

# Mineways: from Minecraft to Reality



Parts & Crafts Workshop

Eric Haines



# What's Minecraft?

A computer game. You start in an undeveloped world.



# What's Minecraft?

Everything is modifiable. You can build a house...

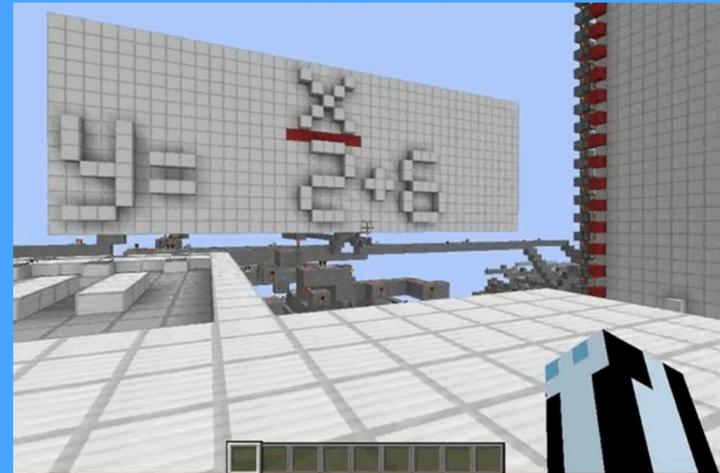
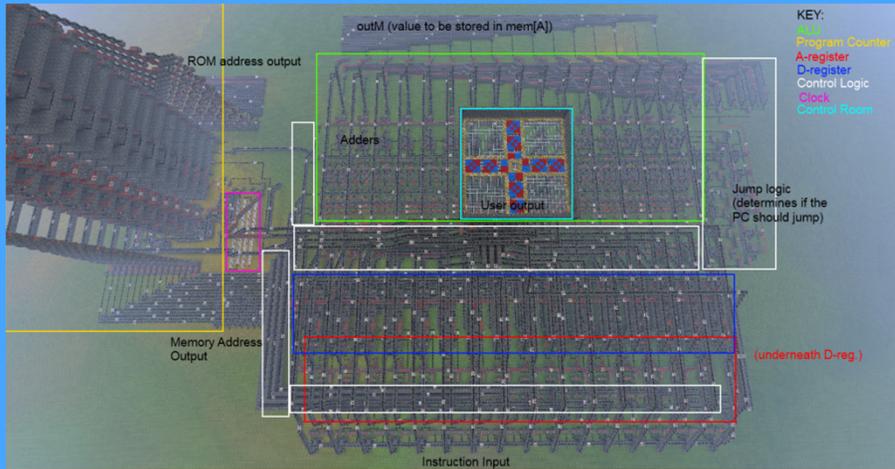


# Many Block Types



# Things Built

Working computers, calculators, instruments...



# Things Built

Starships, for example



Minecraft is possibly the best selling videogame of all time: 100 million and counting.



# Things Built

and many, many buildings



# Subtractive vs. Additive Manufacturing

## Subtractive:

- Carving wood or stone
- Drilling holes in a piece of metal



## Additive:

- Making a sculpture by adding clay
- Building using Legos



# What's Minecraft?

Is it additive or subtractive?



# Minecraft is...

Mostly additive: you add blocks to make stuff, such as giant insects



Sometimes it's subtractive, like when you carve away a hill or make a basement.



# 3D Printing

Is also called “Additive Manufacturing”.

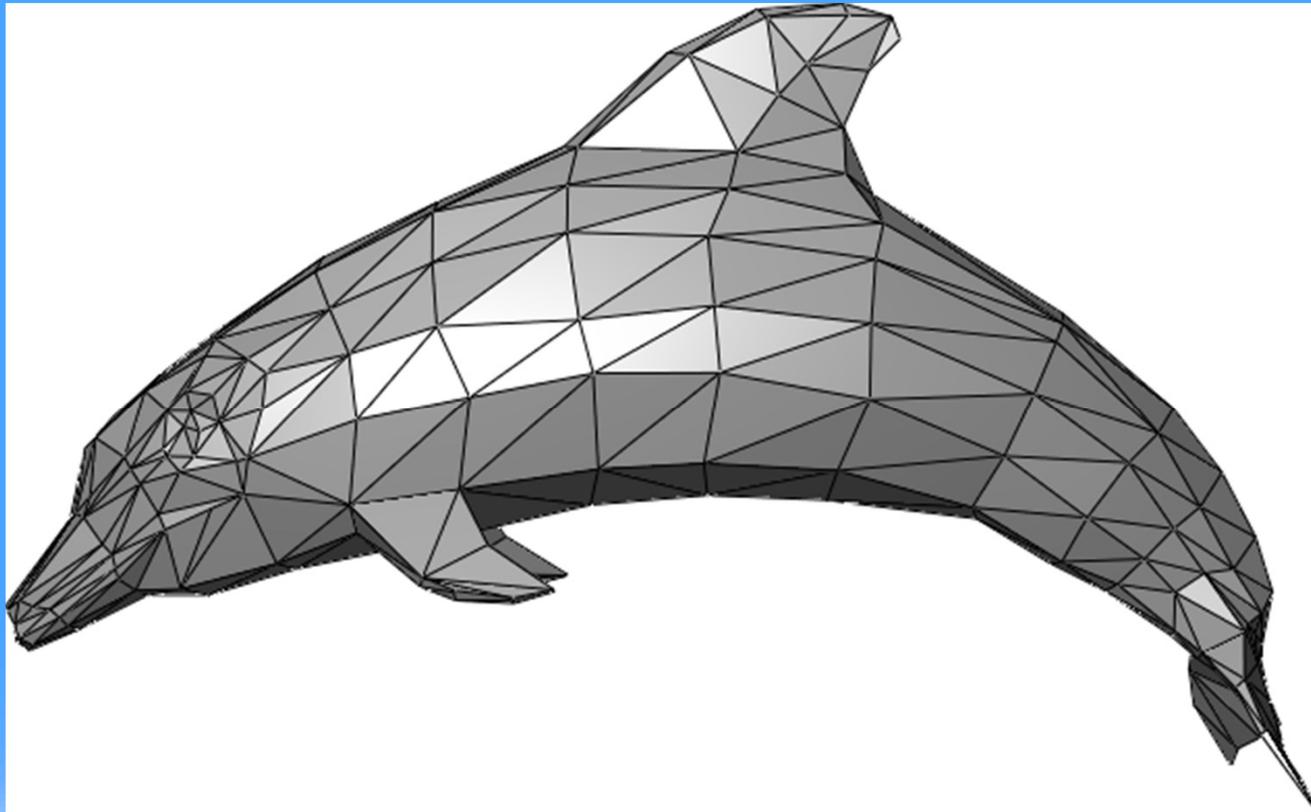
You tell the 3d printer which blocks you want filled in.  
Think of very tiny Lego blocks.

