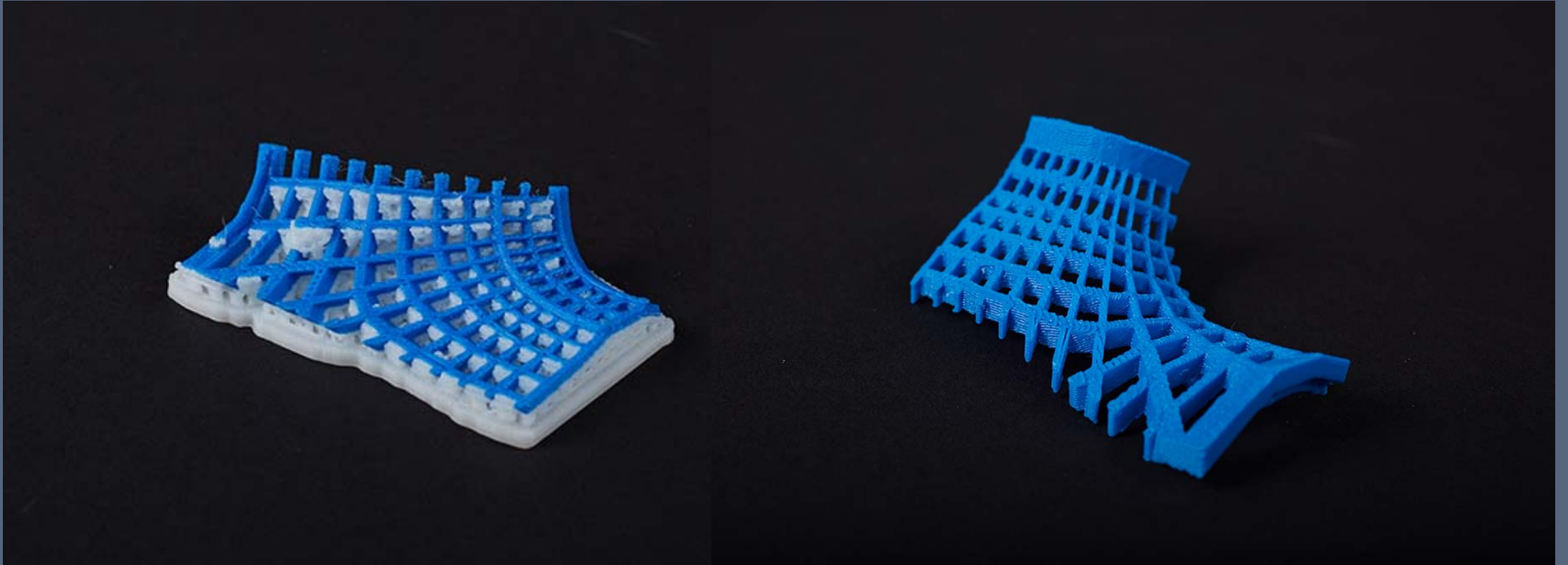


FIT FABLAB – Cost of a 3D Print

- \$7 PER CUBIC INCH OF MODEL AND SUPPORT MATERIAL

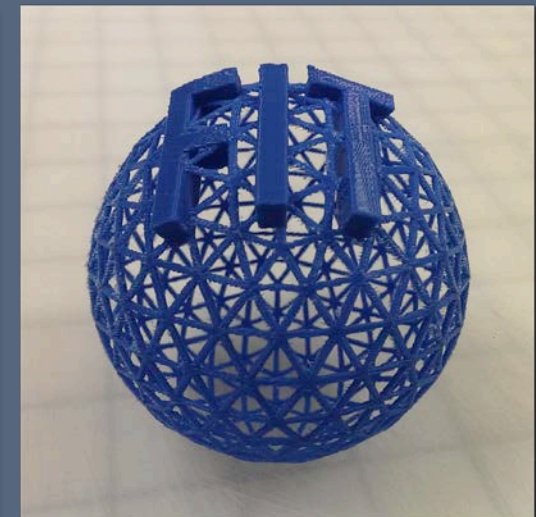
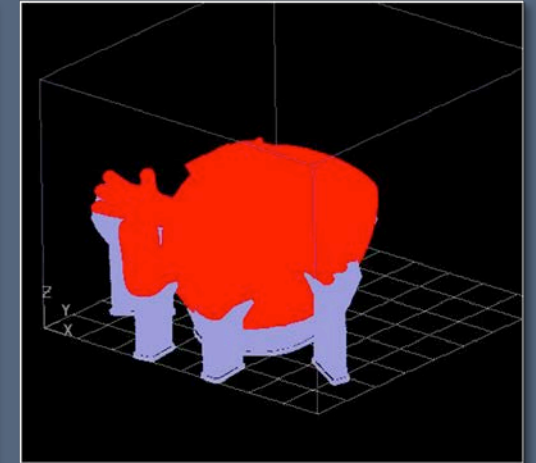
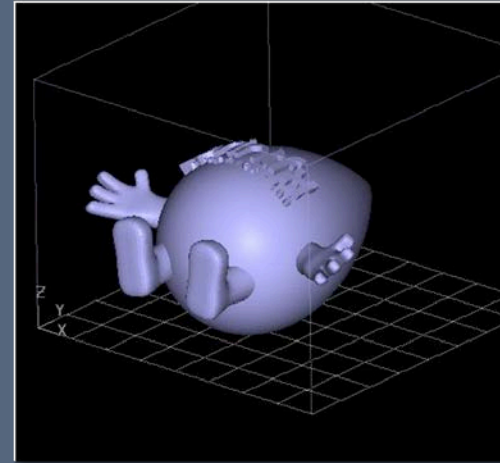


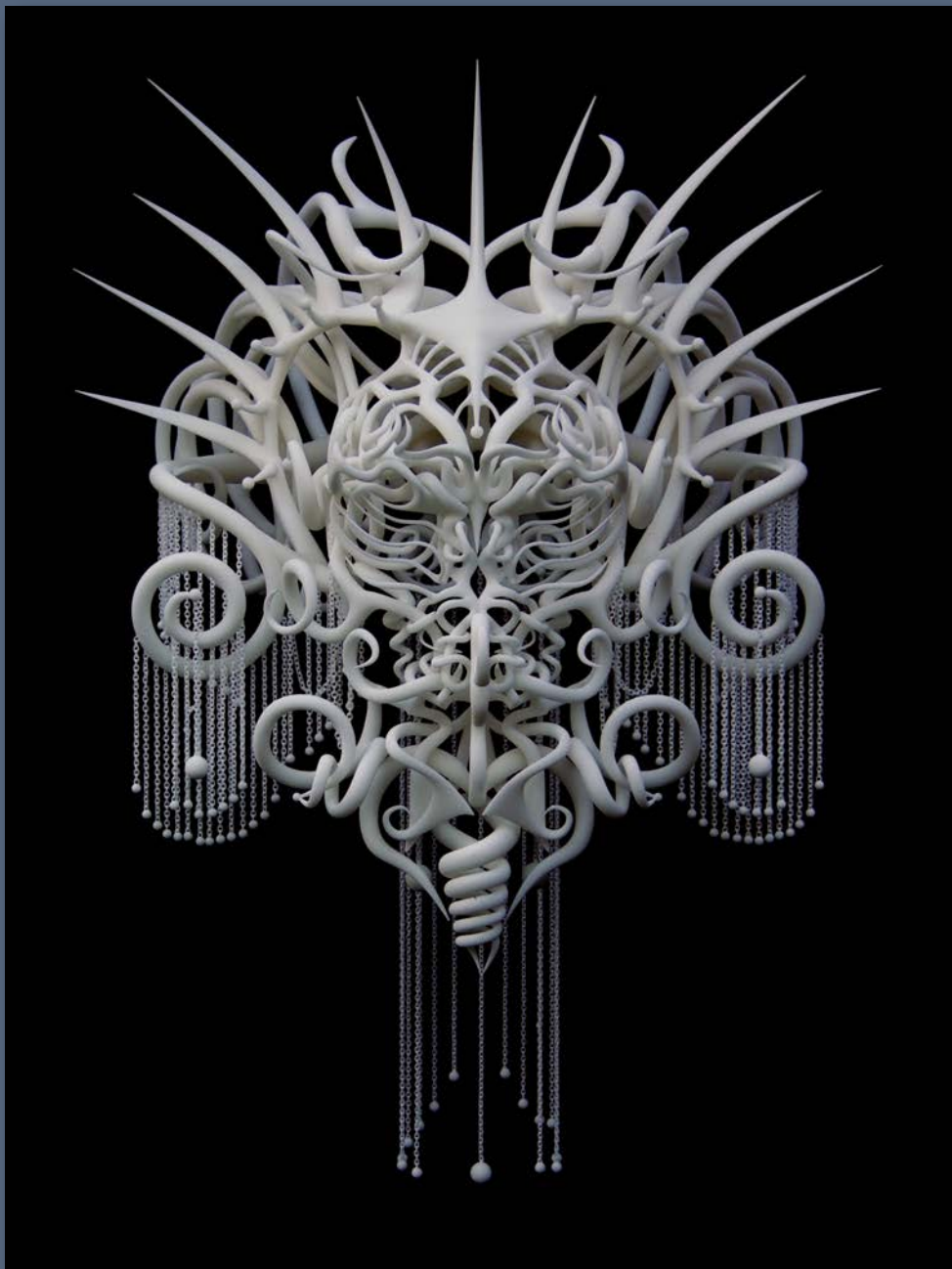
FIT FABLAB – Automatic Support Generation



FIT FABLAB – Automatic Support Generation

- The uPrint's automatic support generation allows for stable 3D printing of models with complex geometric designs, such as:
 - Overhangs
 - Intricate holes and cutouts
 - Interlocking and/or moving parts

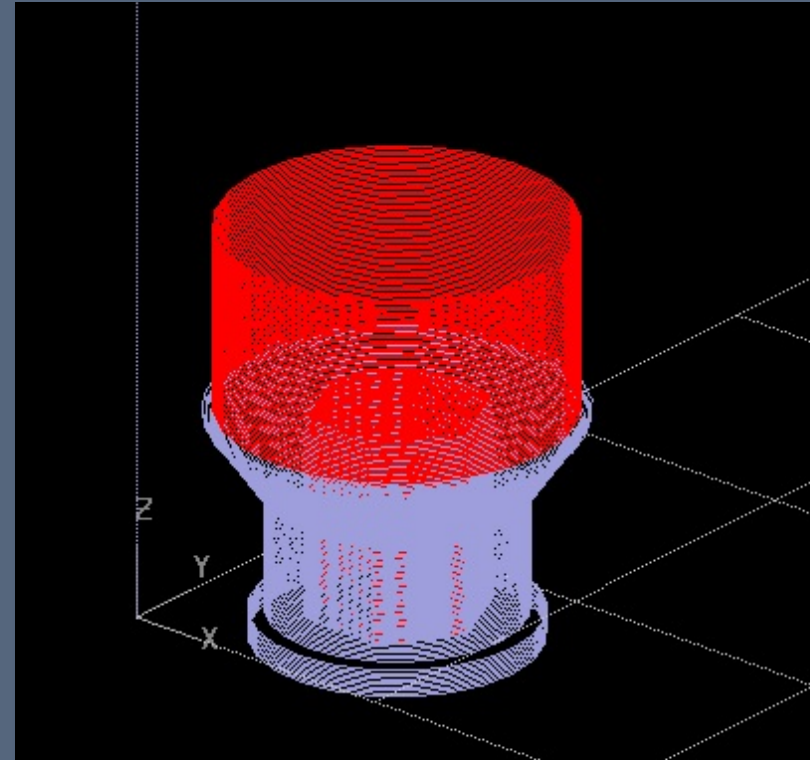
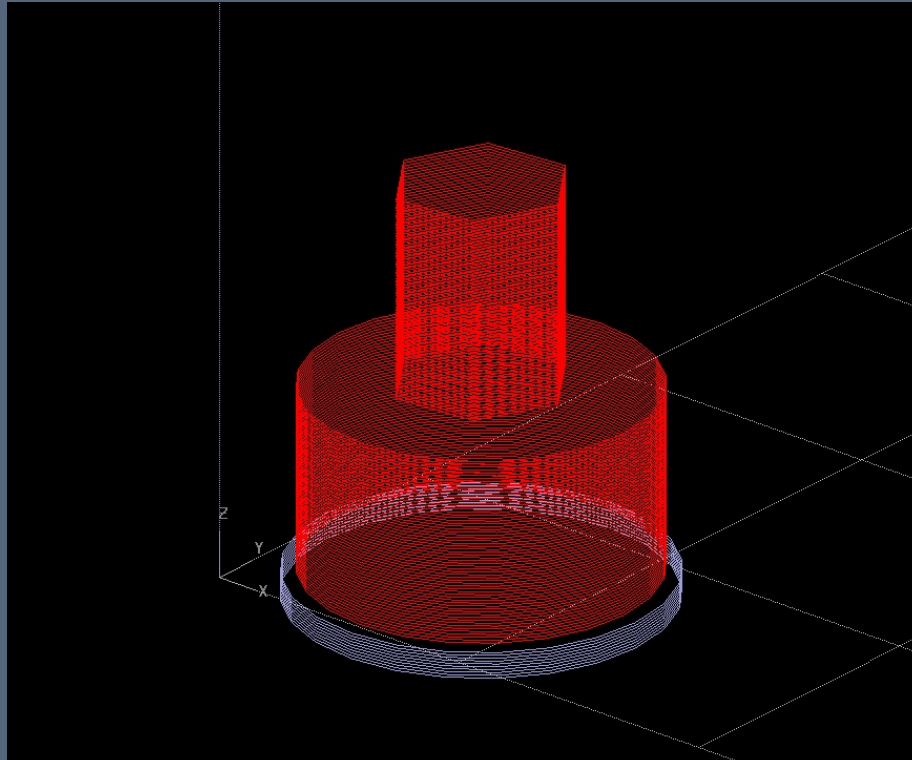






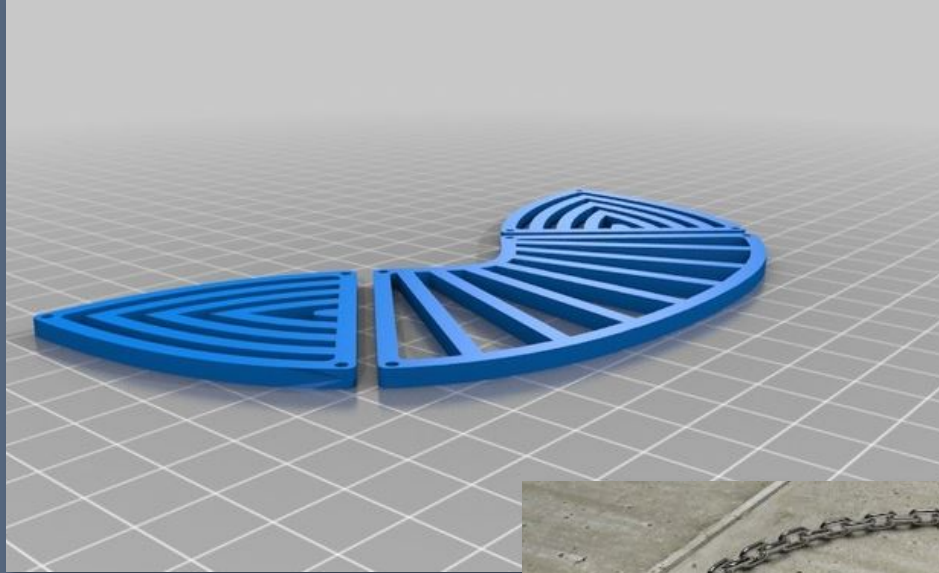


FIT FABLAB – Automatic Support Generation



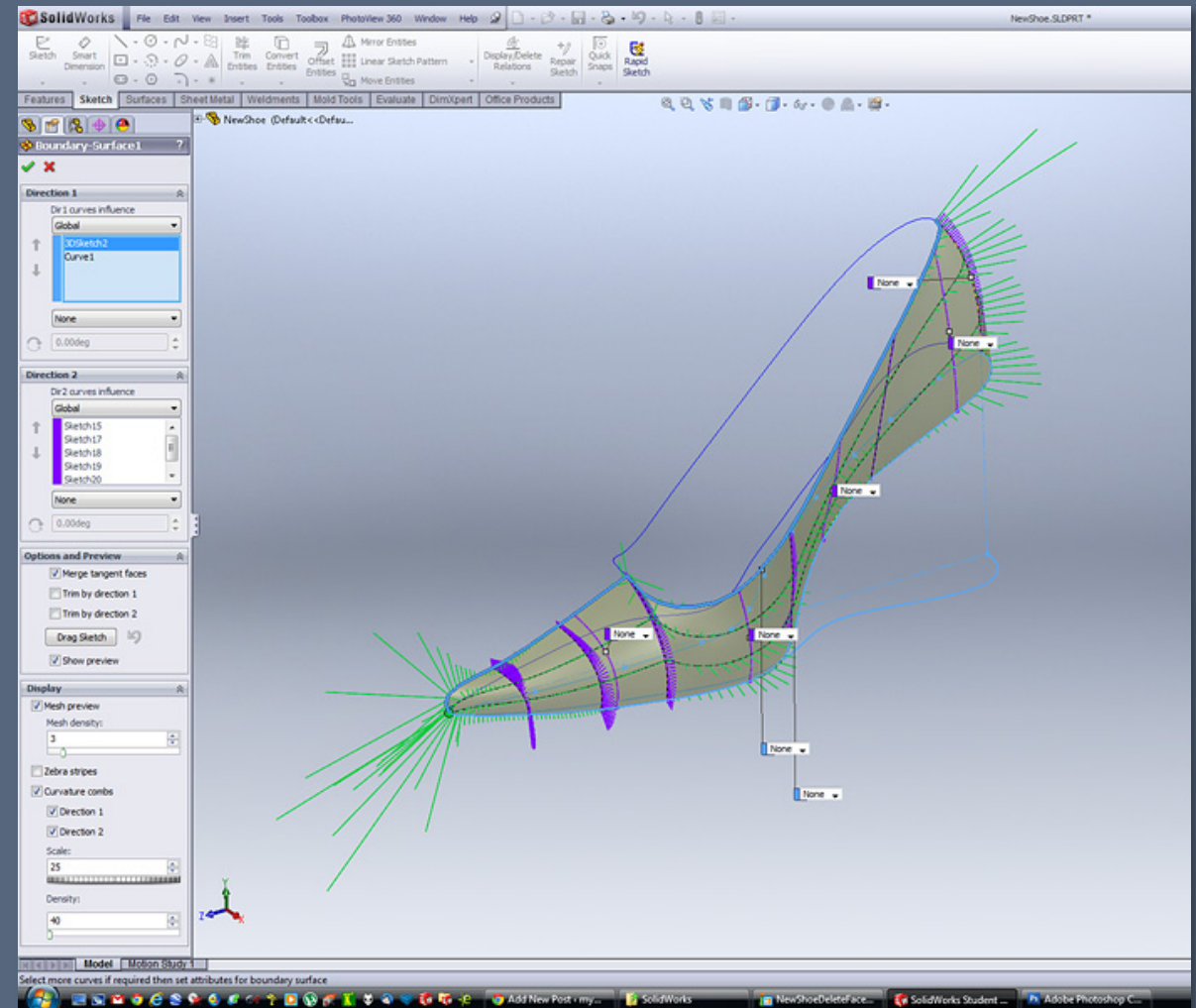
FIT FABLAB – Getting Started with 3D Printing

