

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...

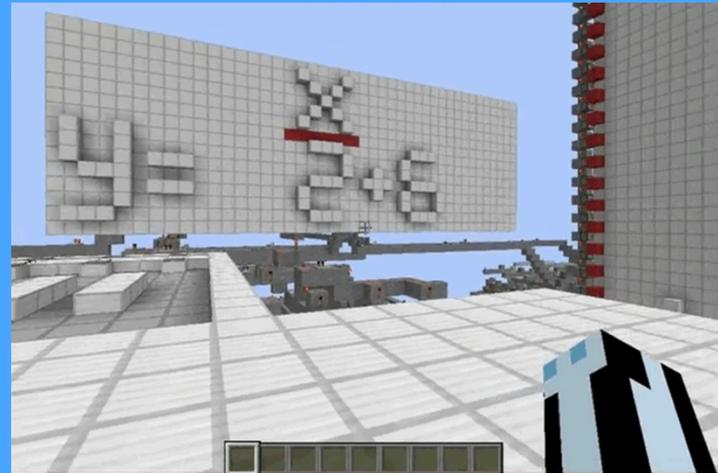
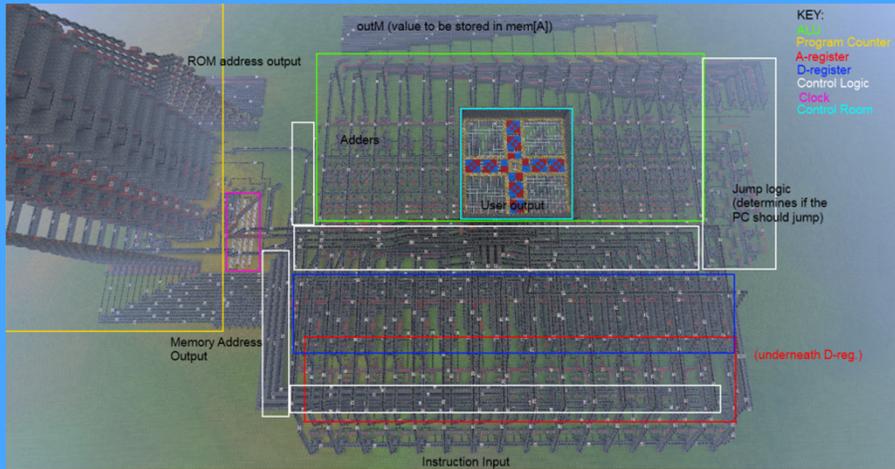


Many Block Types



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”.