These little blocks are sometimes called “voxels” –  
sort of like “volume pixel”.



# Models for 3D Printing

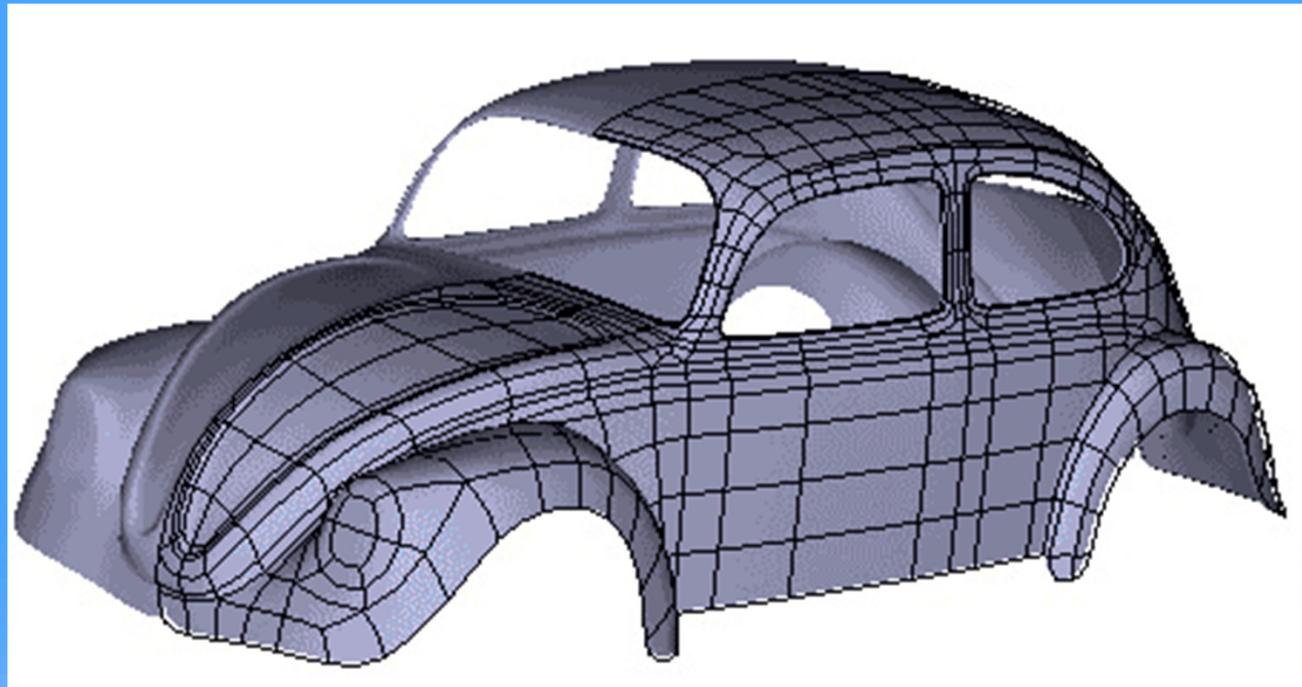
It's all just triangles!



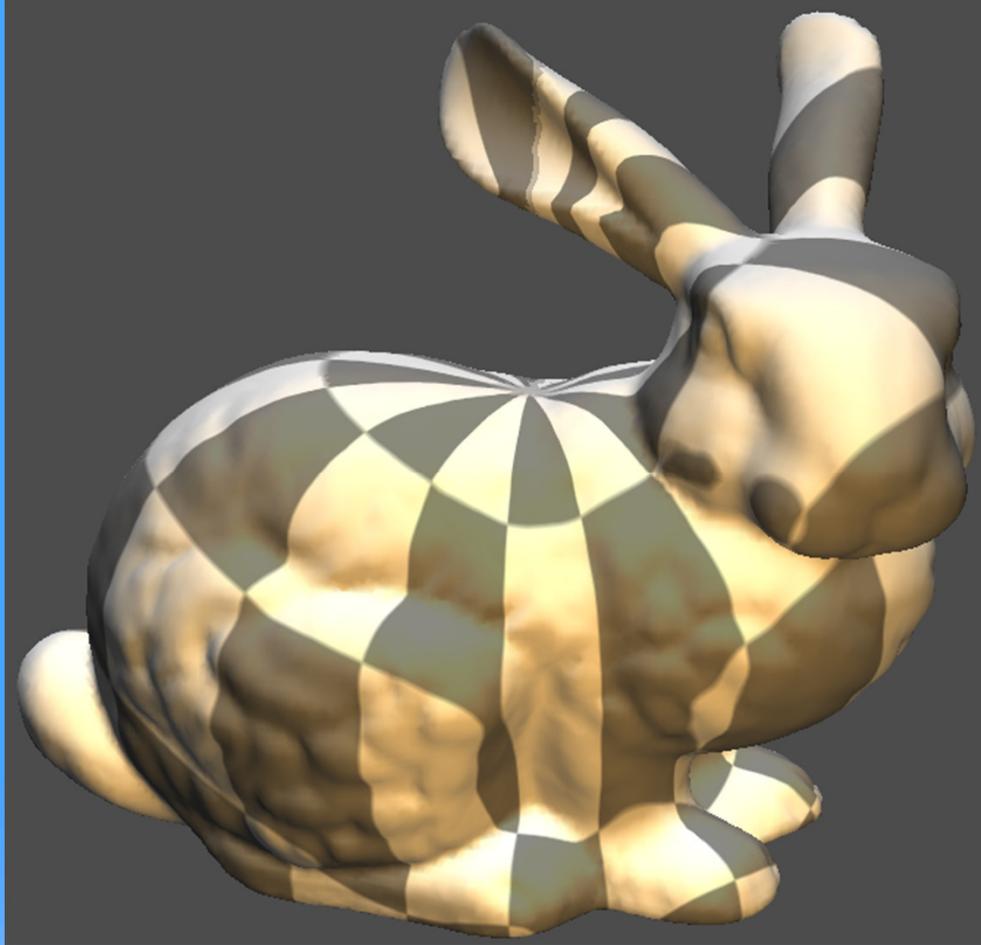
# Watertight Models for 3D Printing

You need to make sure your triangles make a solid object. There's an inside and outside.

This one isn't solid.