- Types of design software
- 3D classes at FIT
- Online 3D repositories
- Web-based apps
- Acceptable file formats

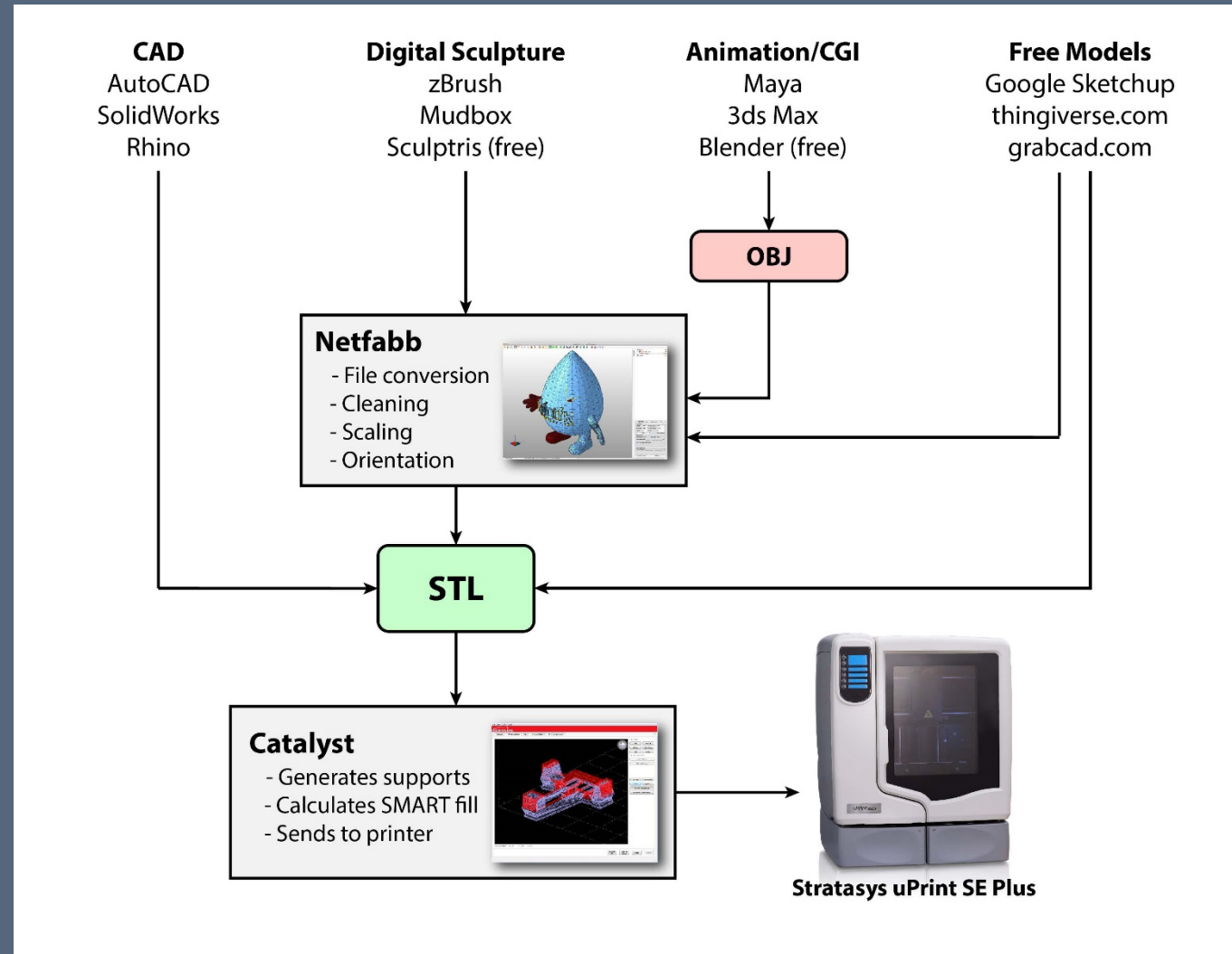


FIT FABLAB – Differences in 3D Software

- History Based Software
- Non-History Based Software
- Digital Sculpting Software
- Parametric Software
- Non-Parametric Software
- NURBS Modeling
- Polygon Modeling



FIT FABLAB – Suggested 3D Software Workflow



CAD
AutoCAD
SolidWorks
Rhino

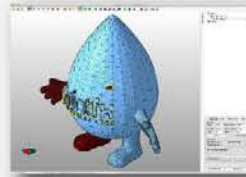
Digital Sculpture
zBrush
Mudbox
Sculptris (free)

Animation/CGI
Maya
3ds Max
Blender (free)

Free Models
Google Sketchup
thingiverse.com
grabcad.com

Netfabb

- File conversion
- Cleaning
- Scaling
- Orientation

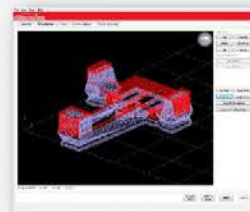


OBJ

STL

Catalyst

- Generates supports
- Calculates SMART fill
- Sends to printer



Stratasys uPrint SE Plus

FIT FABLAB – Software in PrintFX/Library Labs

- Solidworks
- Google SketchUp
- Adobe CC Suite
- Autodesk AutoCAD
- Autodesk 3ds Max
- Netfabb Basic (PrintFX only)

FIT FABLAB – 3D/CAD Classes at FIT


- CG 212 - Introduction to 3D Computer Modeling
- JD 138 - Introduction to CAD for Jewelry Design
- CTD 429 - Introduction to Rhino for the CAD Novice
- CTD 371 - SketchUp Pro
- CTD 375 - SketchUp for 3D Printing
- CTD 225 - Photoshop for 3D Printing

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Product Design

Prototyping

Rendering

Structural

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CAD software

Alias

AutoCAD

Inventor

MODO

Revit Architecture

Rhino

SketchUp

SolidWorks

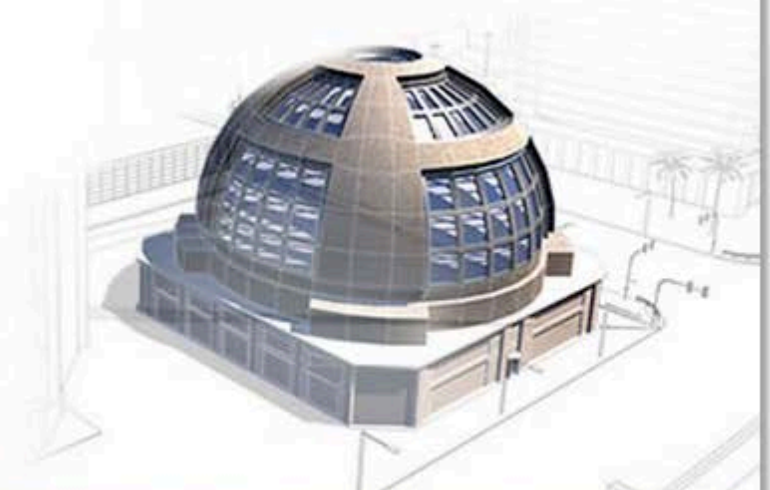
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Skill level

- Beginner (6)
- Intermediate (10)
- Advanced (5)
- Appropriate for all (5)

Software

- Autodesk (5)
- Makerbot (2)
- 123D Catch (1)
- Adobe (1)
- AutoCAD (1)
- Maya (1)
- Meshmixer (1)
- [Show more](#)


Author

- Kacie Hultgren (6)
- Ryan Kittleson (3)
- Gabriel Corbett (1)
- Michael Hathorn (1)


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11 3D Printing courses · 266 video tutorials


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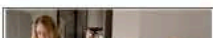
Mike Hathorn: 3D Printing in the Classroom with Michael Hathorn
Find out how teacher Mike Hathorn is helping students transform from tech consumers to tech creators with a curriculum based on 3D modeling and printing.
10m 18s Appropriate for all CC Viewers: 918



3D Printing a Scale Model with AutoCAD with Kacie Hultgren
Transform your 2D architectural drawings into three-dimensional models optimized for 3D printing, with AutoCAD.
1h 17m Intermediate CC Viewers: 738



3D Scanning with a Camera with Kacie Hultgren
Learn to scan a 3D object with your smartphone or camera and the free 123D Catch app from Autodesk.
53m 53s Beginner CC Viewers: 2,846



3D Scanning a Person with Kacie Hultgren

FIT FABLAB – Adobe Software for 3D Printing

The screenshot shows the Lynda.com website interface. At the top, the Lynda.com logo is on the left, and a user profile 'Hi, Jasper' is on the right. Below the header, there are navigation links: 'Browse the library' with a search bar, and 'My courses'. The main content area features a large video player for the course '3D Printing with Photoshop' by Ryan Kittleson. The video player has a title bar with 'In playlist', 'Exercise files', 'Share', 'Take a tour', and 'Use classic layout' buttons. The video thumbnail shows a person holding a 3D printed figure. Below the video player, there is a search bar for the course and a list of course sections: 'Introduction' (4m 20s), 'Welcome' (59s), 'Using the exercise files' (31s), and 'What you should know before watching' (58s). To the right of the video player, there are tabs for 'Course details', 'Transcript', 'FAQs', and 'My notes Beta'. The 'Transcript' tab is active, showing a 'Welcome' message from Ryan Kittleson. The footer contains copyright information '© 1995-2014 lynda.com, Inc.' and a list of links: 'Follow', 'About us', 'Press', 'Careers', 'Products', 'Support', and 'Site feedback'.

lynda.com[®] Hi, Jasper

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3D Printing with Photoshop with Ryan Kittleson

In playlist Exercise files Share Take a tour Use classic layout

3D Printing with Photoshop

with Ryan Kittleson

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Expand all Collapse all

Introduction 4m 20s

Welcome 59s

Using the exercise files 31s

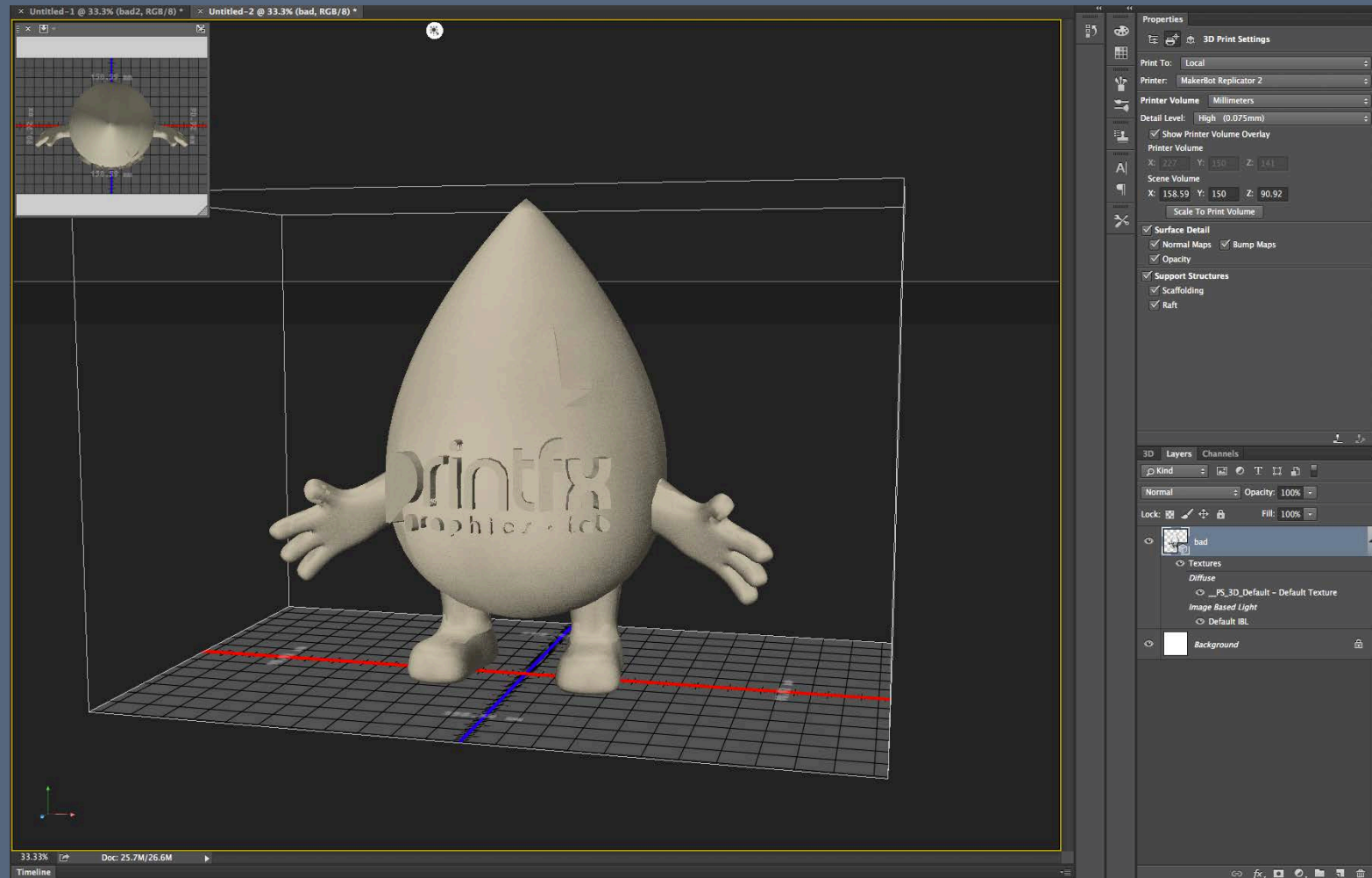
What you should know before watching 58s

Welcome

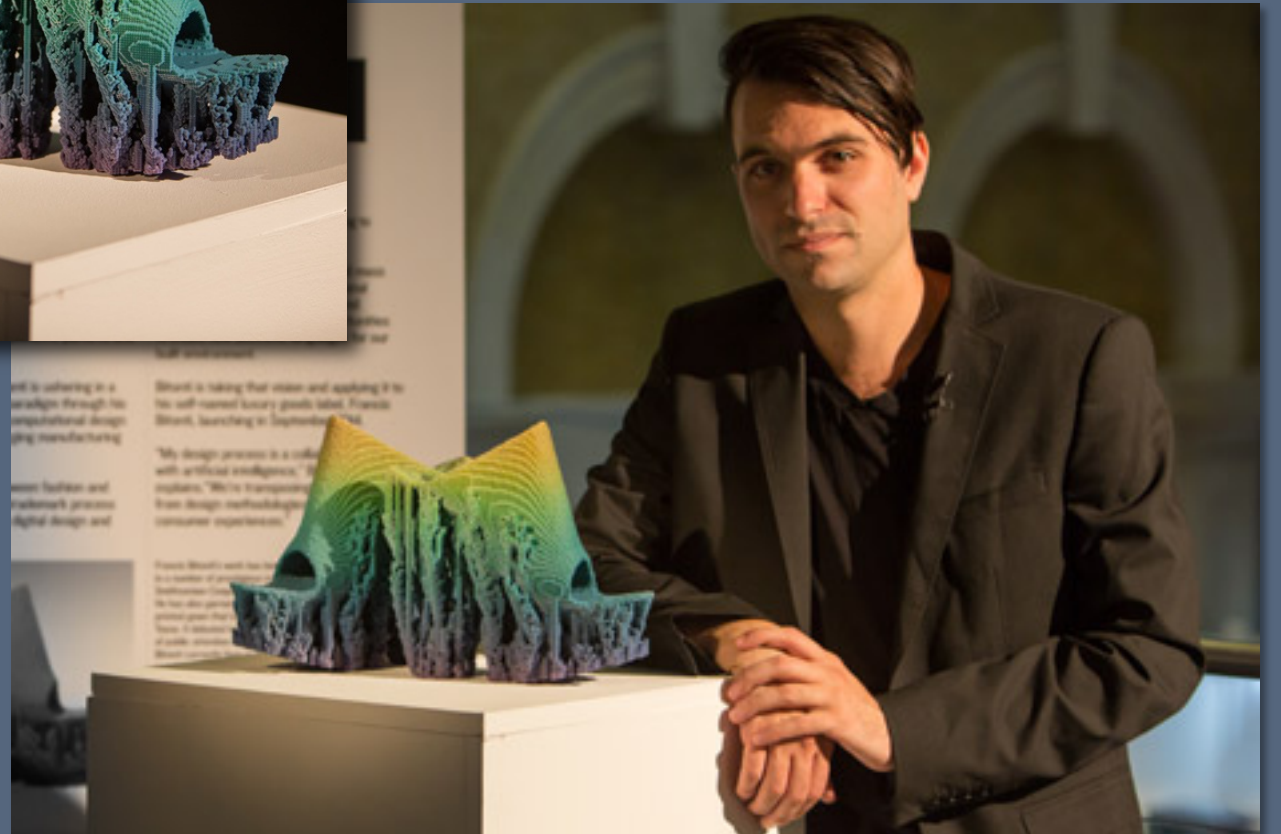
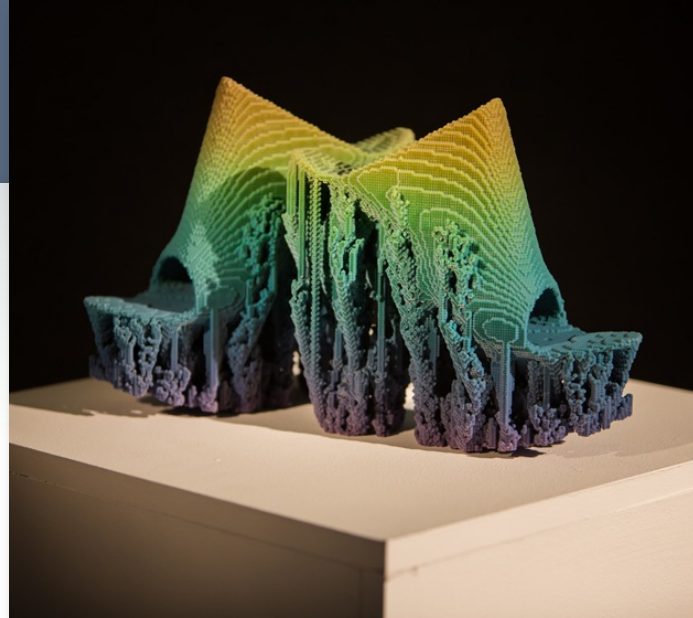
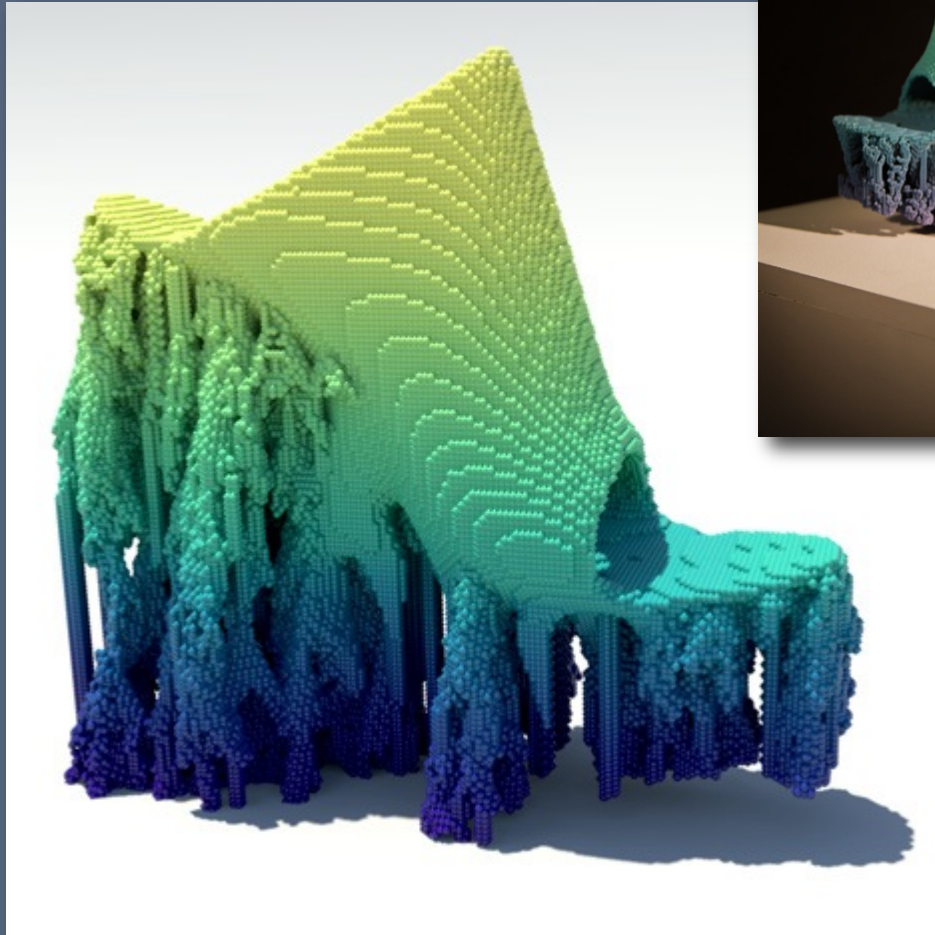
Hi, I'm Ryan Kittleson, and I'd like to welcome you to 3D Printing and Photoshop. In this course, I'll show you how to use Photoshop's 3D tools to create models and then get them printed. It's really great that Adobe has put these features into Photoshop, making 3D printing more accessible to more people. First, I'm going to talk about getting 3D models to work with, either by