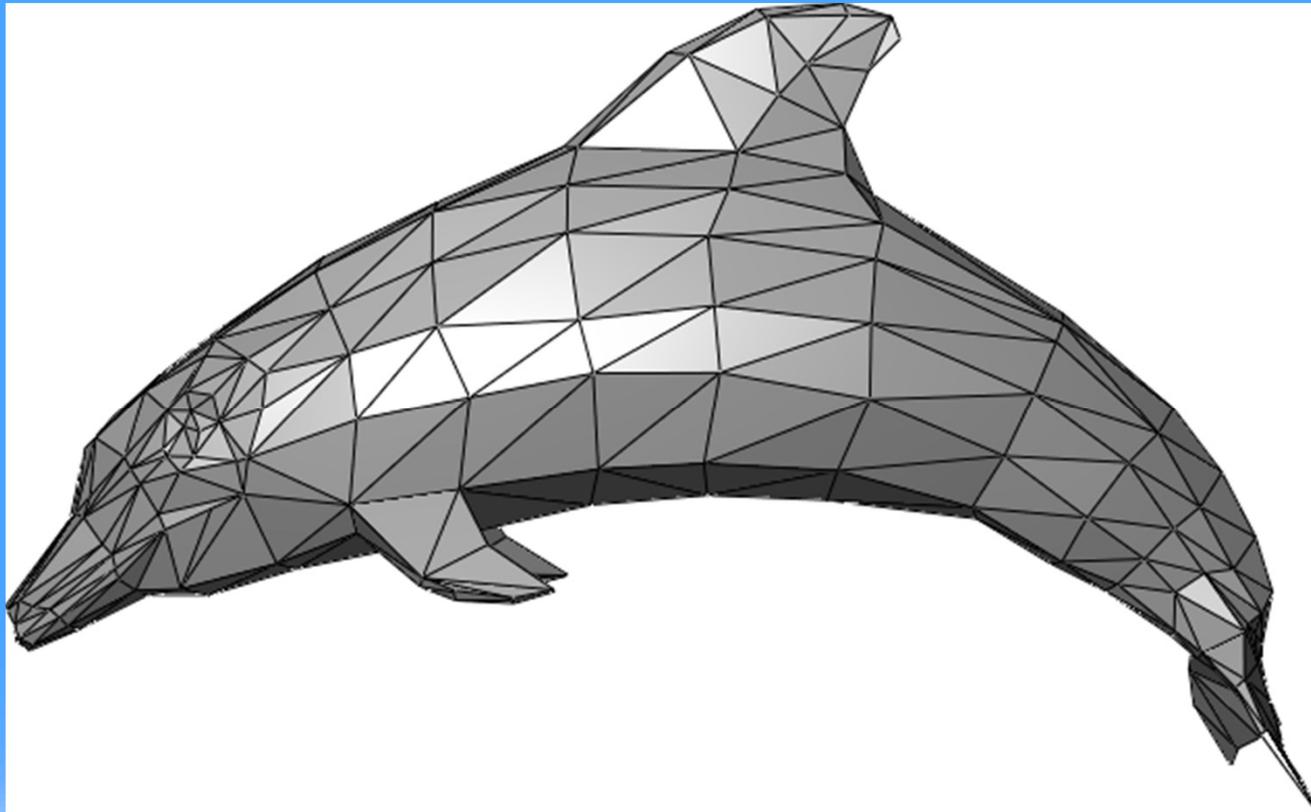
You tell the 3d printer which blocks you want filled in.
Think of very tiny Lego blocks.

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



Models for 3D Printing

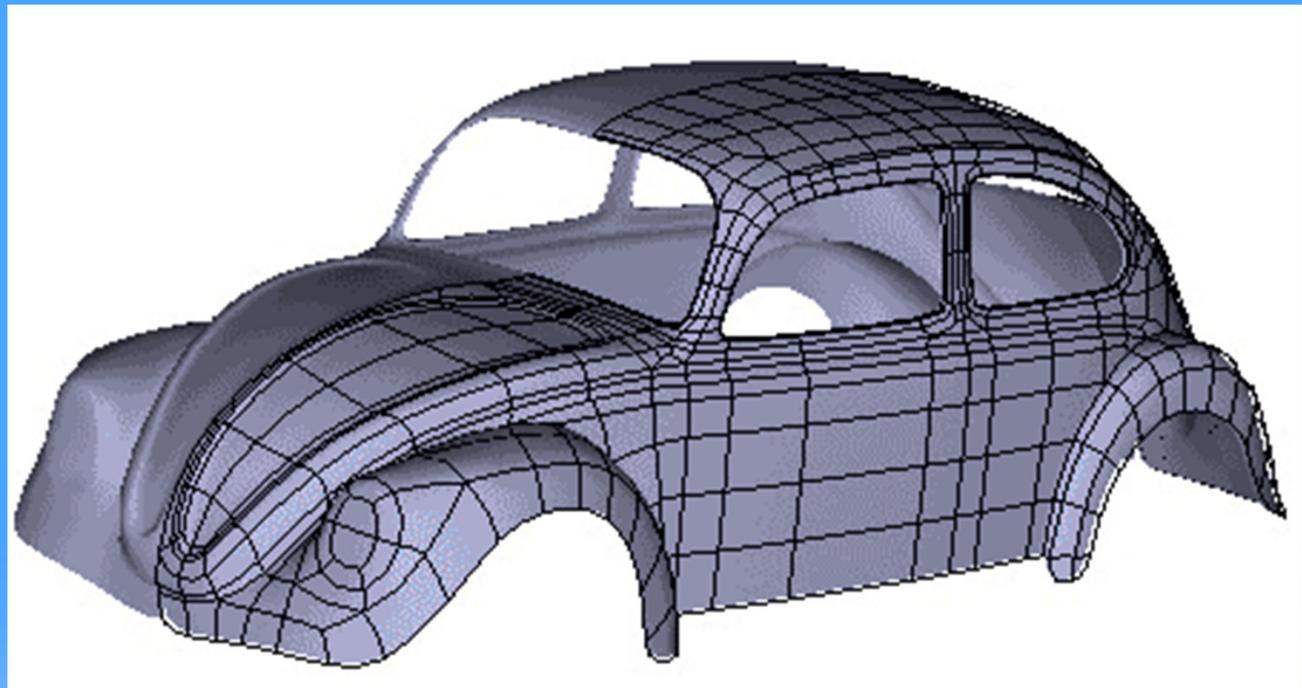
It's all just triangles!