# Solid Model



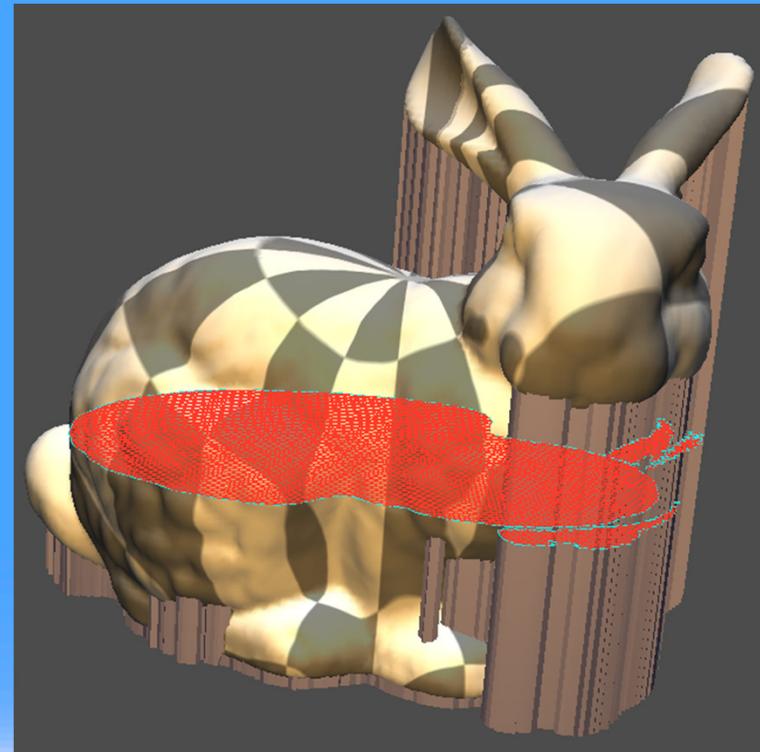
This model of a bunny is solid.

Think of a balloon – you can't have leaks.

# Preparing a Model

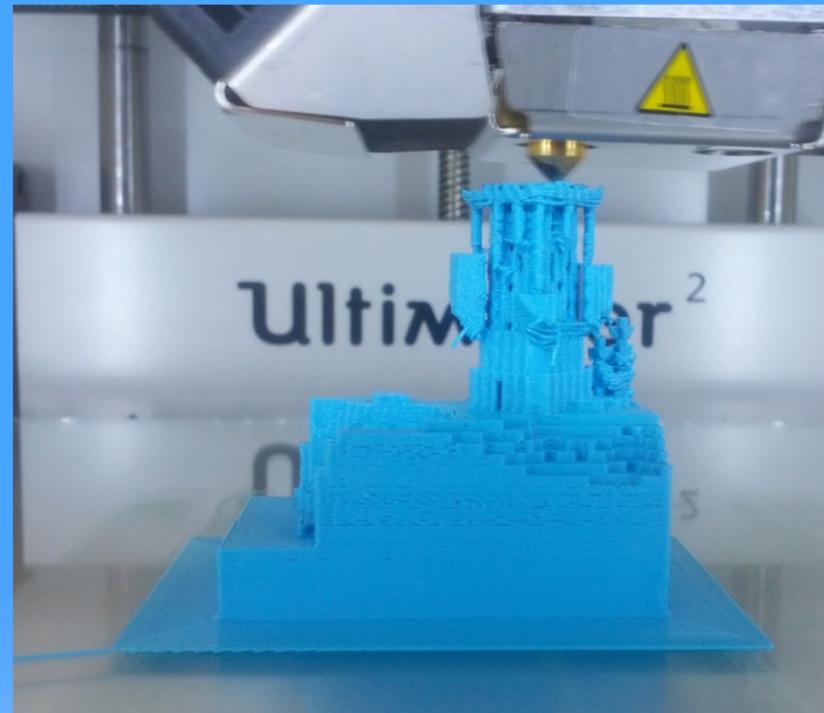
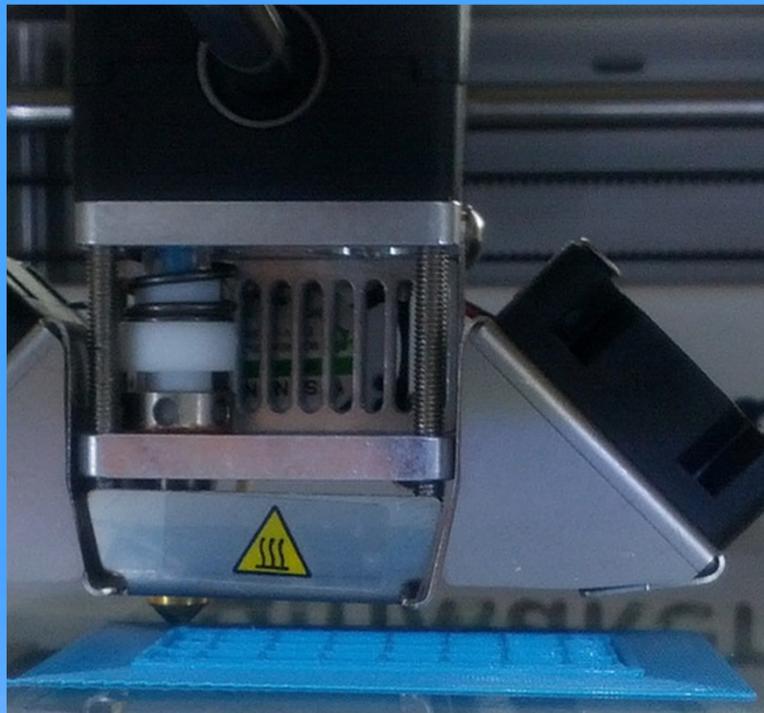
This model is then turned into horizontal slices, like a sideways deli meat cutter.

Sometimes you might need what's called a support structure.