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FIT FABLAB – Adobe Software for 3D Printing

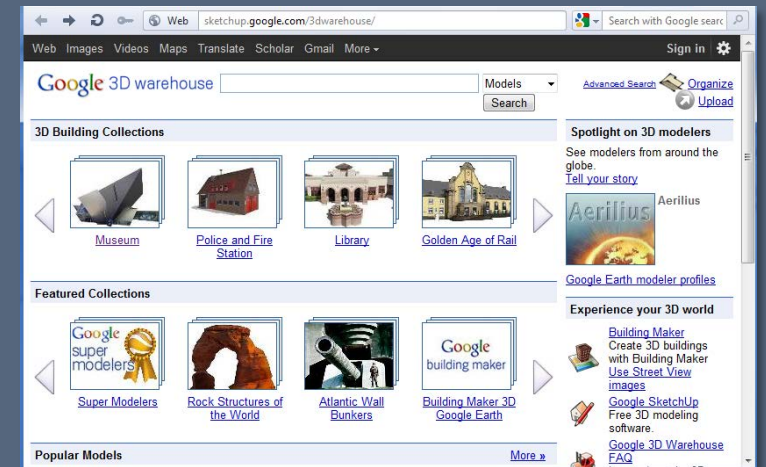
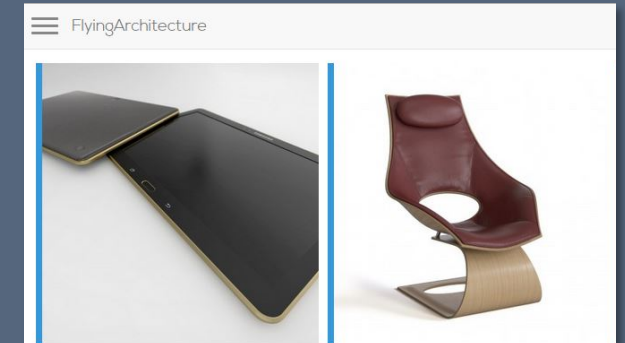


FIT FABLAB – Adobe Software for 3D Printing

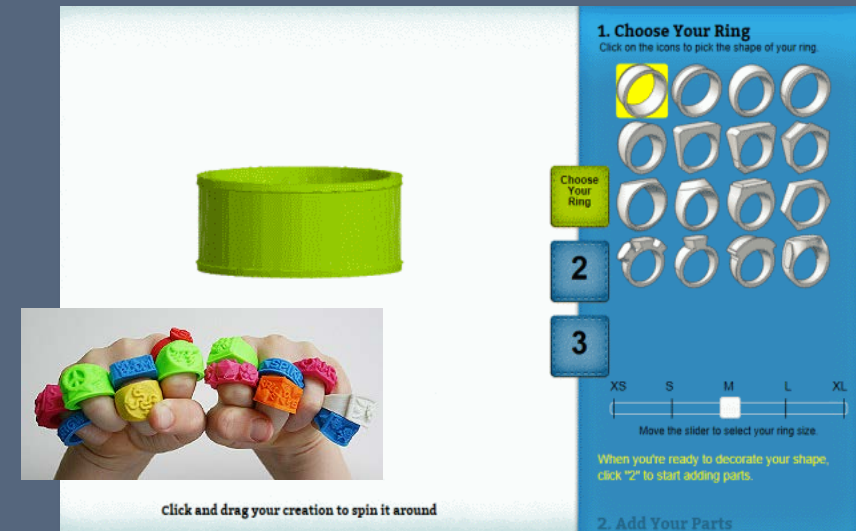
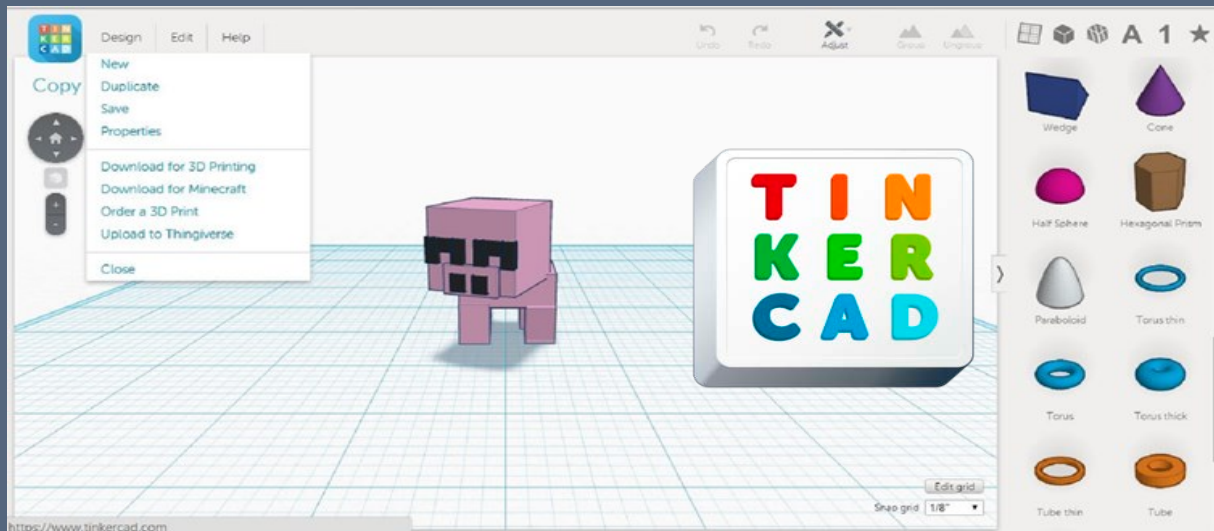
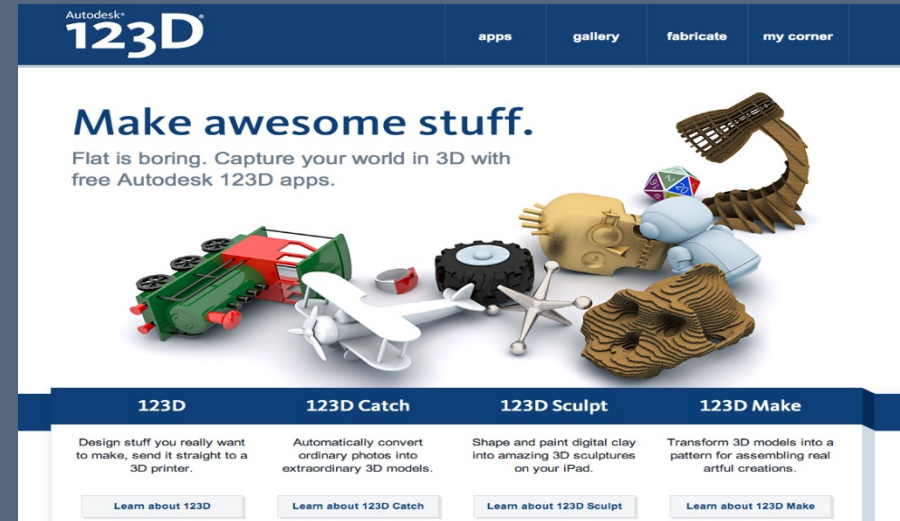


FIT FABLAB – 3D Repositories

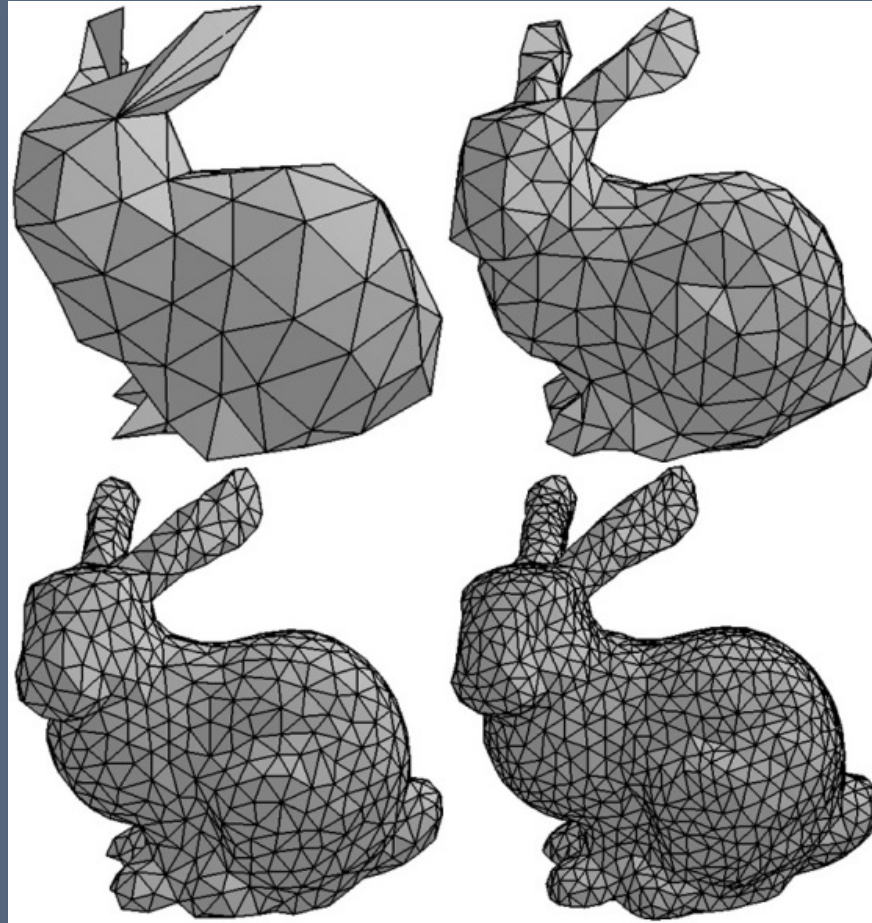
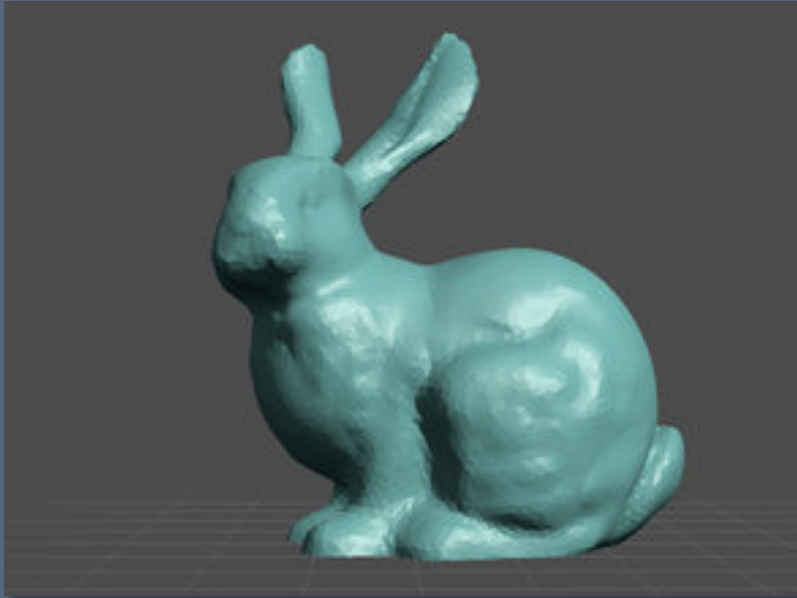
- Google Warehouse
- GrabCAD.com
- FlyingArchitecture.com
- Thingiverse.com