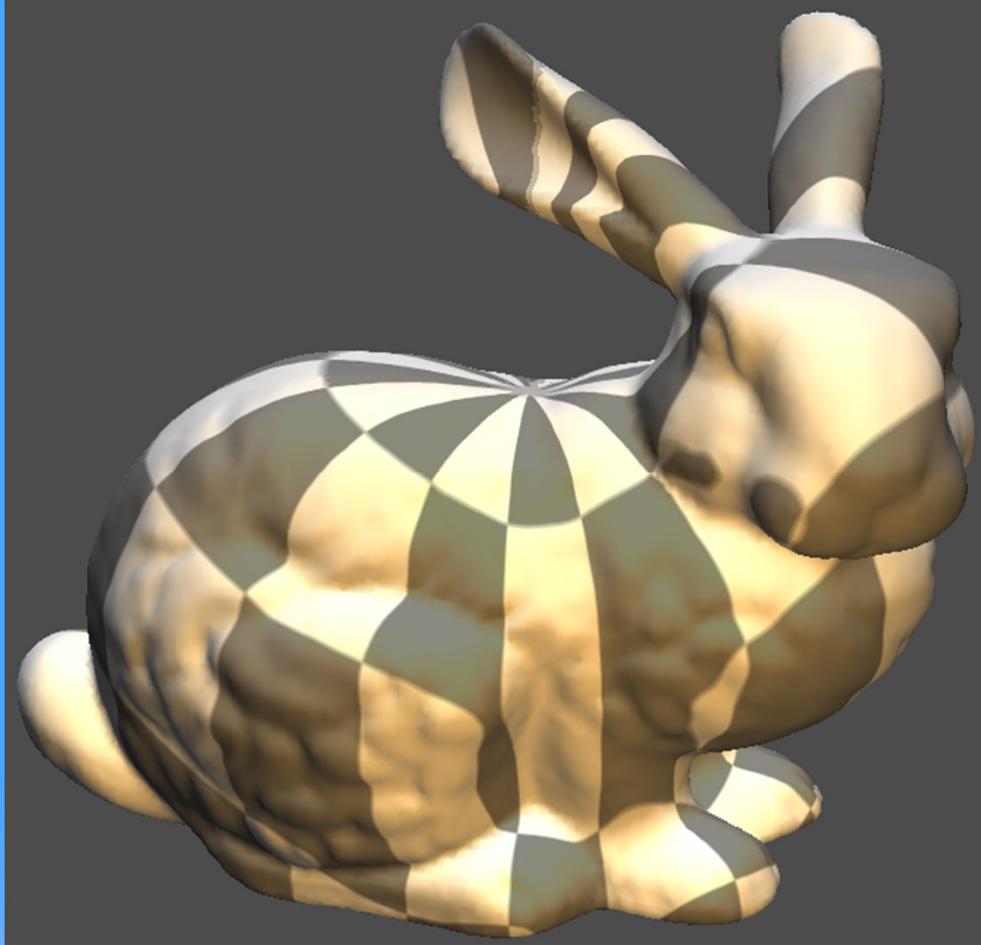
Watertight Models for 3D Printing

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

This one isn't solid.