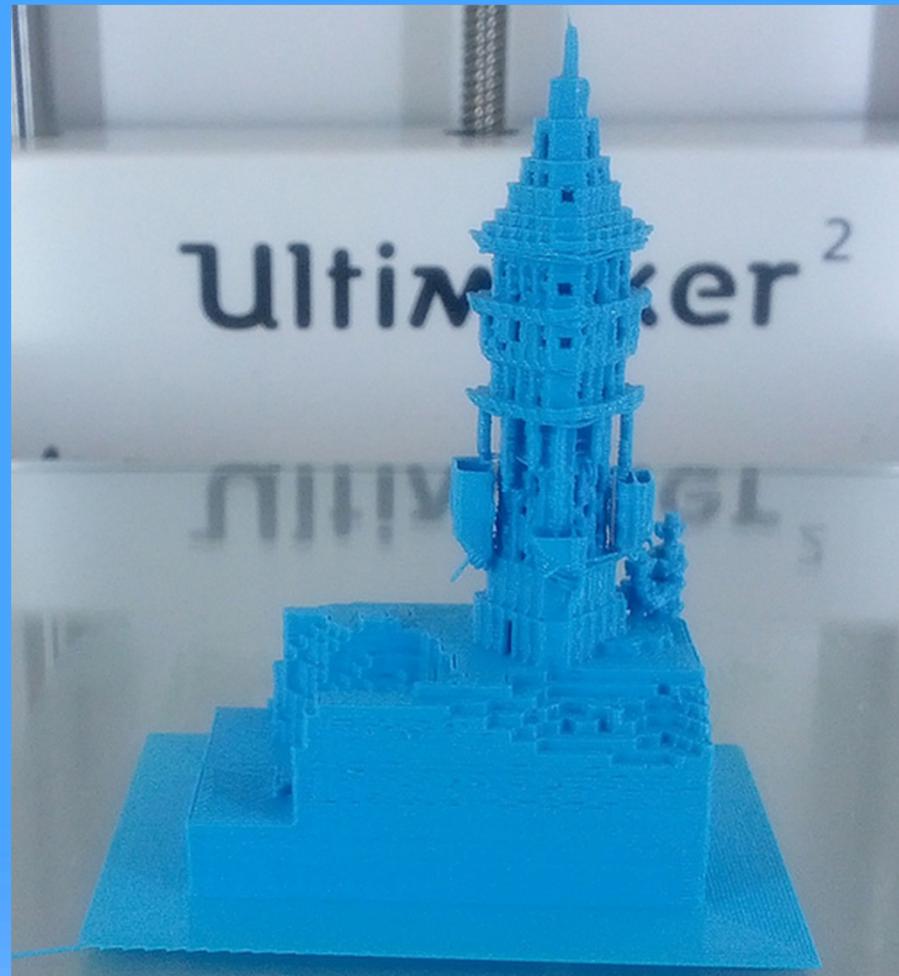
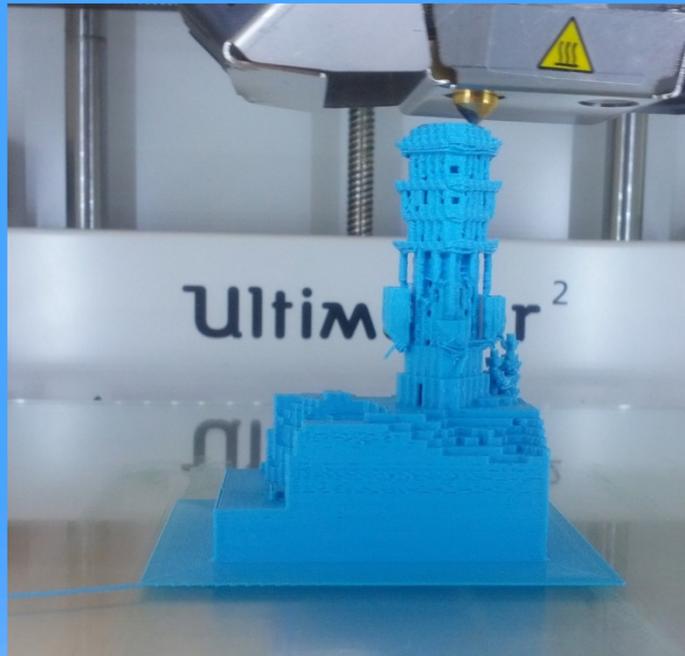
# Printing a Model

Each slice is then filled in by the 3D printer, layer by layer.



# Printing a Model

Can take awhile.



# First 3D printing of Minecraft

Minecraft and 3D printing look like a great fit.

Minecraft.print() by two students at MIT, 2011:



# Mineways

- Free program I wrote for fun.
- Select a “box” in your world to create a model.
- Export the model to get a file. This model is (usually) watertight.
- Print on a 3D printer.



# Demo



# Materials

Plastic, metals, ceramic, sandstone, chocolate, rubber, even liver. More new ones all the time!

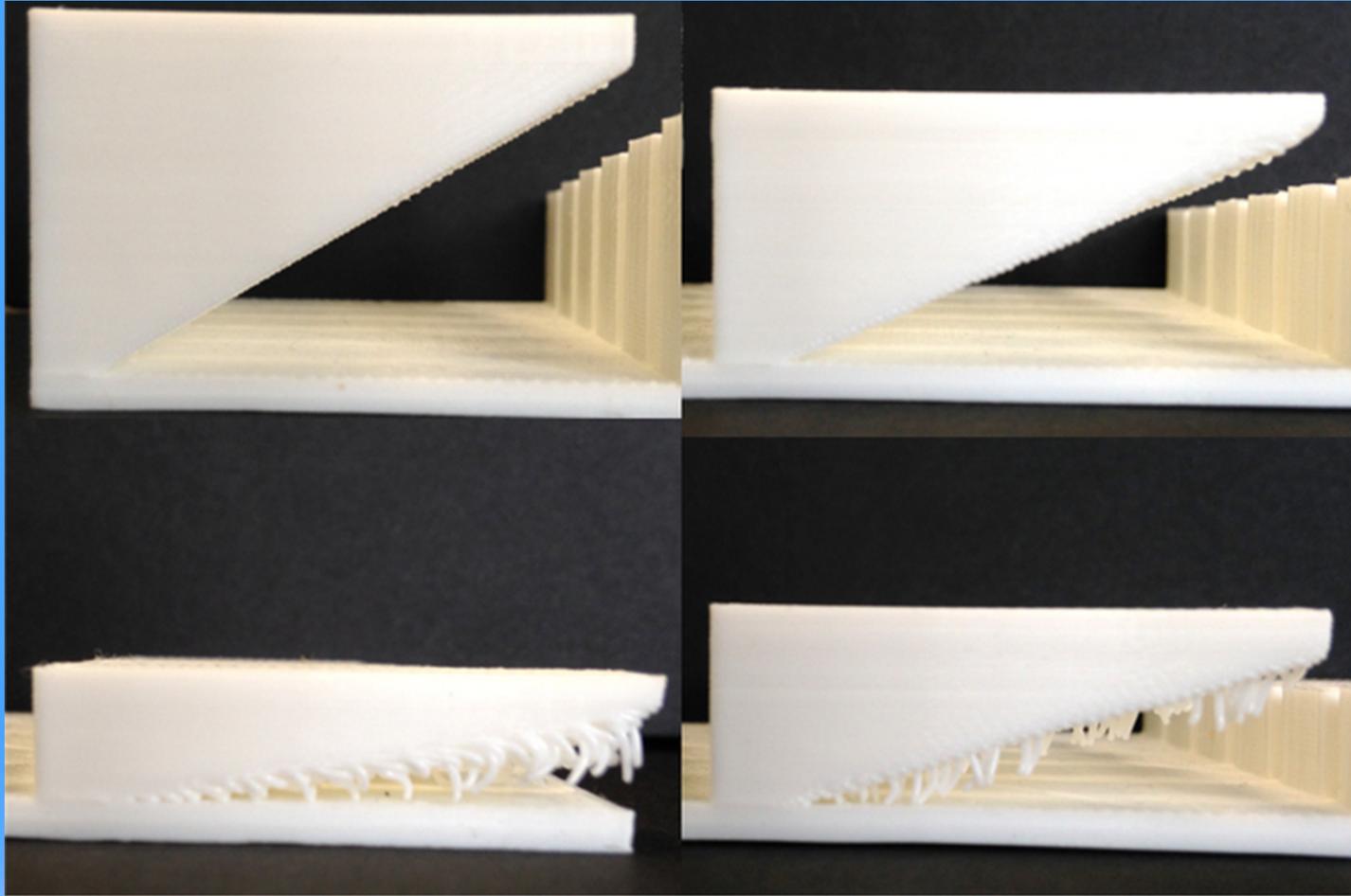
Would  
toothpaste  
work?