FIT FABLAB – Web-based Apps



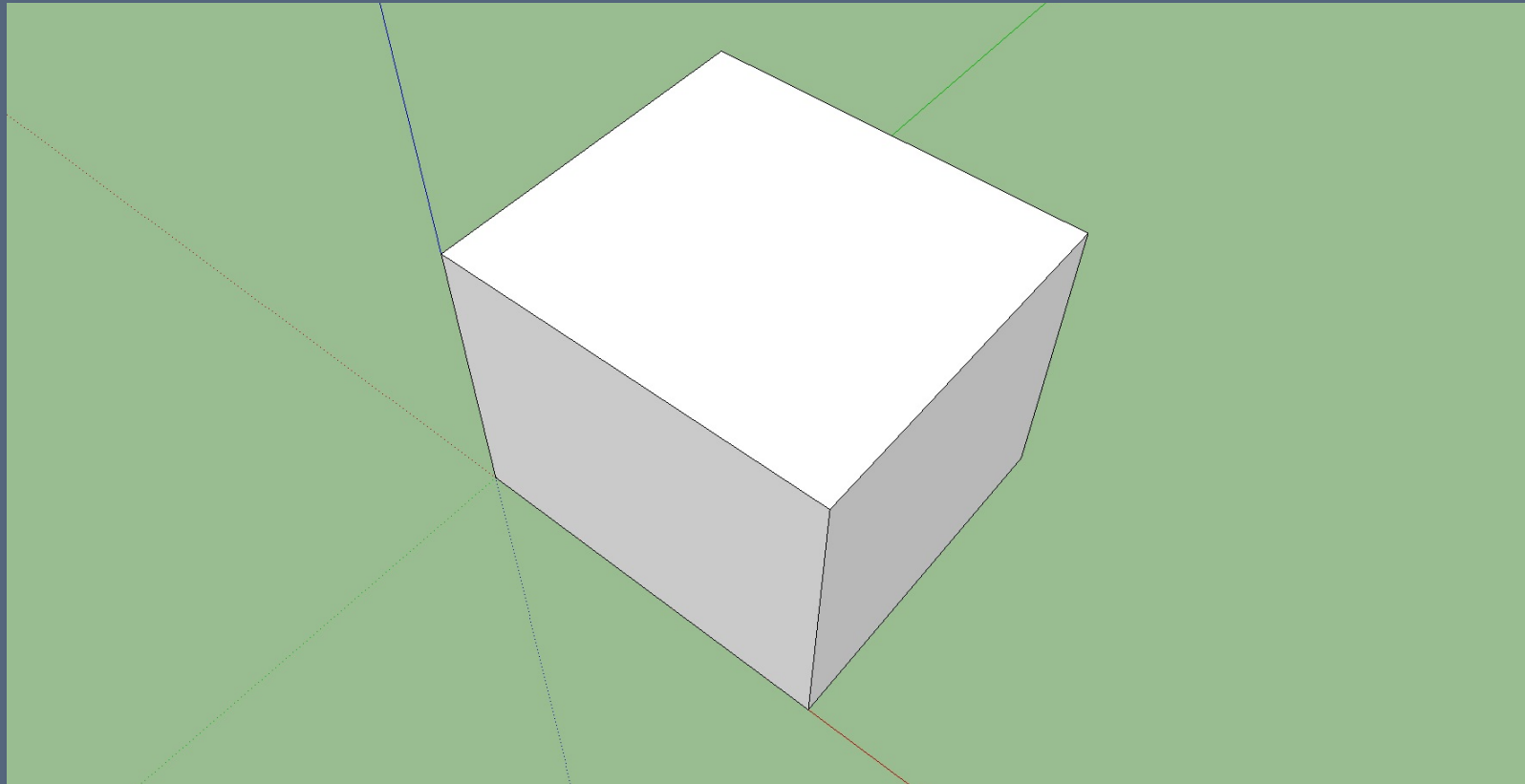
FIT FABLAB – STL File Format



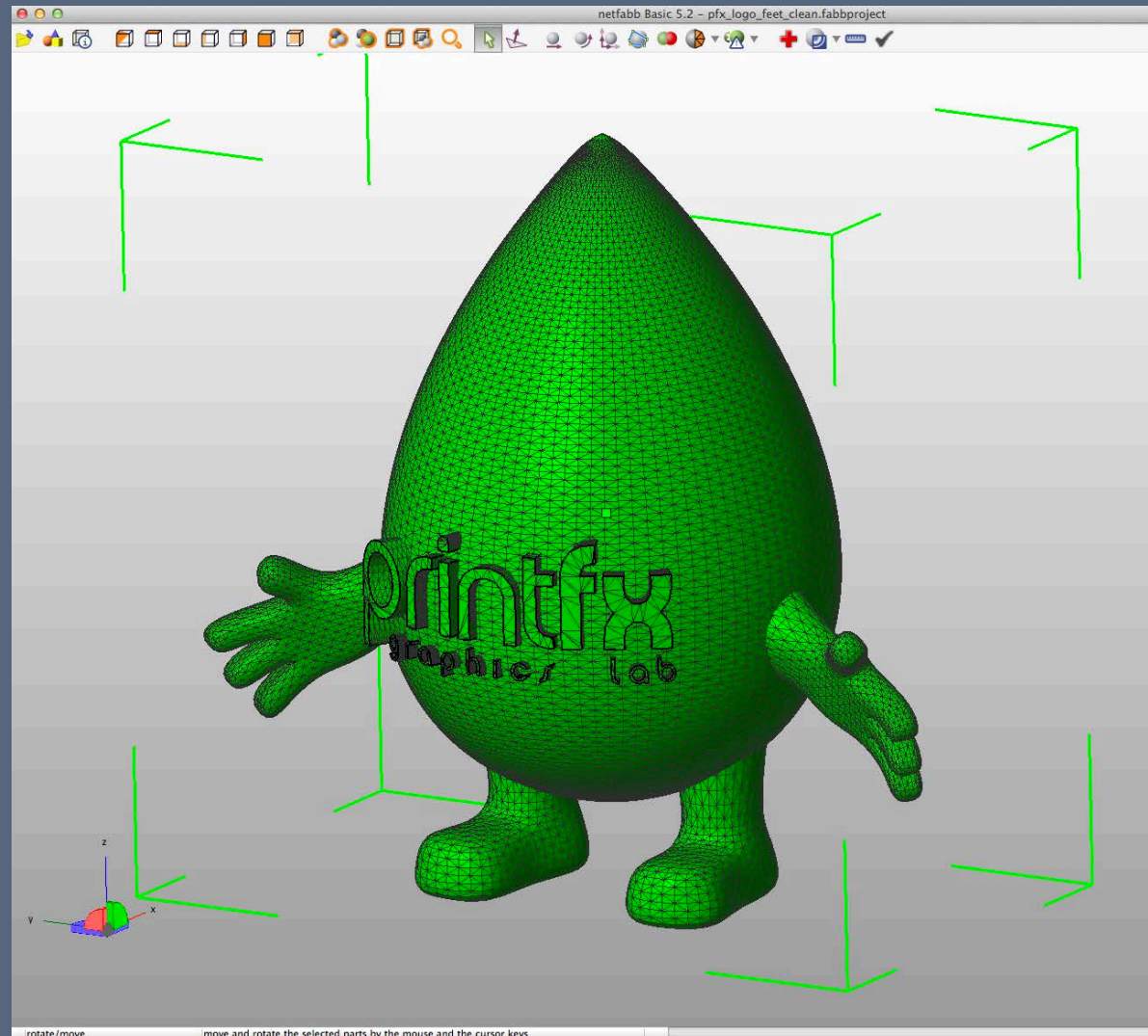
FIT FABLAB – Common 3D Modeling Pitfalls

- Unsealed Edges
- Flipped Normals
- Unnecessary Debris
- Improper Wall Thickness
- Loss of Object Scale

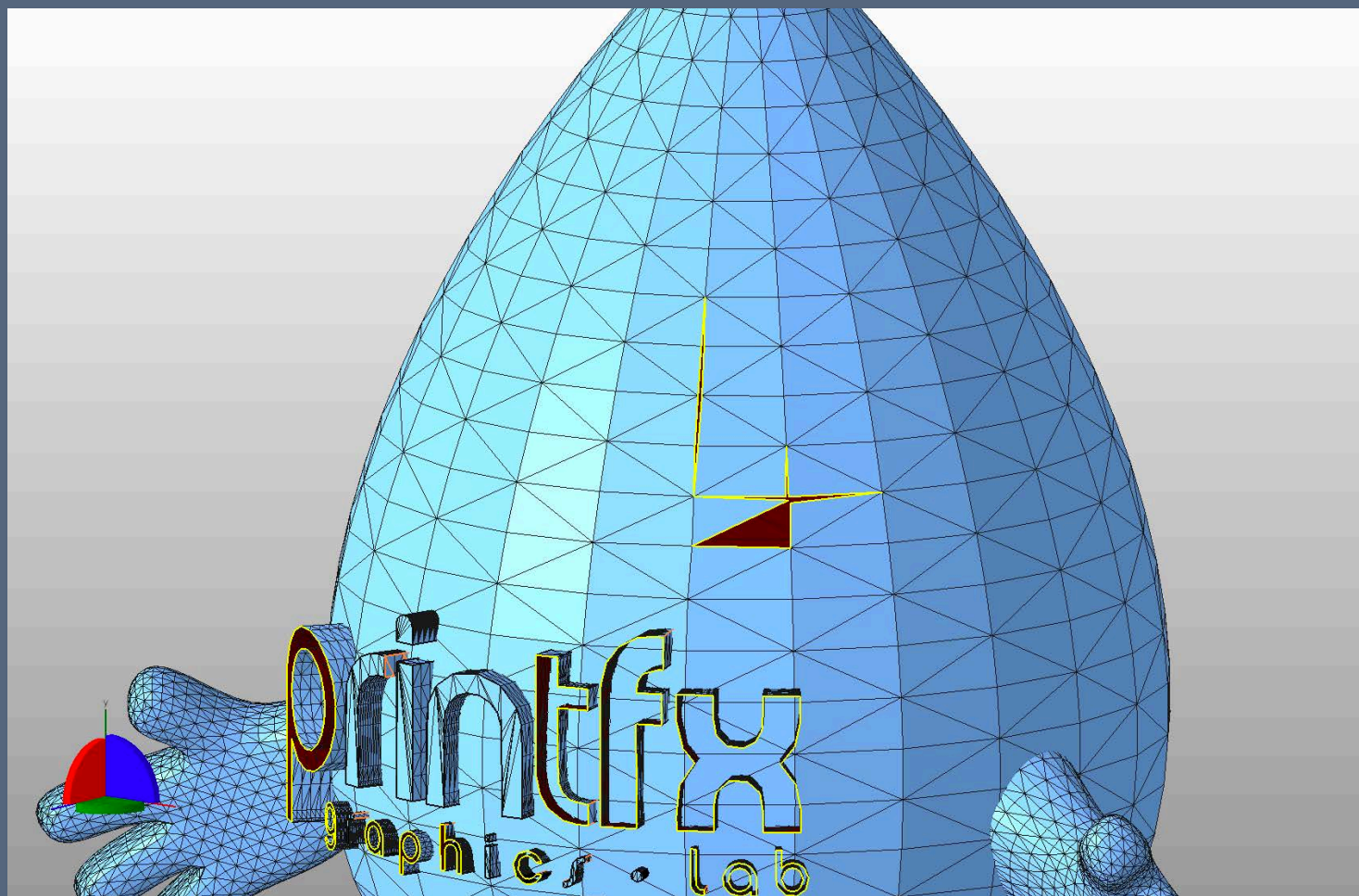
FIT FABLAB – Simple Geometry Model



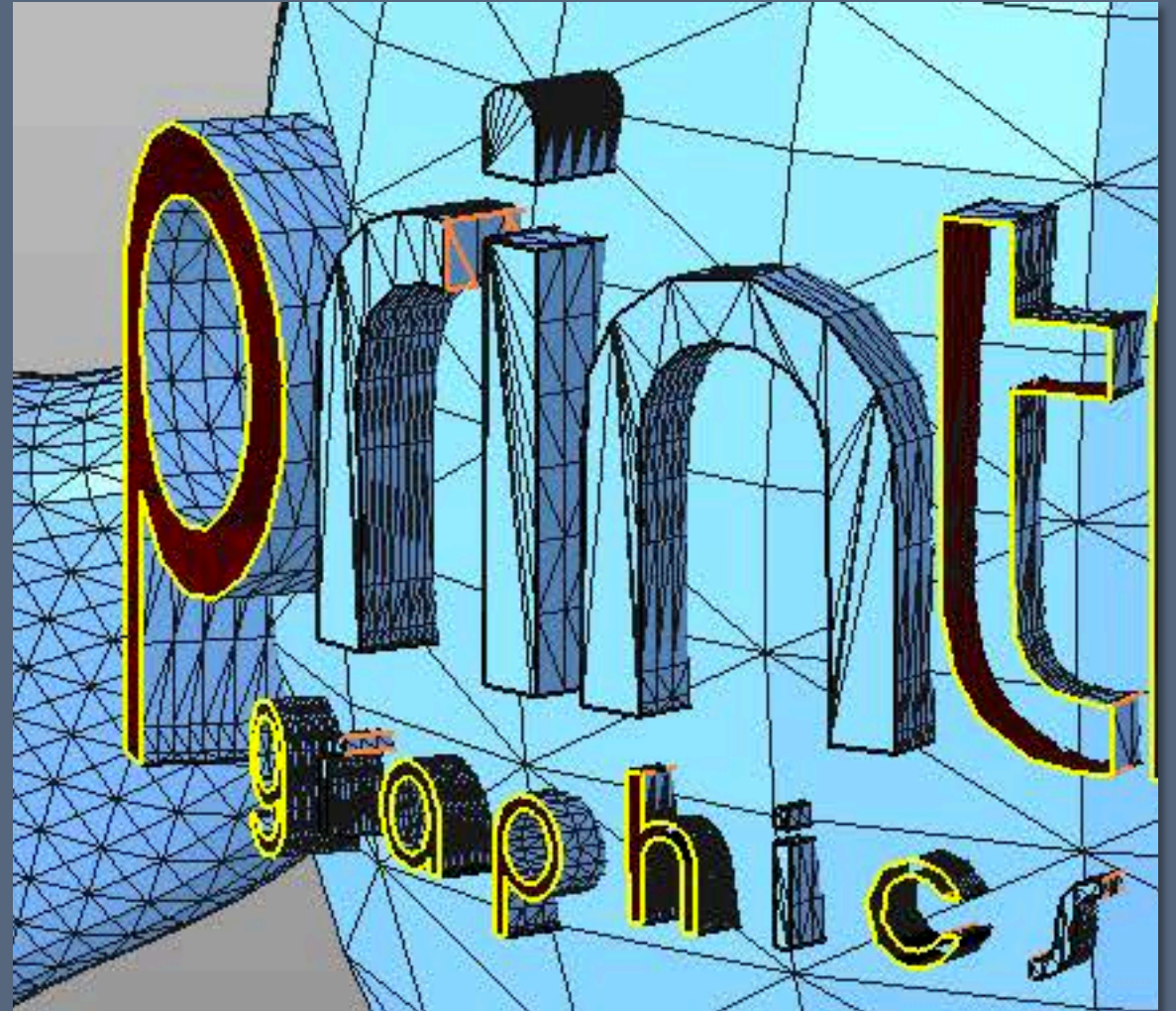
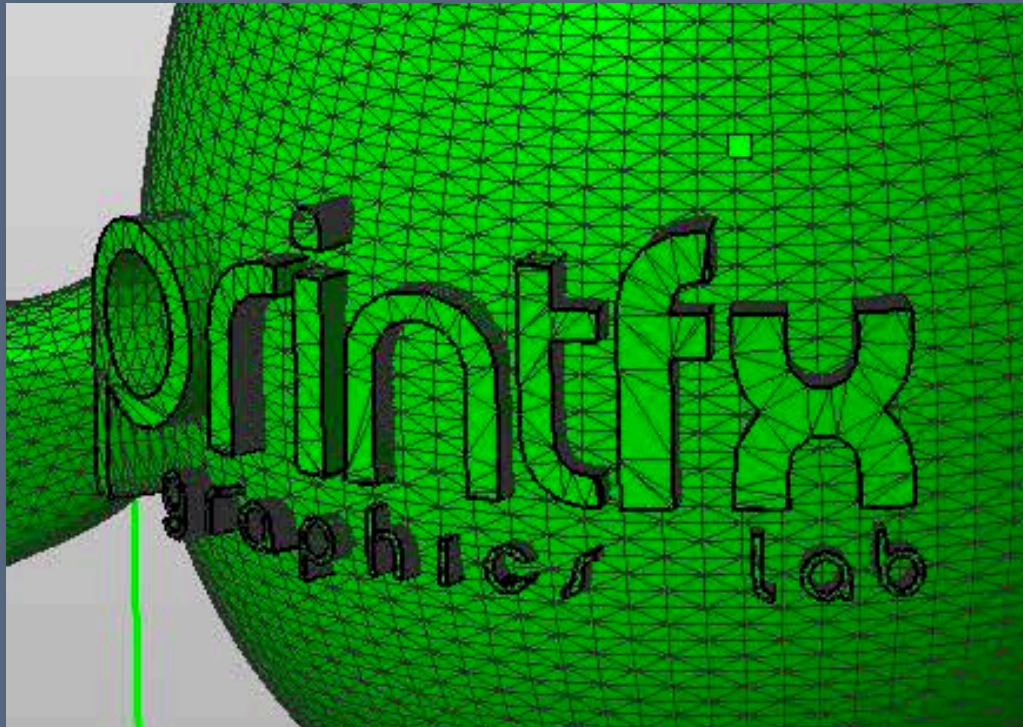
FIT FABLAB – Complex Geometry Model



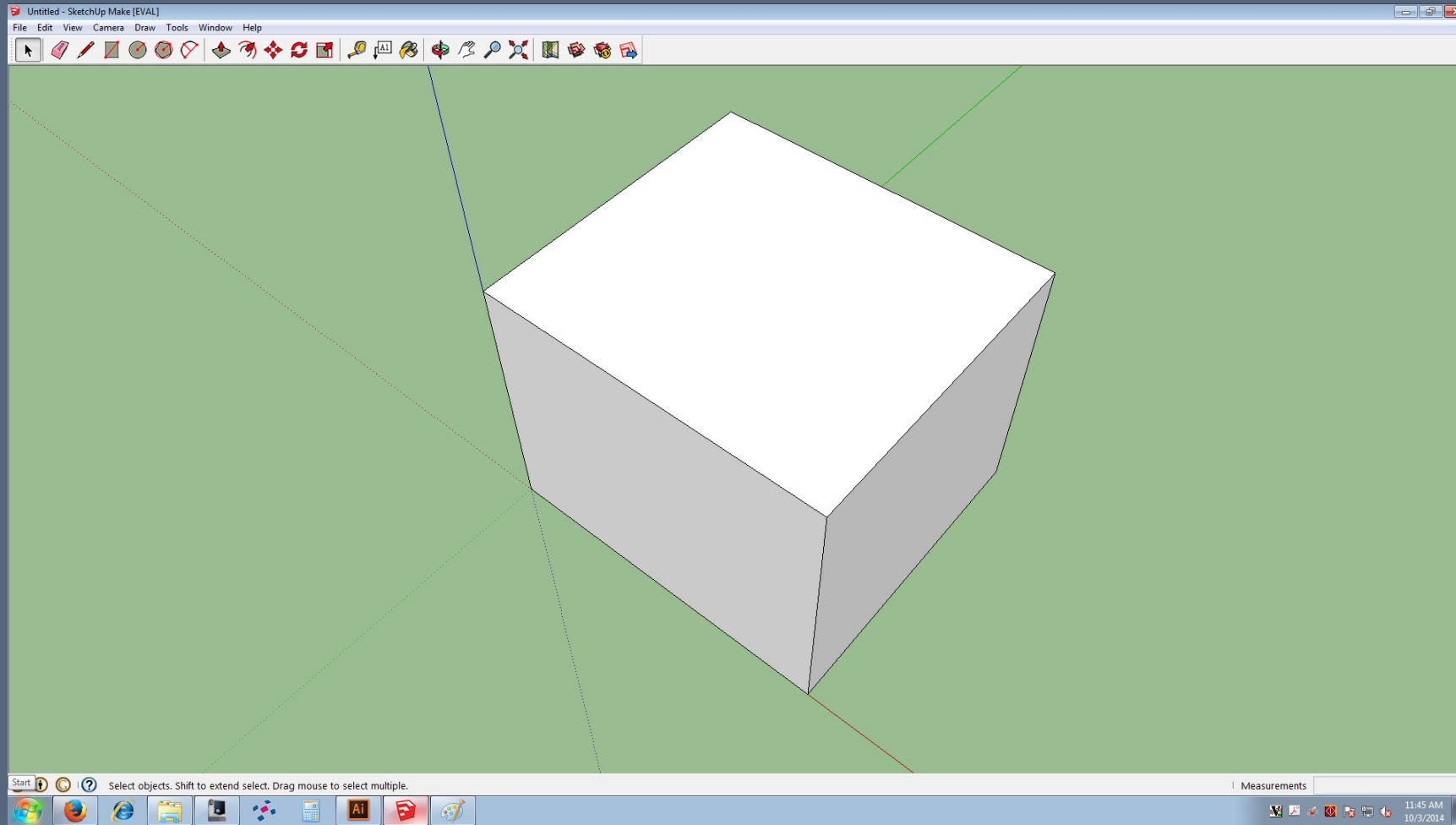
FIT FABLAB – Unsealed vs Watertight Models



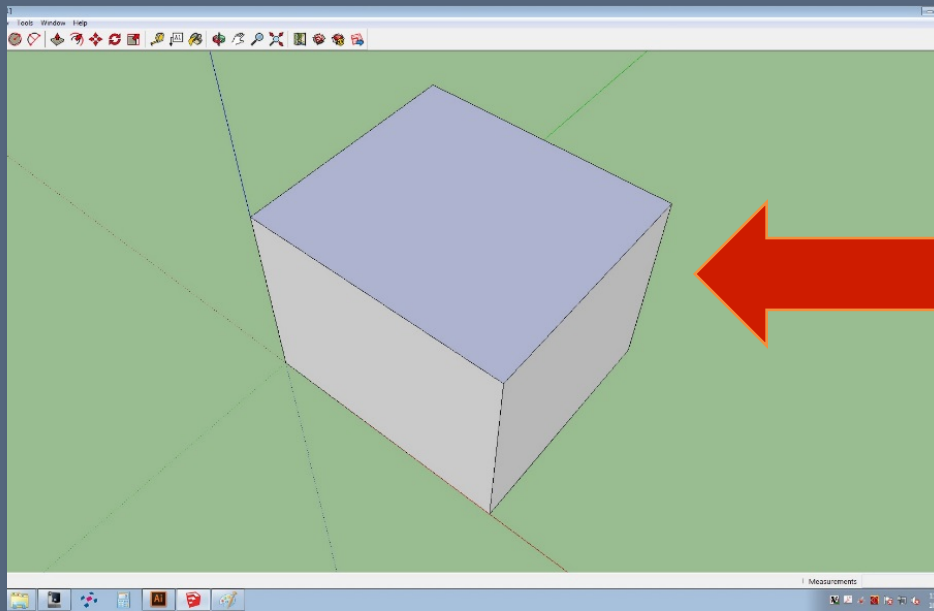
FIT FABLAB – Missing Faces



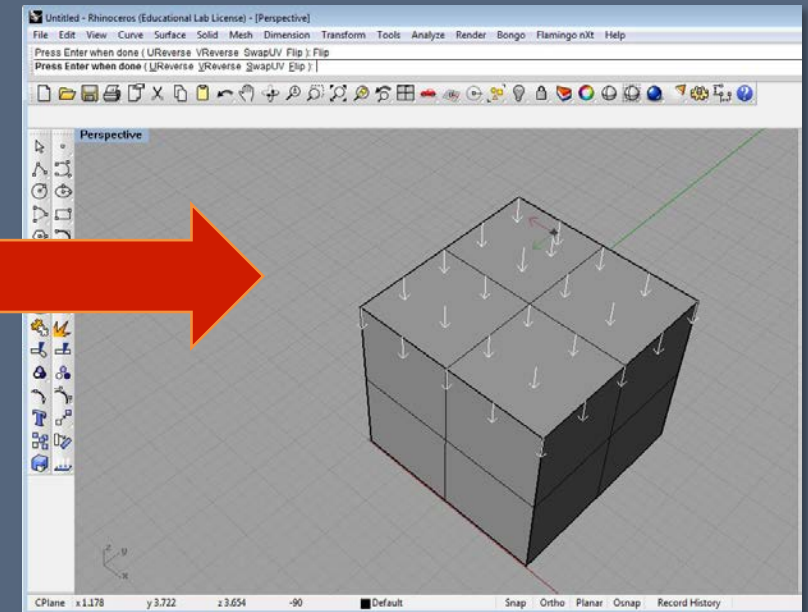
FIT FABLAB – Normals vs Flipped Faces



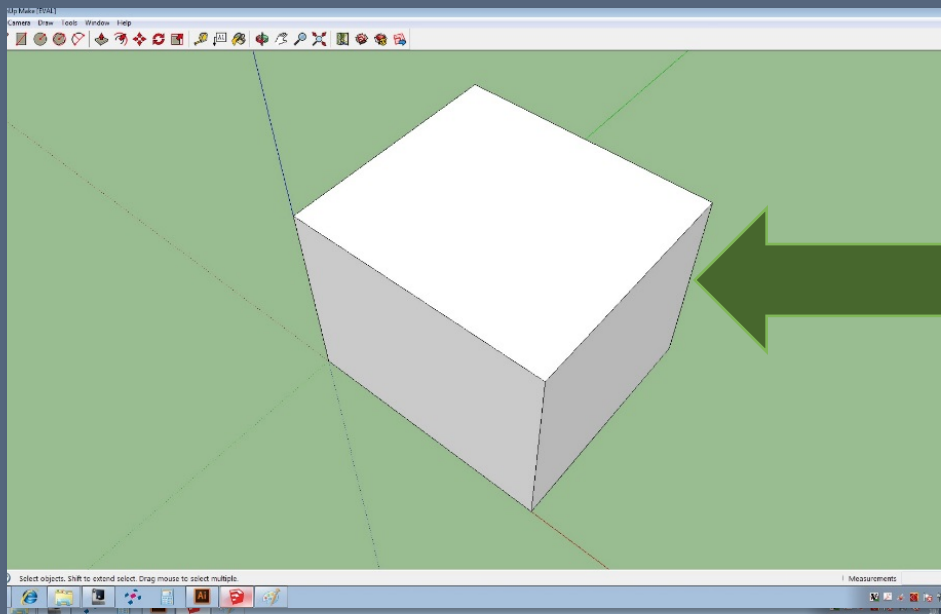
FIT FABLAB – Normals vs Flipped Faces



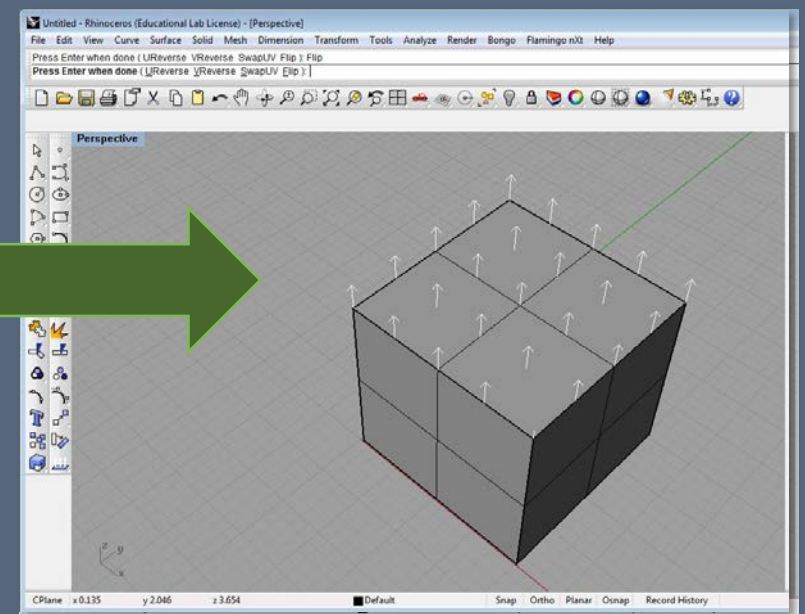
Inversed
Faces



FIT FABLAB – Normals vs Flipped Faces

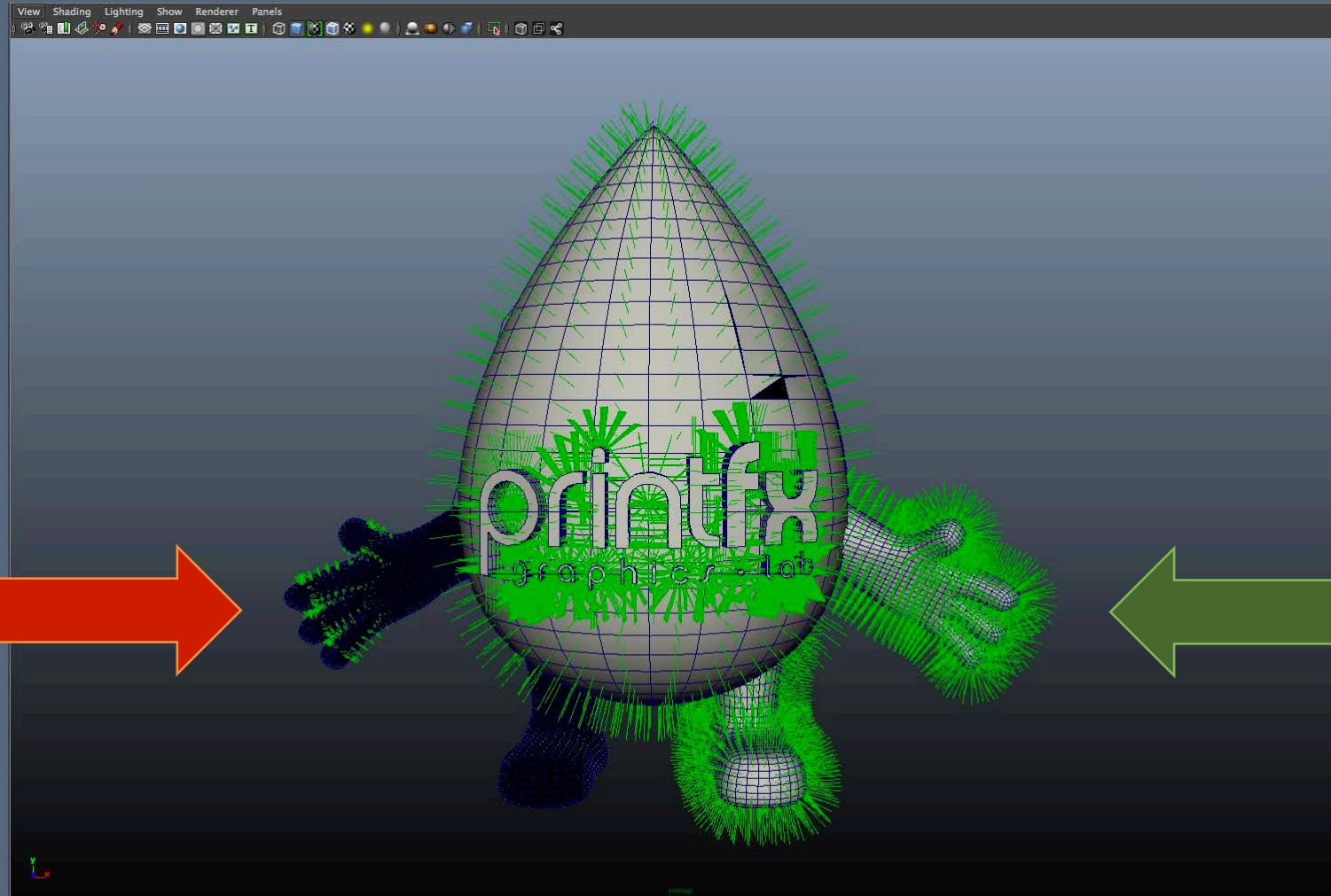
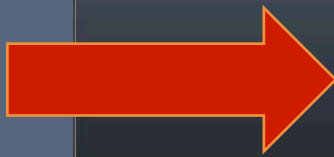


Normals



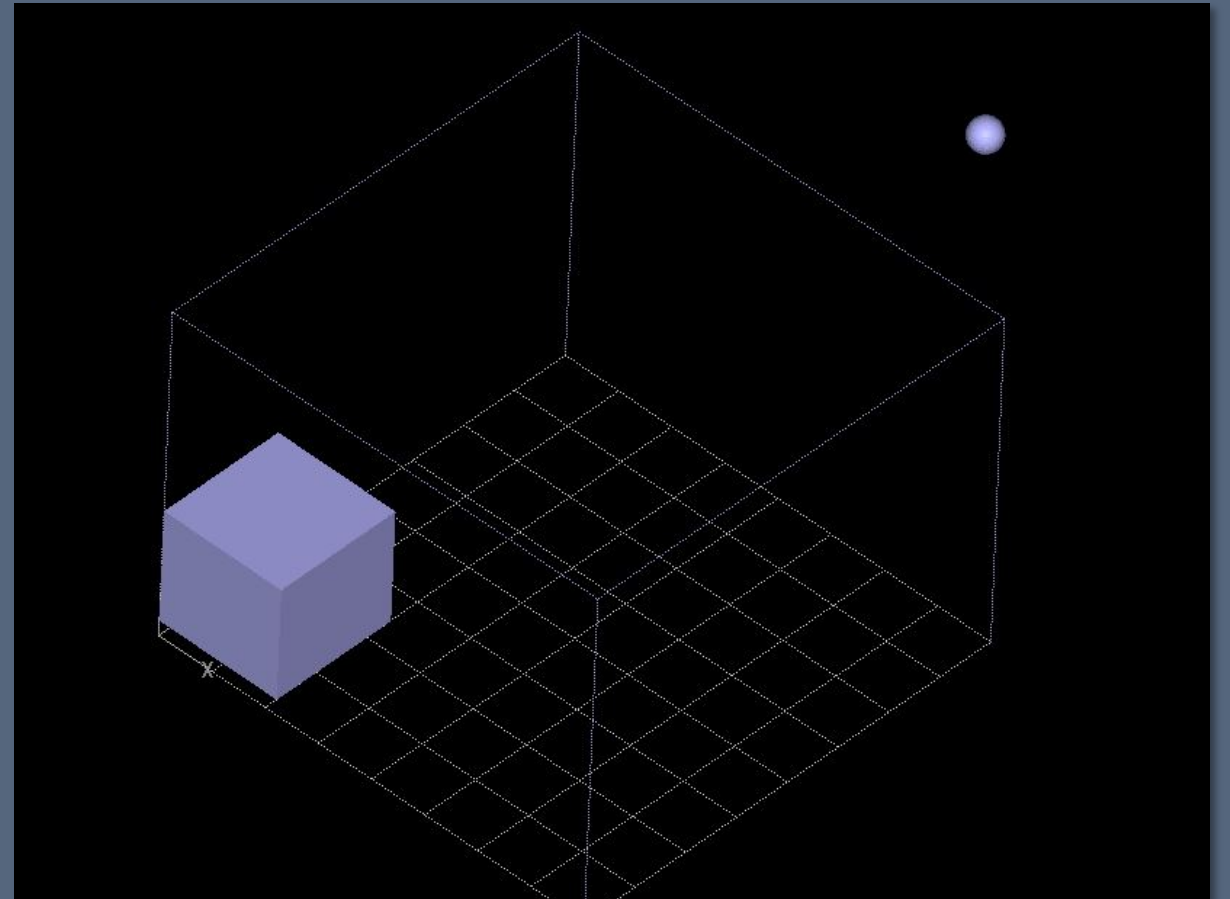
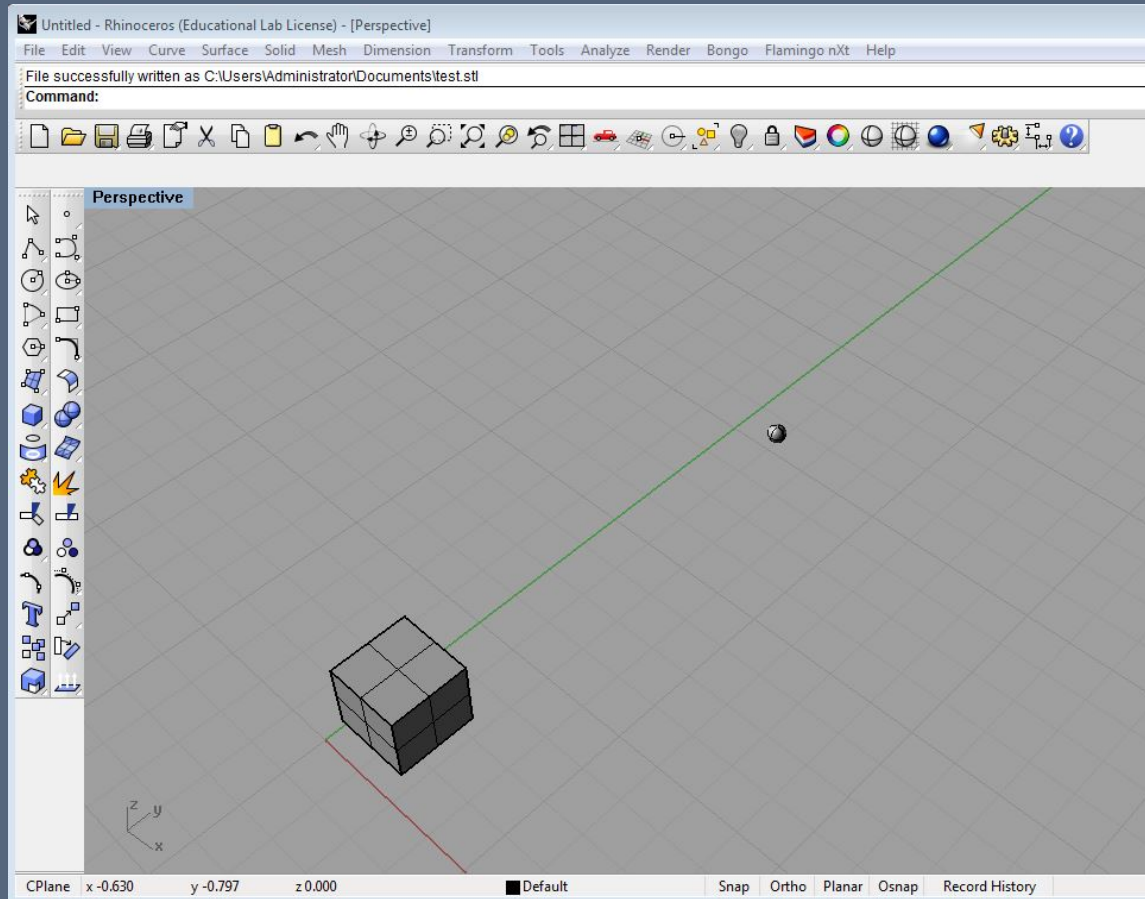
FIT FABLAB – Normals vs Flipped Faces