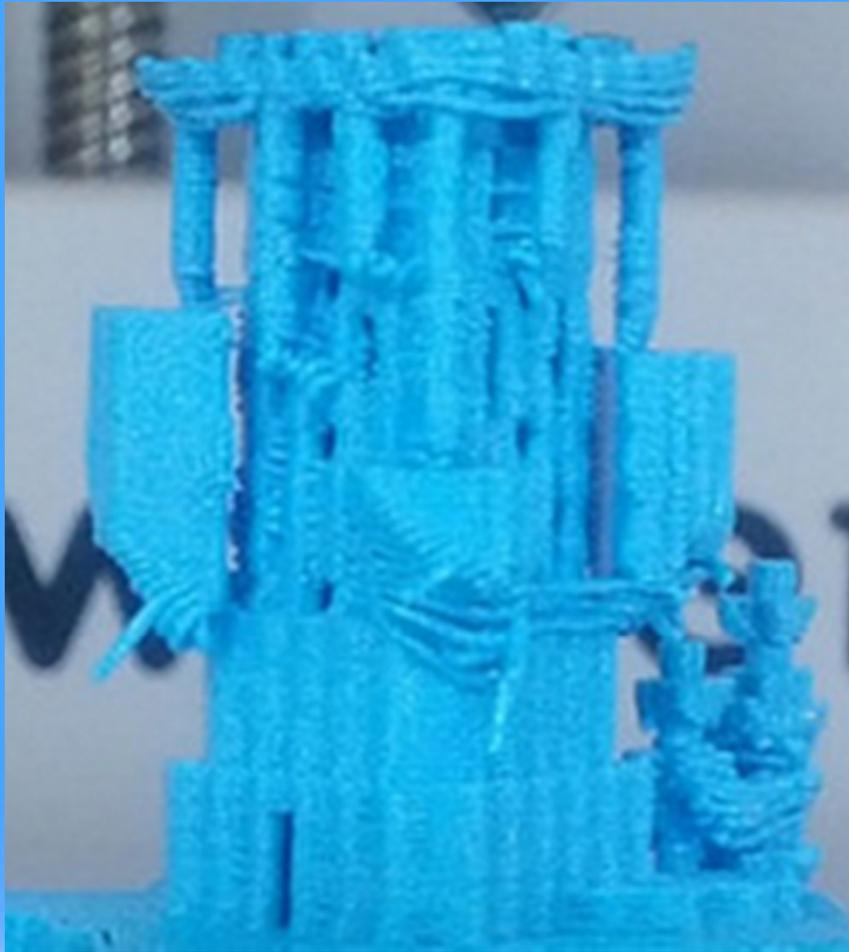
# Toothpaste Minecraft



# Try to Avoid Overhang



Or Else...



# Try to Avoid This

Long overhangs can droop.

Doorways and windows can be OK – “bridging”.



# Definitely Avoid This

Avoid putting blocks that have nothing below or next to them.



The 3D printer here can't print these without adding "support" underneath.



# Your Turn!

- Avoid a lot of overhang – fill things in, build straight up.
- Export using Mineways (we'll help!) – uncheck “Hollow parts” near bottom right of options.
- Preview your model with a viewer – double-click on the file you make.
- Send to the 3D printer! We'll help you copy the file over.



# Wall Thickness

Unlike Minecraft, if you make things in the real world, they might not work.



# Floating Object Problem

Things float in Minecraft. Sometimes this is not obvious.

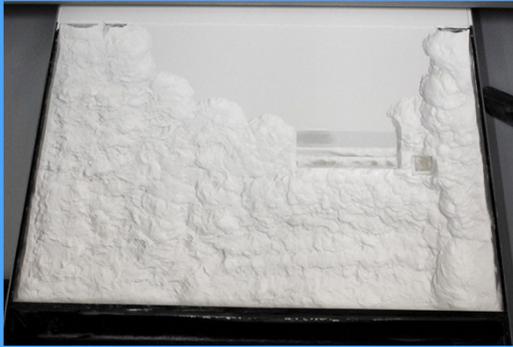


Mineways tries to help by adding blocks to glue floating pieces to other pieces.

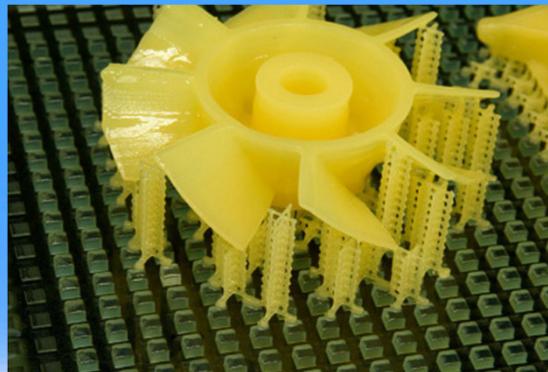


# Overhangs Can Be Fine

Some 3D printers need no support structures:



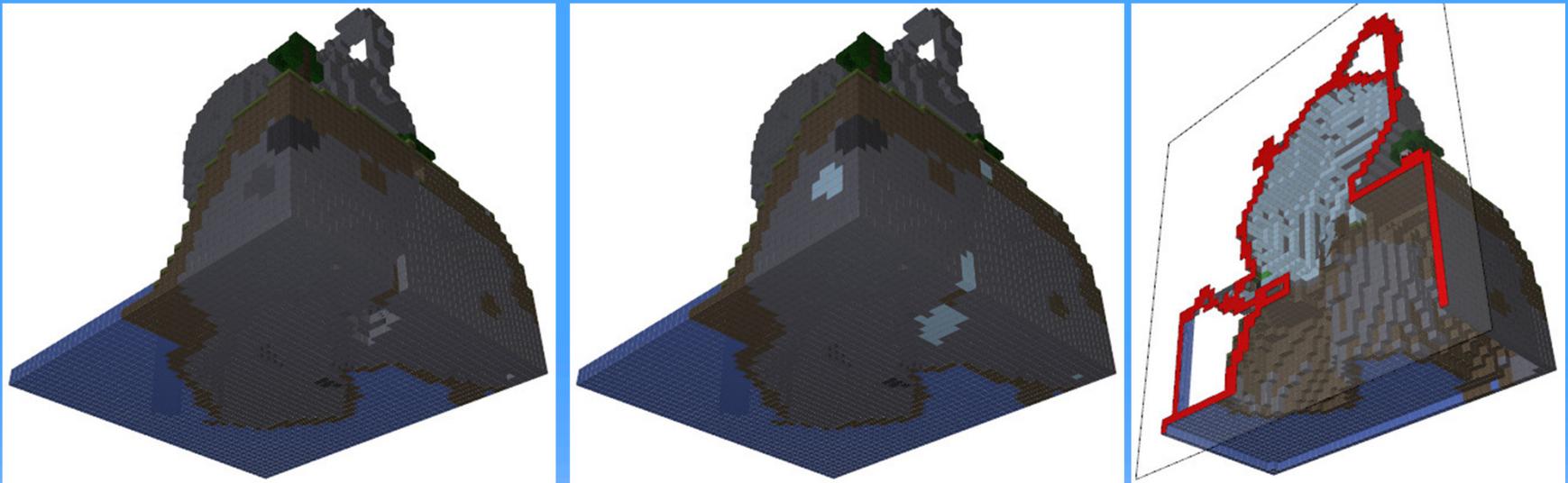
Some printers do:



# Don't Print What You Can't See

Hollowing can cut costs by 3x or more.

- My trick is to fill in all interior “bubbles” found, then hollow out the single solid mass.



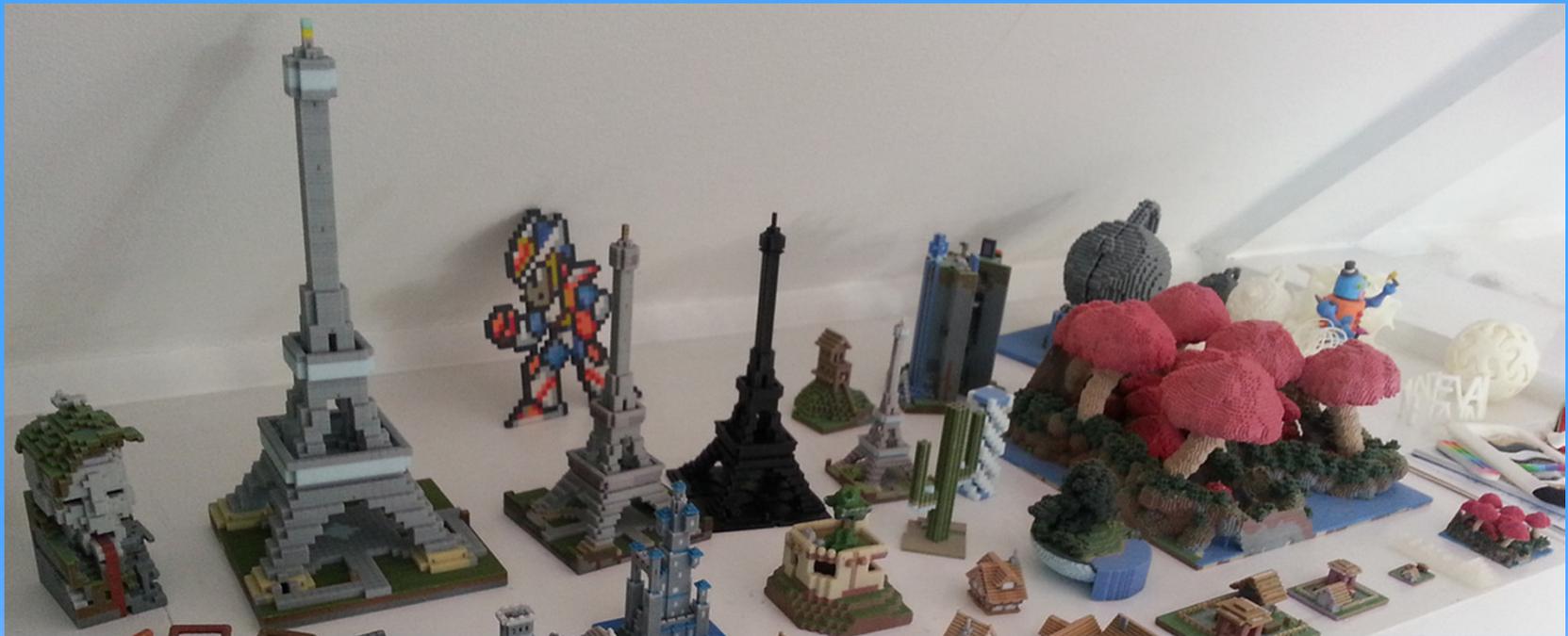
# Big is Fun

But, larger costs more.



# Eiffel Quiz

How many 6 inch Eiffels together weigh the same as a single 12 inch Eiffel?



# Smaller is Cuter is Cheaper is Faster

Also, complexity is free!