Inversed
Faces

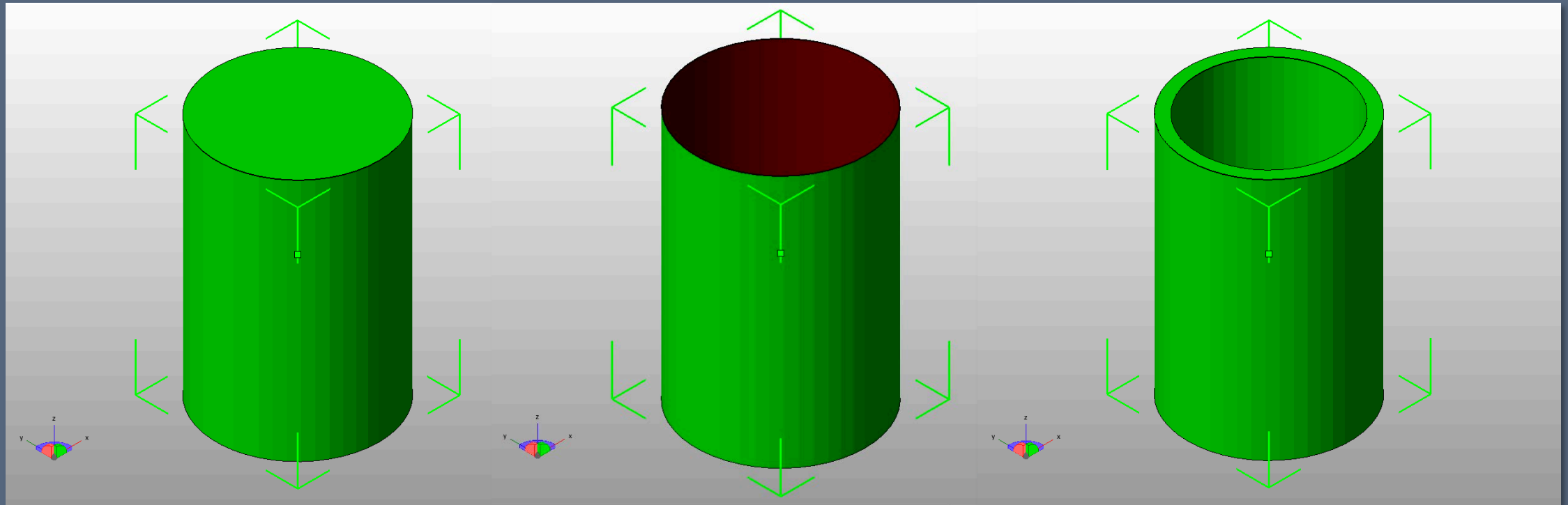


Normals

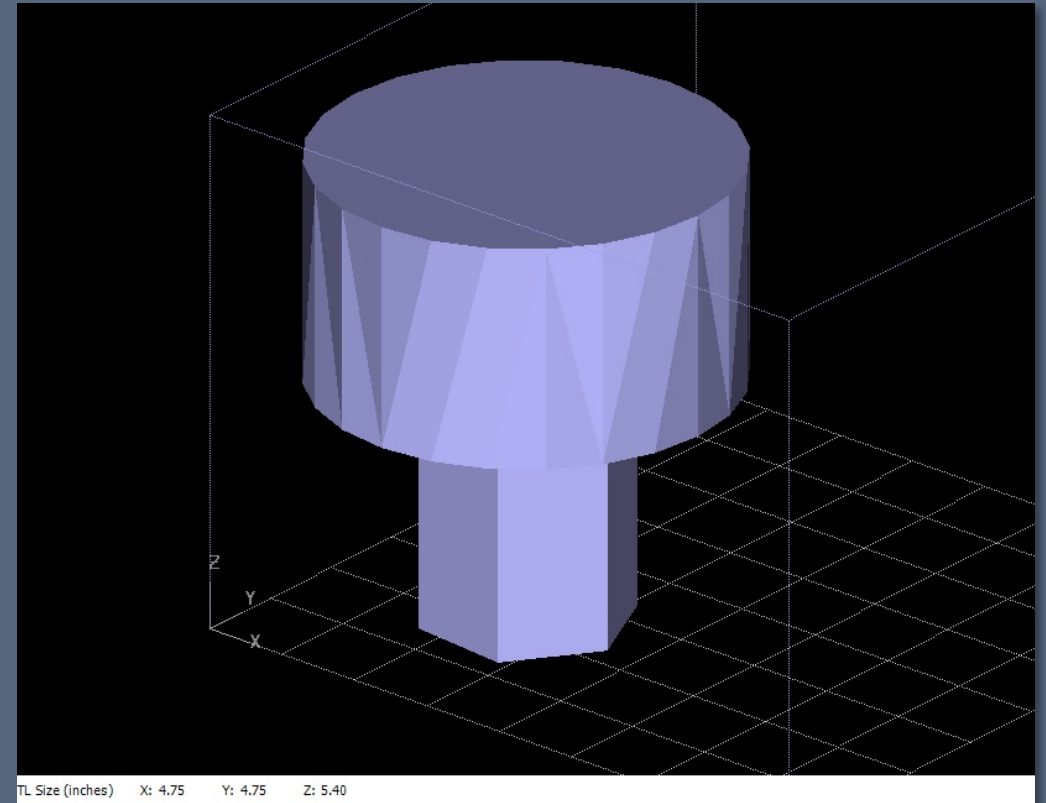
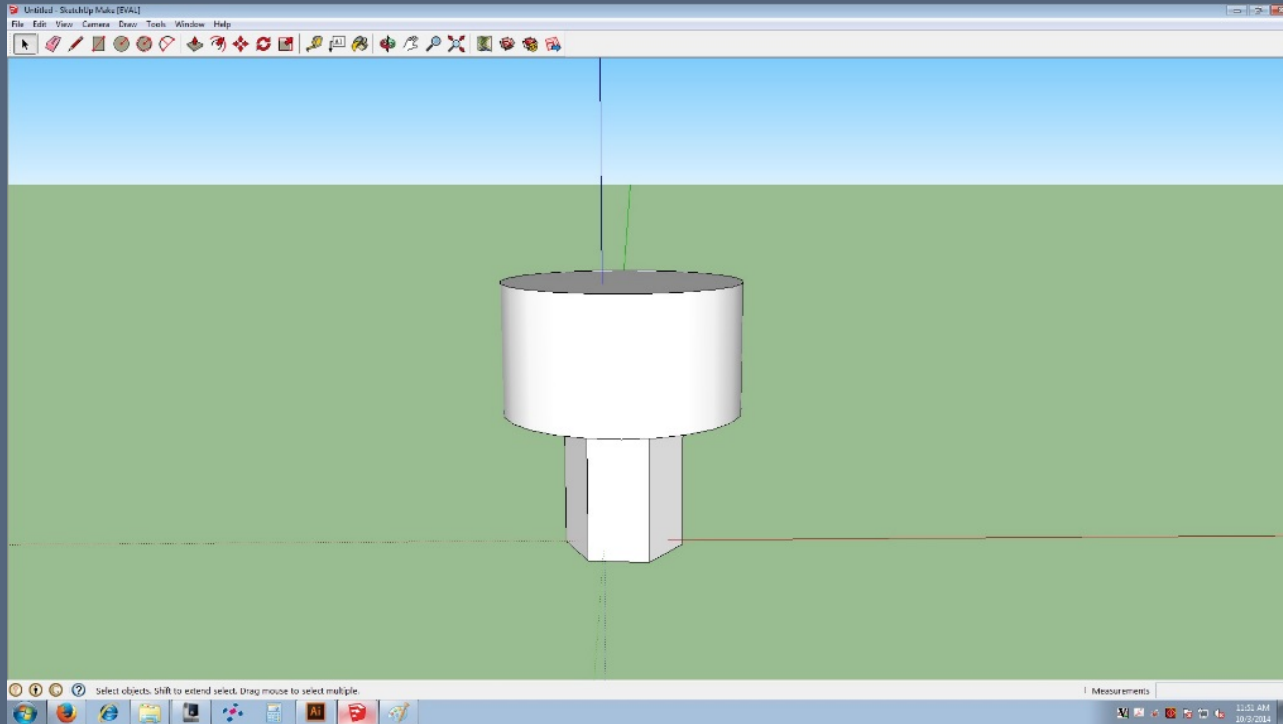
FIT FABLAB – Unnecessary Debris



FIT FABLAB – Wall Thickness

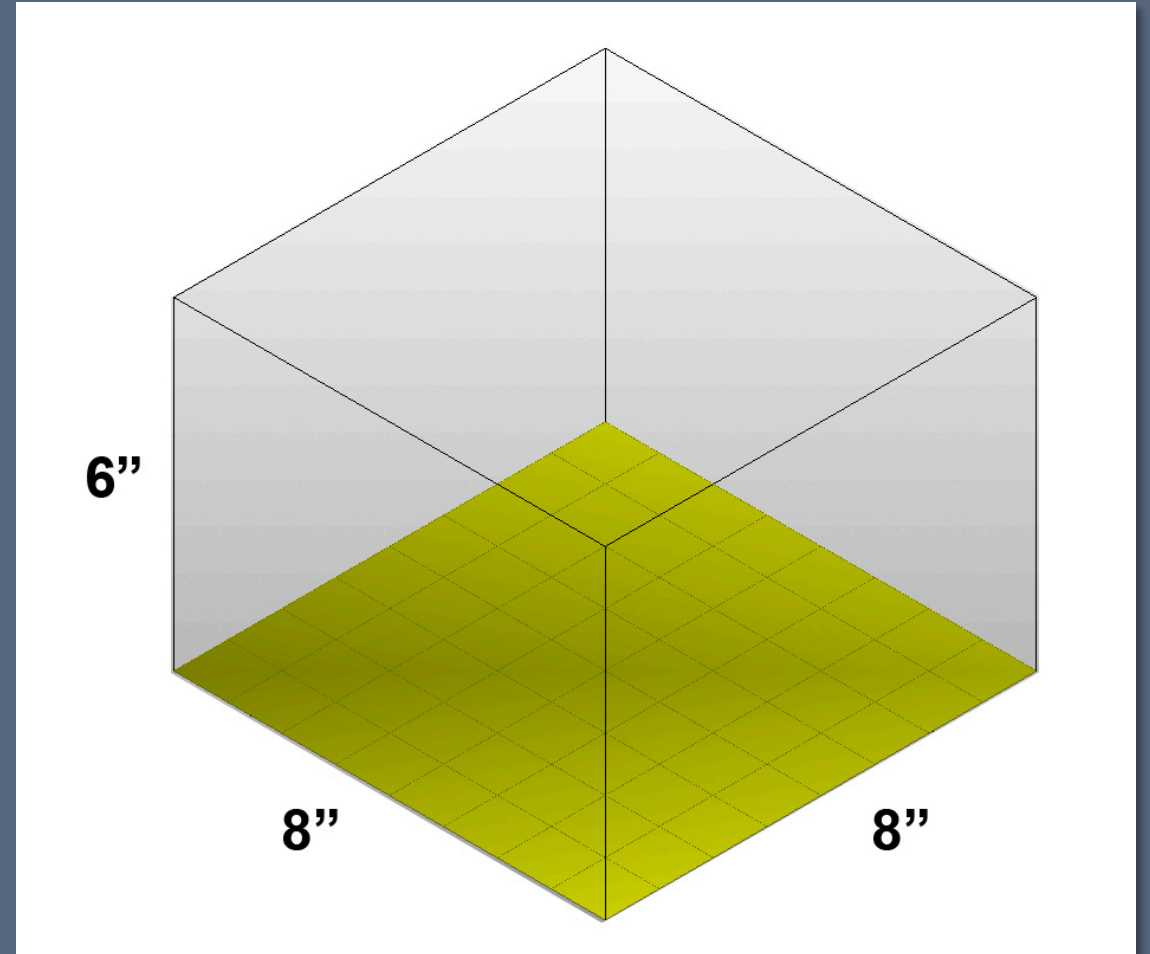


FIT FABLAB – Loss of Object Scale



FIT FABLAB – Working with Object Scale

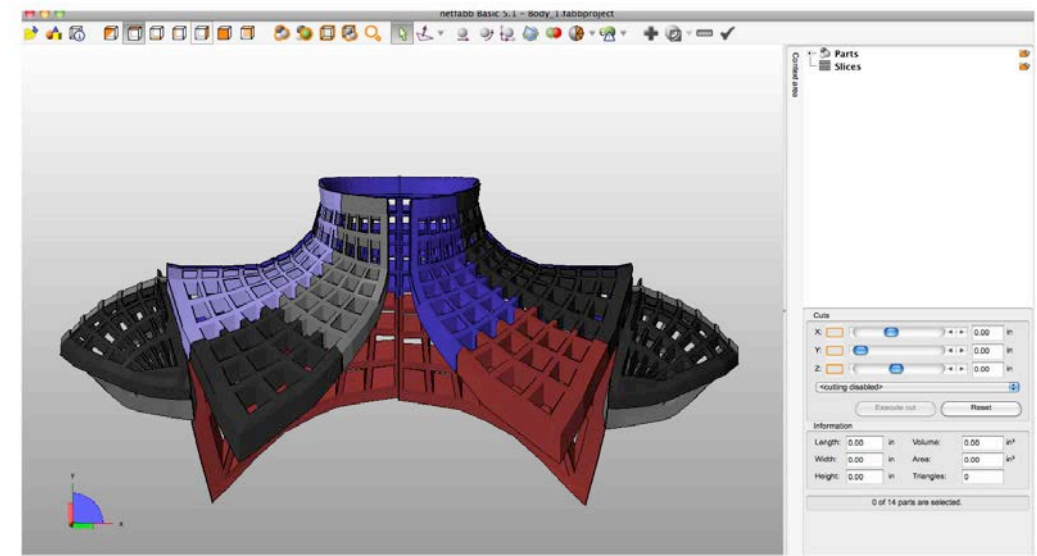
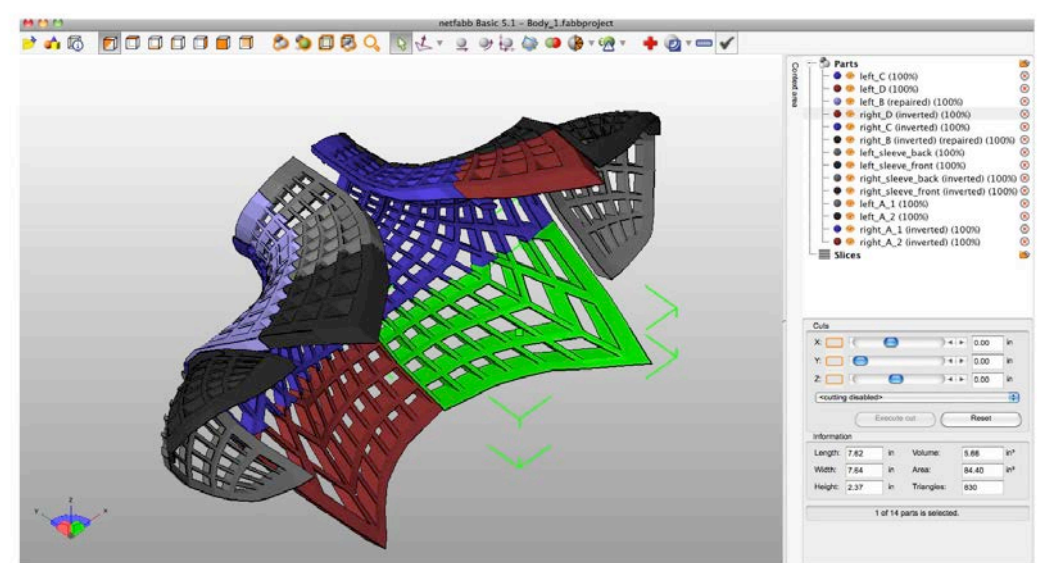
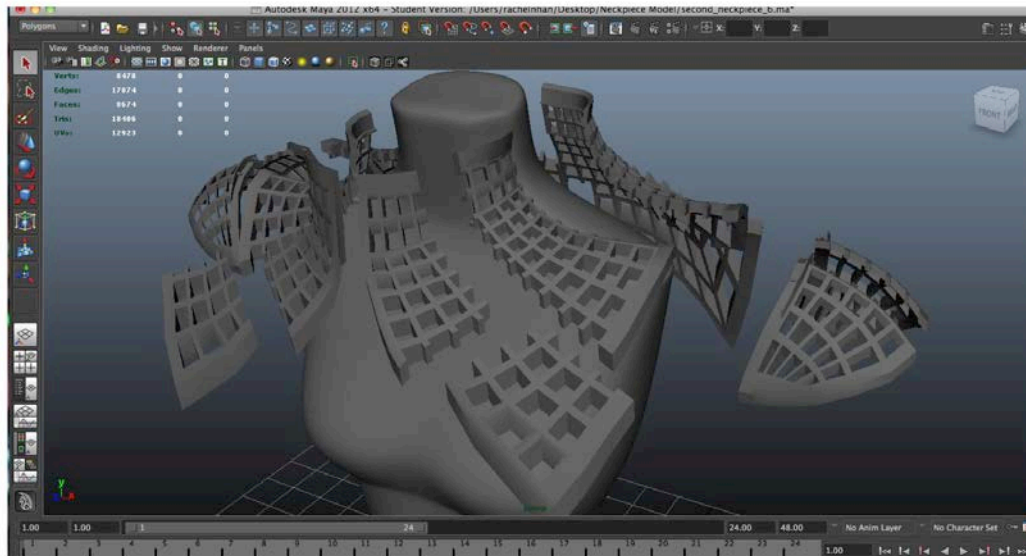
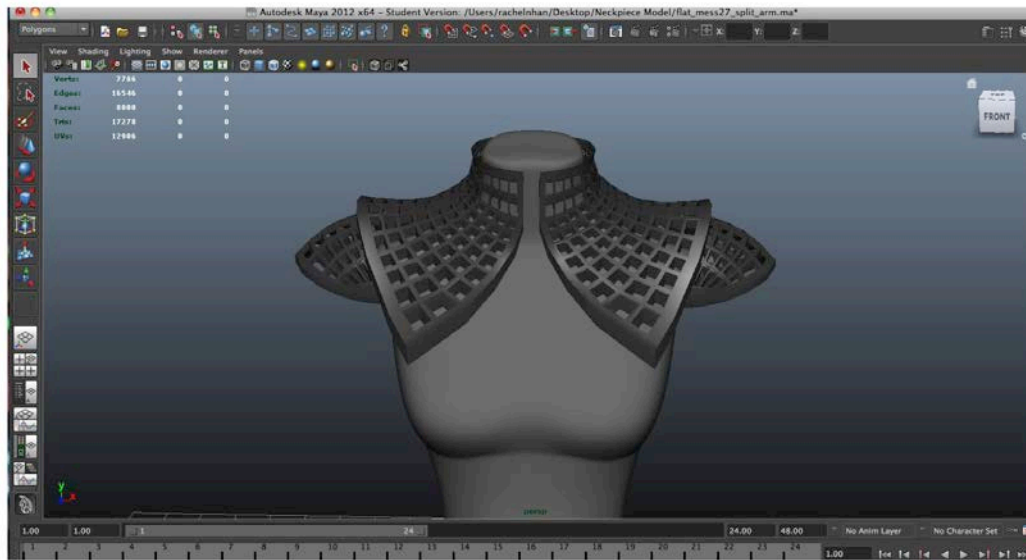
- The uPrint Plus SE has a bed size of 8" x 8" x 6"
- Files submitted to 3D print in the FabLab must fit within this area