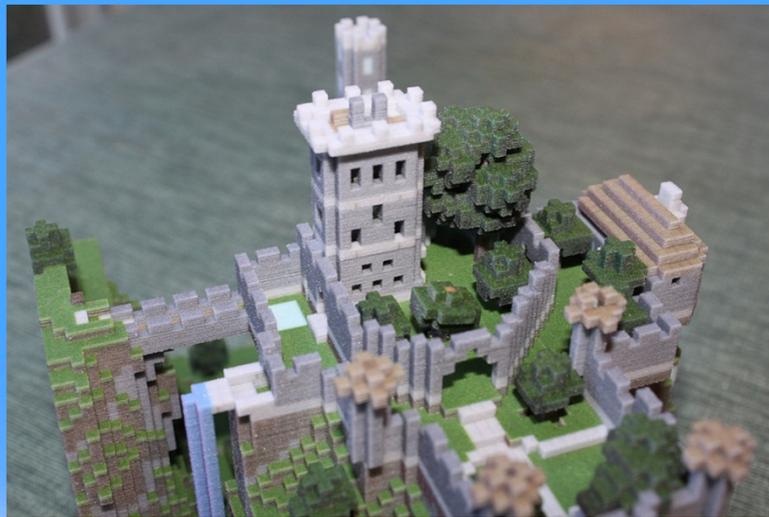
# Some Examples



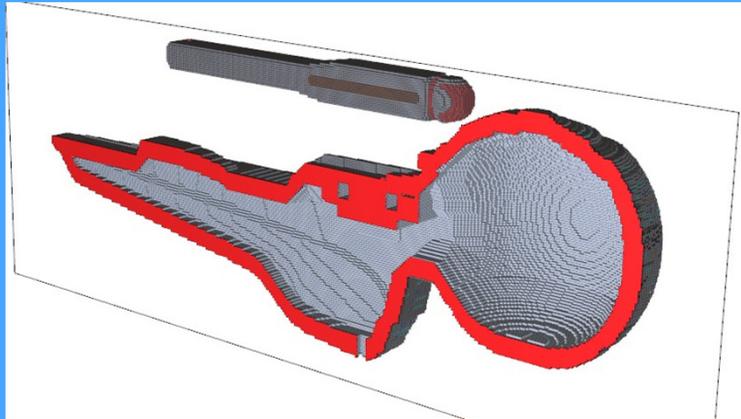
*Sentinel Castle, by Mauricio Vives*



*World in a Bowl, by Nefashu*



# Still More Examples



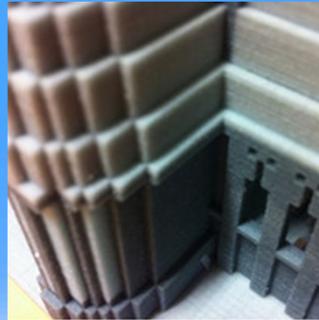
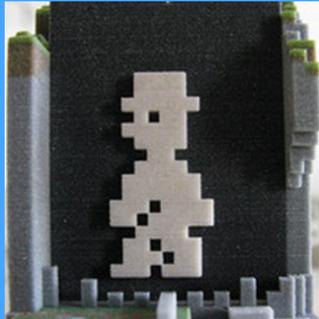
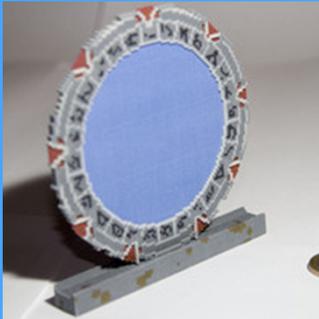
*Olympic starship, by Momentaneously*



*Chainlandia, by combineelite*



# And More



# And You Can Make Pictures



*Image made with Arnold, by Estopero. Appears on the cover of "3D Artist" magazine.*

# A Practical Use



Northwestern University Campus, by Ben Rothman

# A Practical Use



Ford Engineering Design Center, by Ben Rothman

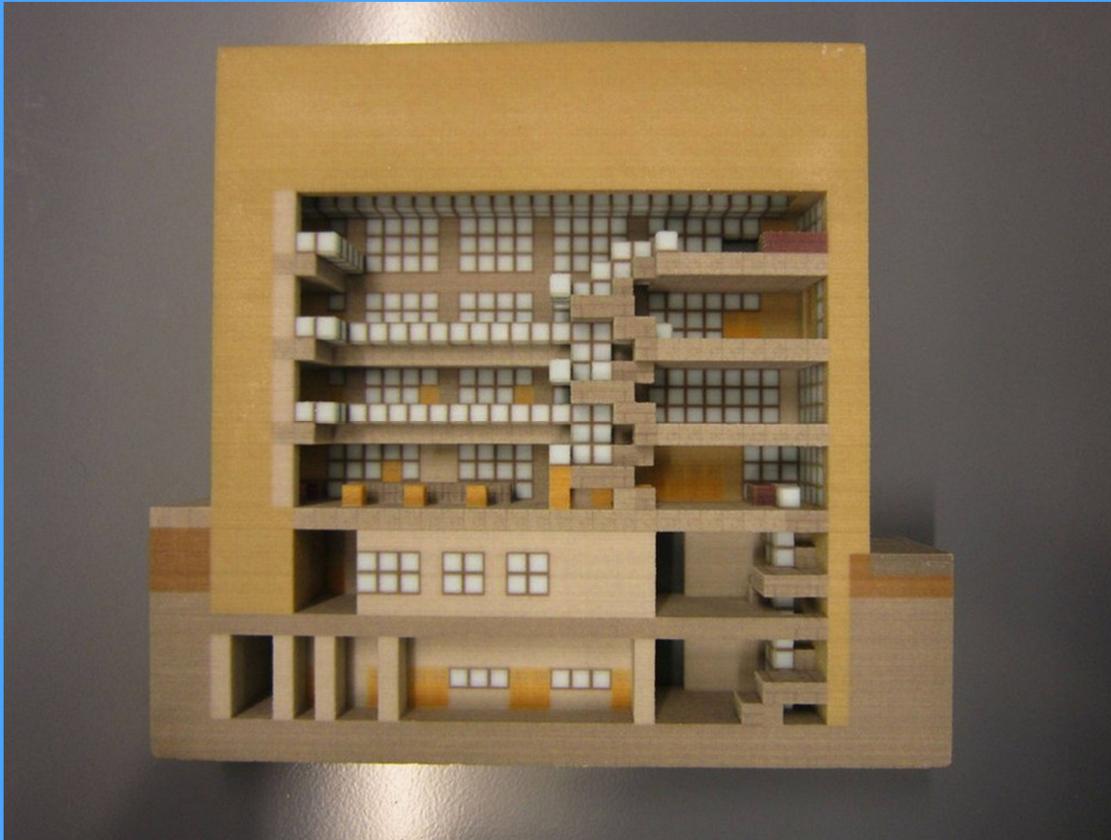


# A Practical Use



Ford Engineering Design Center, by Ben Rothman

# A Practical Use



Ford Engineering Design Center, by Ben Rothman

# Or, the Whole Campus...



Northwestern University, by Ben Rothman



Or, the Whole Campus...