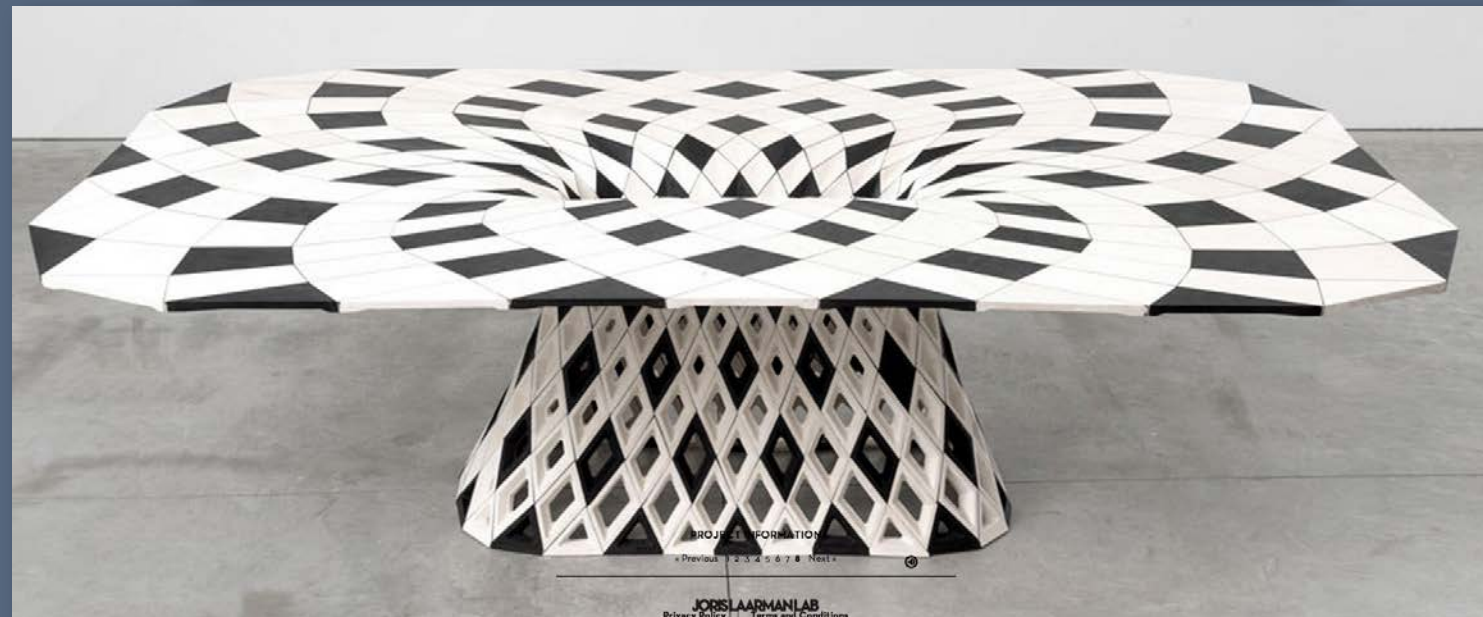
FIT FABLAB — Working With Bed Size Limitations



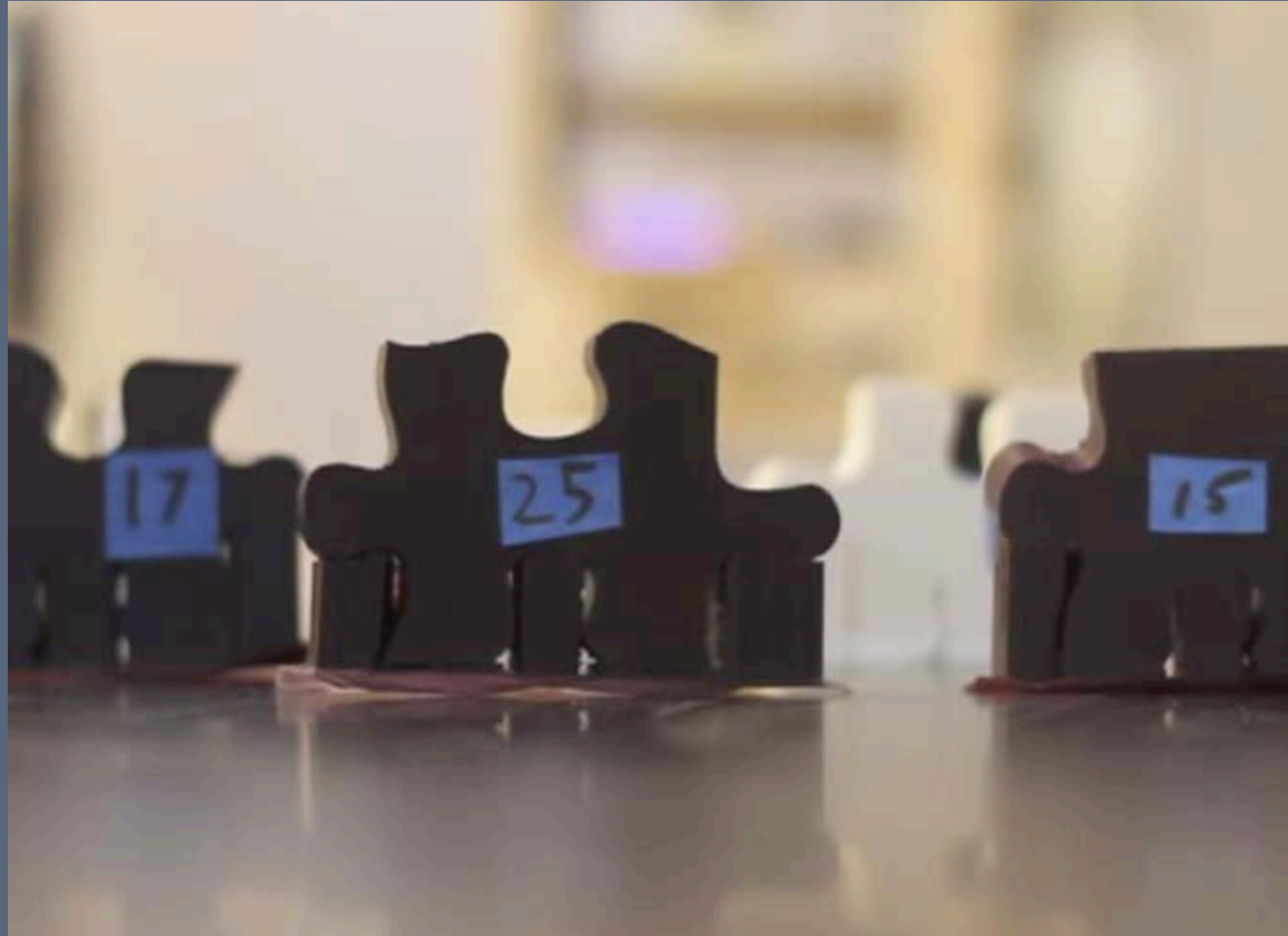
FIT FABLAB — Working With Bed Size Limitations



FIT FABLAB — Working With Bed Size Limitations



FIT FABLAB — Working With Bed Size Limitations



FIT FABLAB — Working With Bed Size Limitations

CROWD FABRICATION

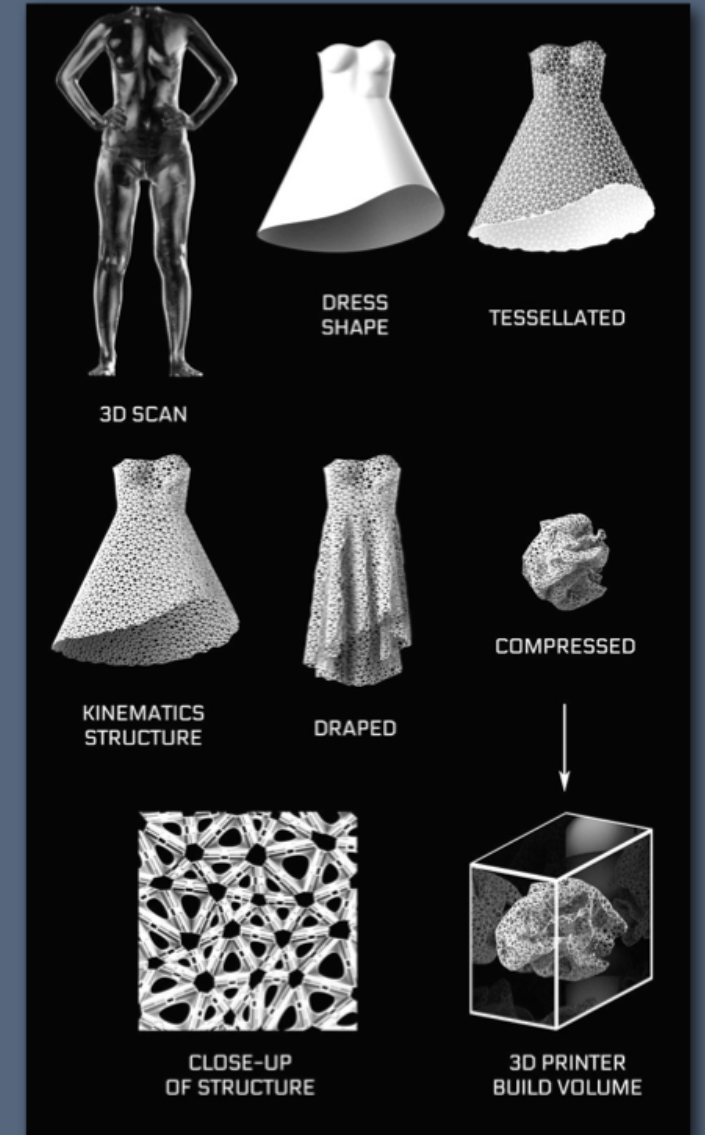
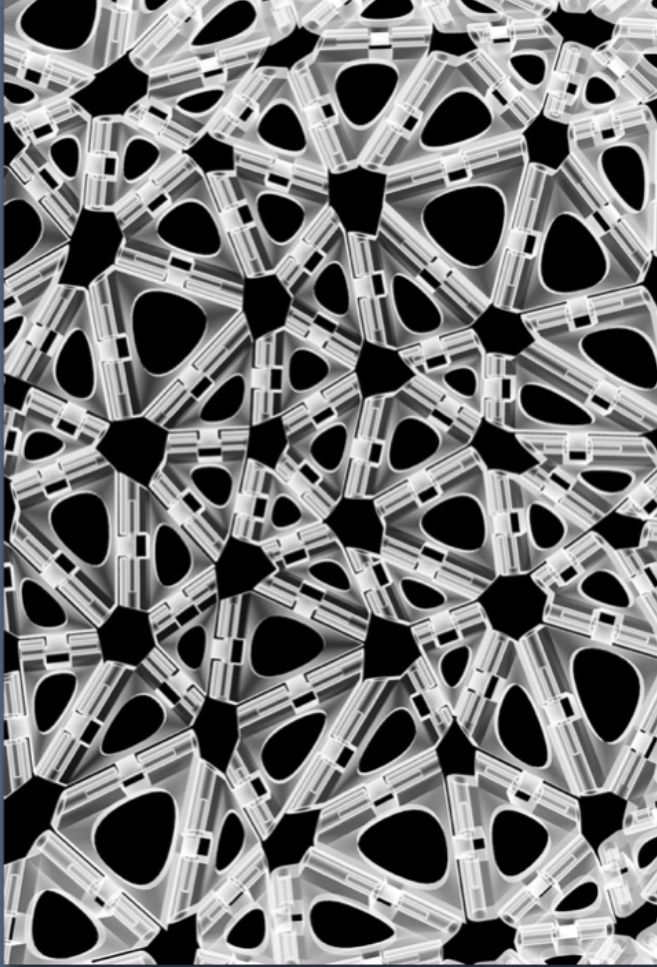
FOR THE FIRST PROTOTYPE WE ASKED THE HELP OF A 3D PRINTING HUB TO CREATE THE WORLDS FIRST CROWD FABRICATED CHAIR. THE FIRST CHAIR IS GENERATED OUT OF A SINGLE SHEET FRACTIONATED IN 202 3D JIGSAW PUZZLE PARTS.



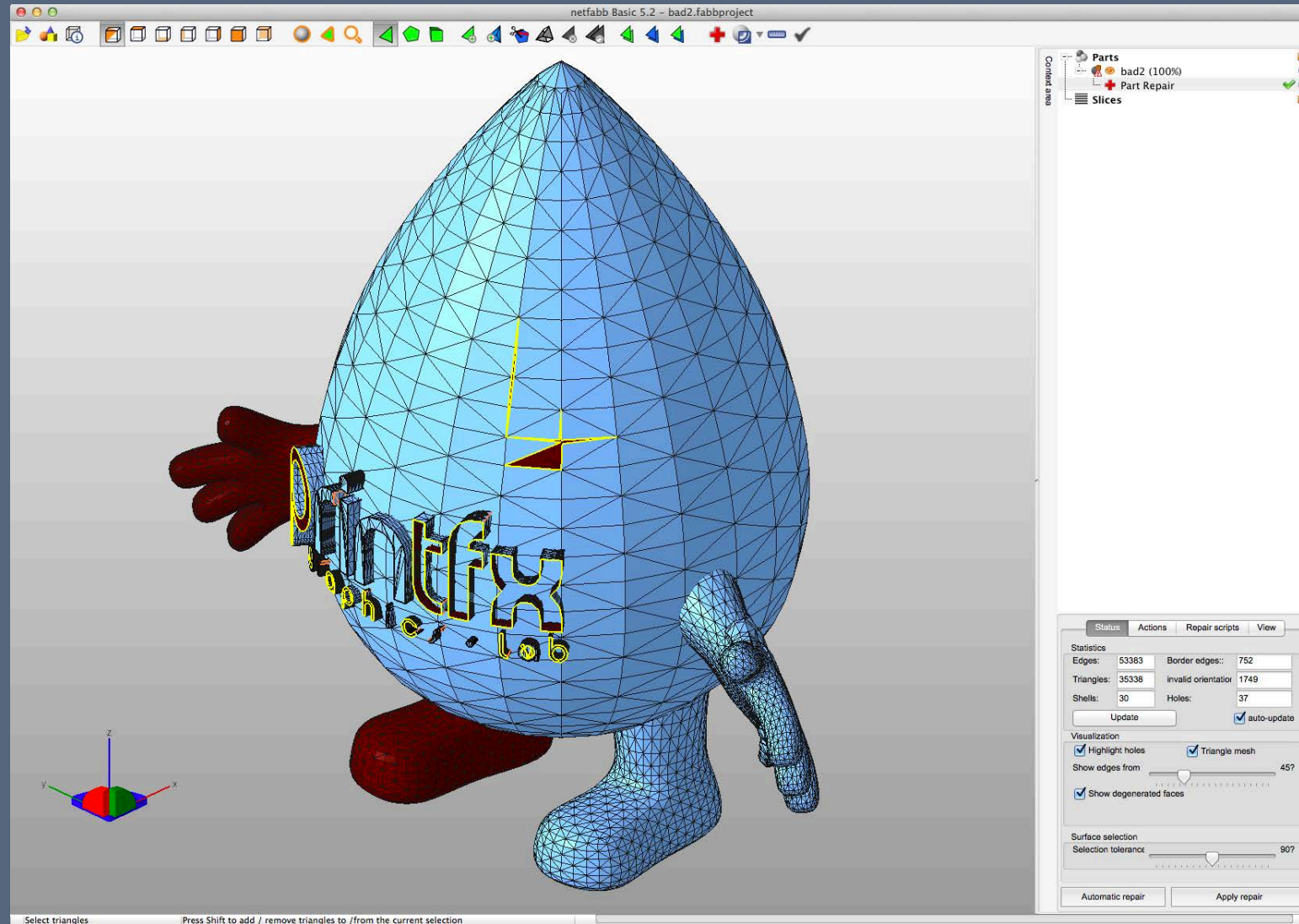
FIT FABLAB — Working With Bed Size Limitations