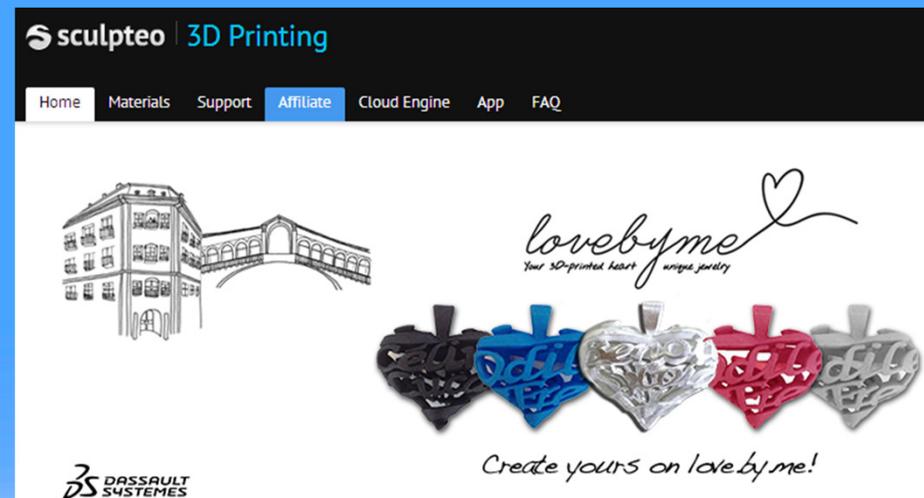
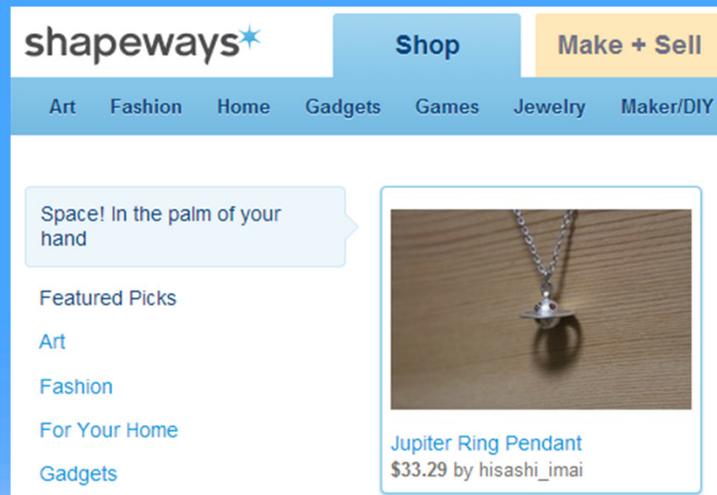
Northwestern University, by Ben Rothman



# No Printer?

I don't have one, either. I use two print service firms:

- Shapeways: cheapest, and slowest
- Sculpteo: more expensive, faster



# Pro Tips for Mineways

- The “[” and “]” keys adjust the selected bottom level up and down.
- Middle-mouse can also select height.
- Control-X: eXport again with same options.
- Import Settings lets you load a previous exported file for its settings.
- Color Schemes let you remove various types of blocks.

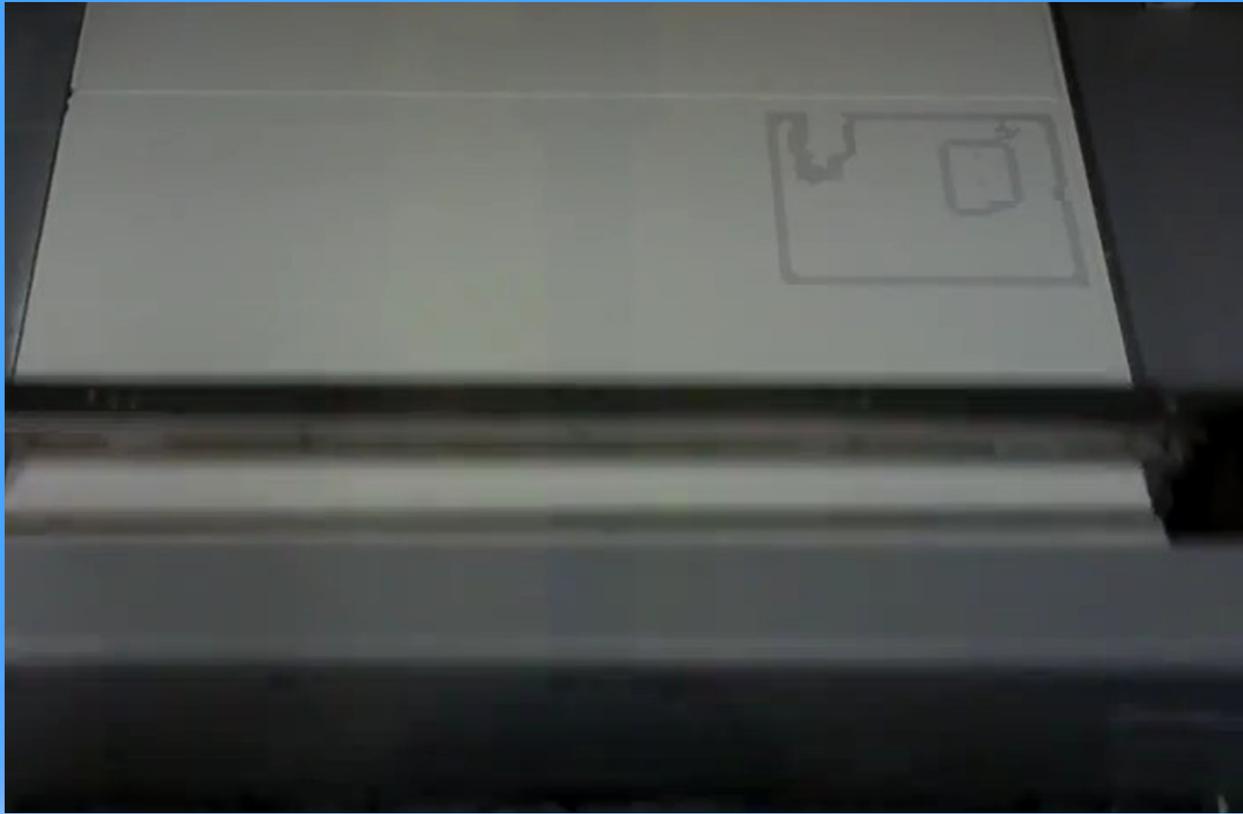


More at [mineways.com](http://mineways.com)



# Additive Manufacturing

Here's one type of printer, it lays down layers:



# Then Subtractive

Then you dig your model out:



# More Subtraction

Then vacuum it:



# A Bit More

Then clean with pressurized air:



# The Last Step

Then douse with superglue.