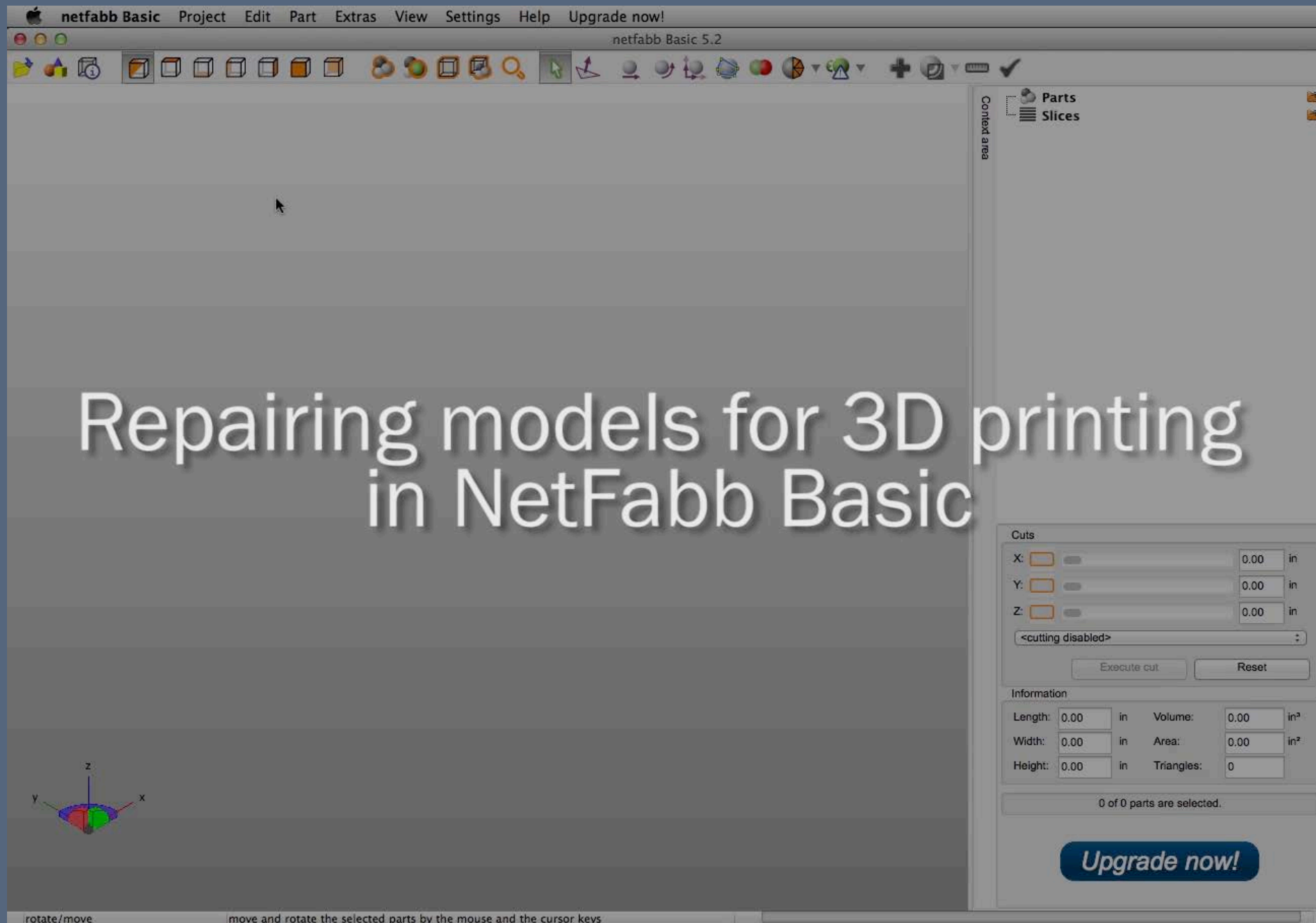


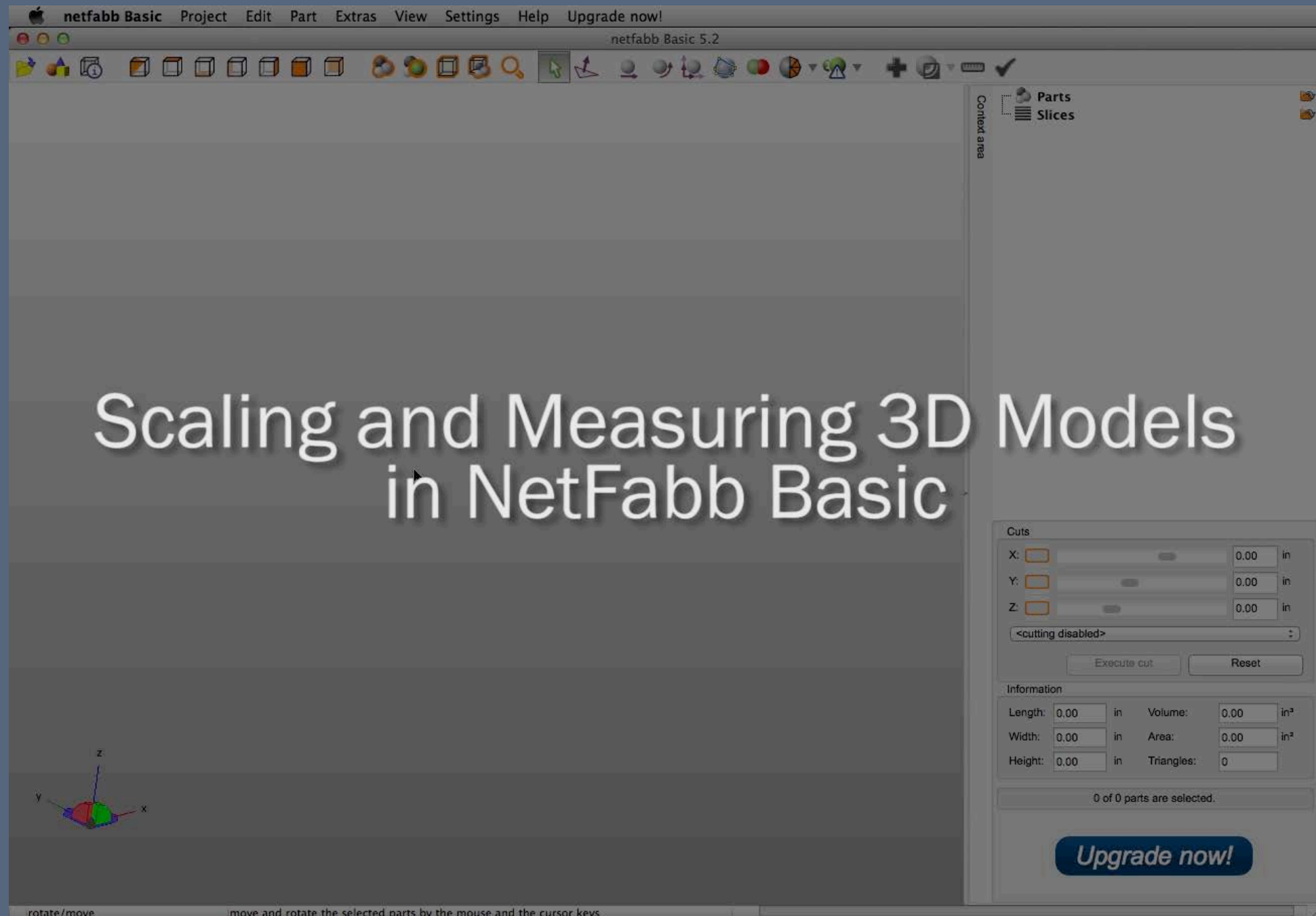
FIT FABLAB — Working With Bed Size Limitations



FIT FABLAB – STL Repair in Netfabb Basic

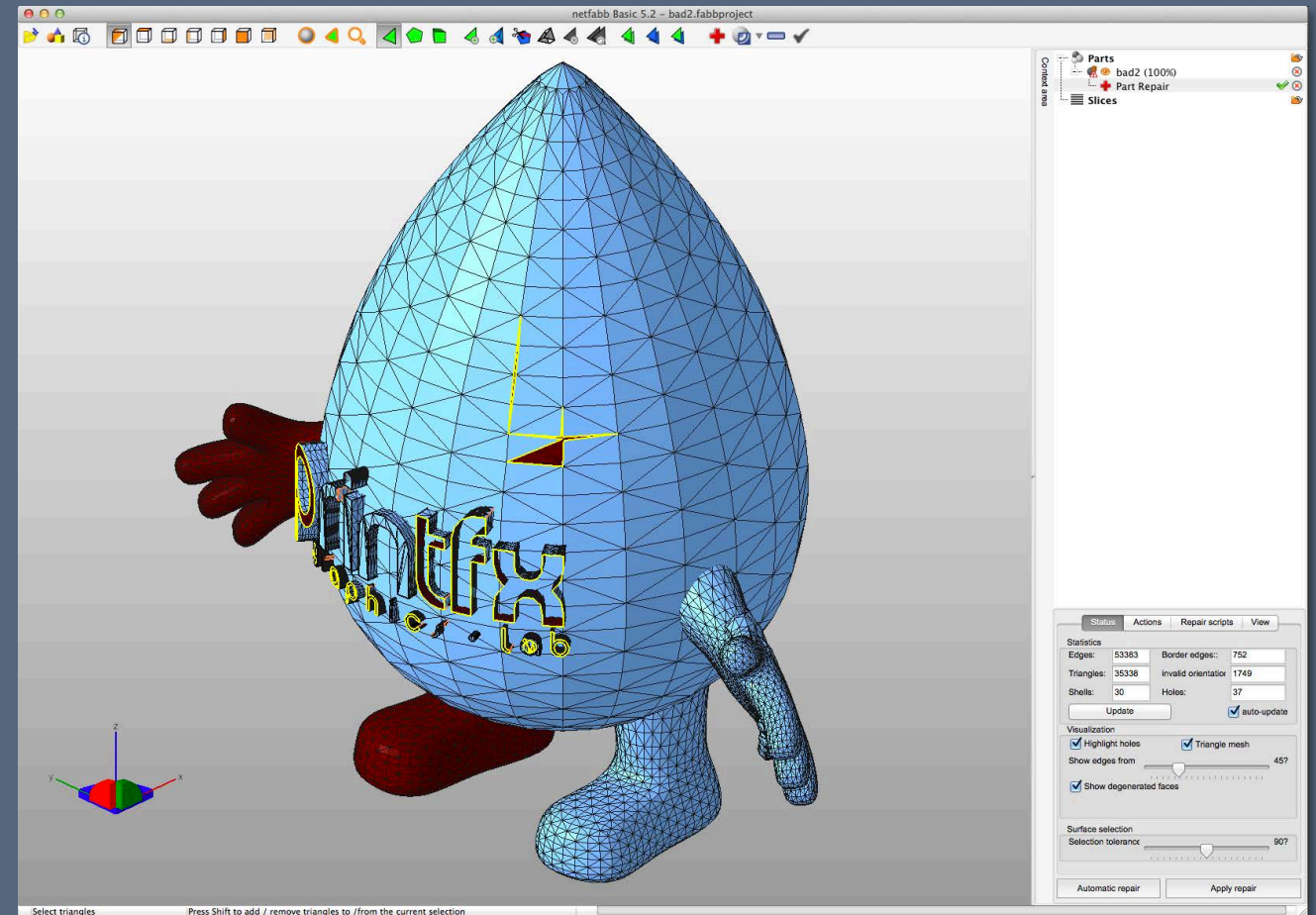






FIT FABLAB – FabLab Policies and Procedures

- FabLab staff will make an attempt to repair basic errors your files
- Files with complex errors will be returned to the student for repair
- We highly recommend students prep and repair their files in Netfabb prior to submitting a 3D print



FIT FABLAB – Failed 3D Prints



FIT FABLAB – 3D Printing in Various Industries



FIT FABLAB – 3D Printing in Various Industries



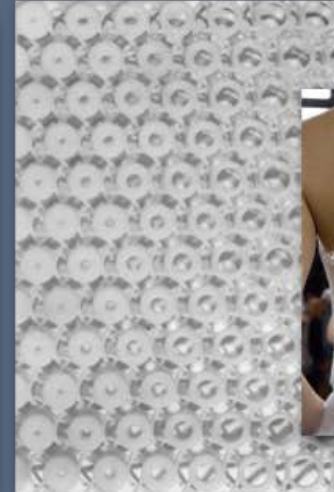
FIT FABLAB – 3D Printing in Various Industries



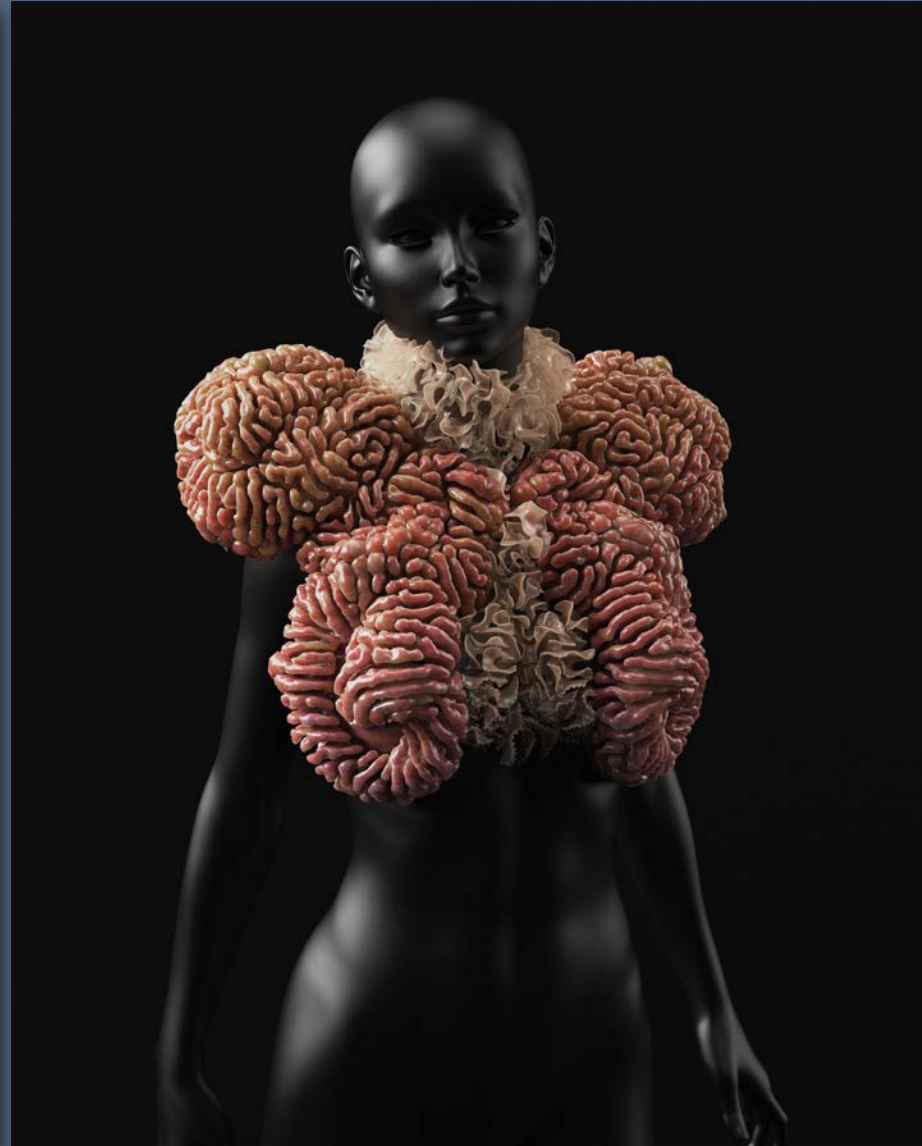
FIT FABLAB – 3D Printing in Various Industries



FIT FABLAB – 3D Printing in Various Industries



FIT FABLAB – 3D Printing in Various Industries



FIT FABLAB – 3D Printing in Various Industries



FIT FABLAB – 3D Printing in Various Industries



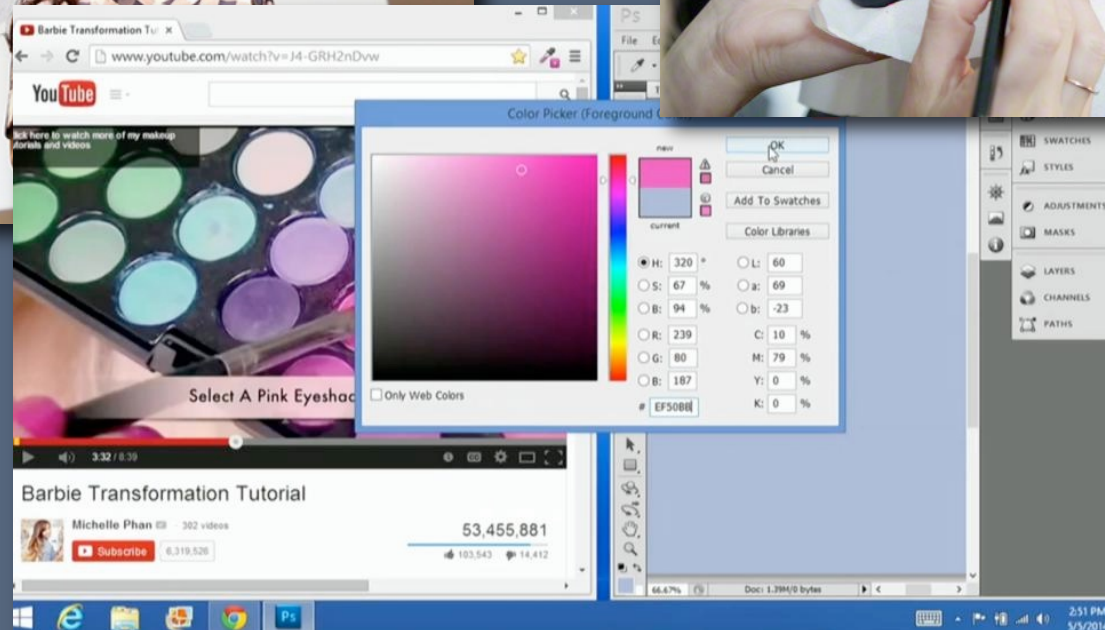
FIT FABLAB – 3D Printing in Various Industries



FIT FABLAB – 3D Printing in Various Industries



FIT FABLAB – 3D Printing in Various Industries



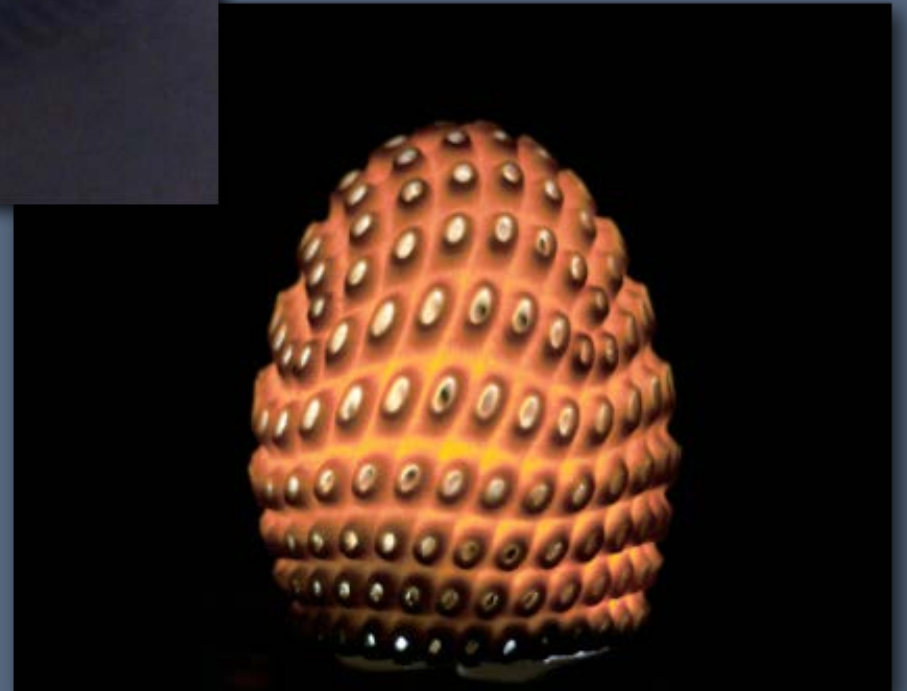
FIT FABLAB – 3D Printing in Various Industries



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FIT FABLAB – 3D Printing in Various Industries



Q&A

FabLab/PrintFX
Pomerantz Center, room D529A

Regular Hours:
Mon-Thurs: 9am-7pm, Fri: 9am-6:30pm

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Web: www.fitnyc.edu/printfx