Solid Model



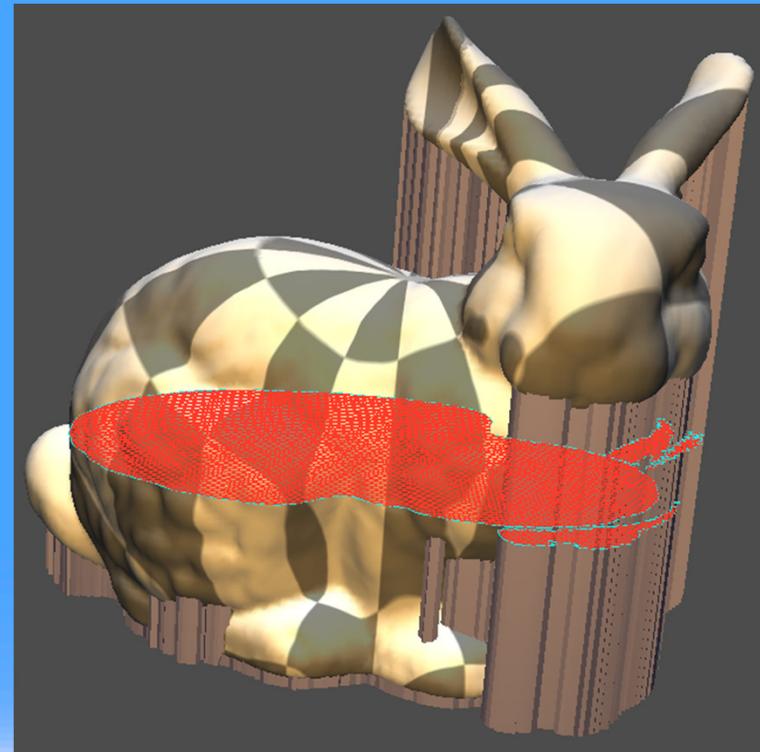
This model of a bunny is solid.

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

Preparing a Model

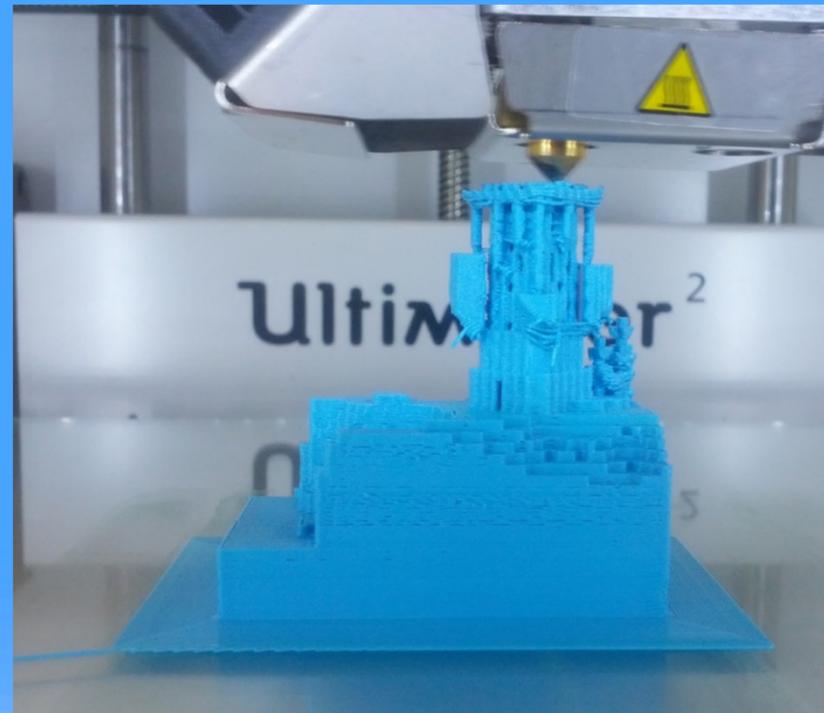
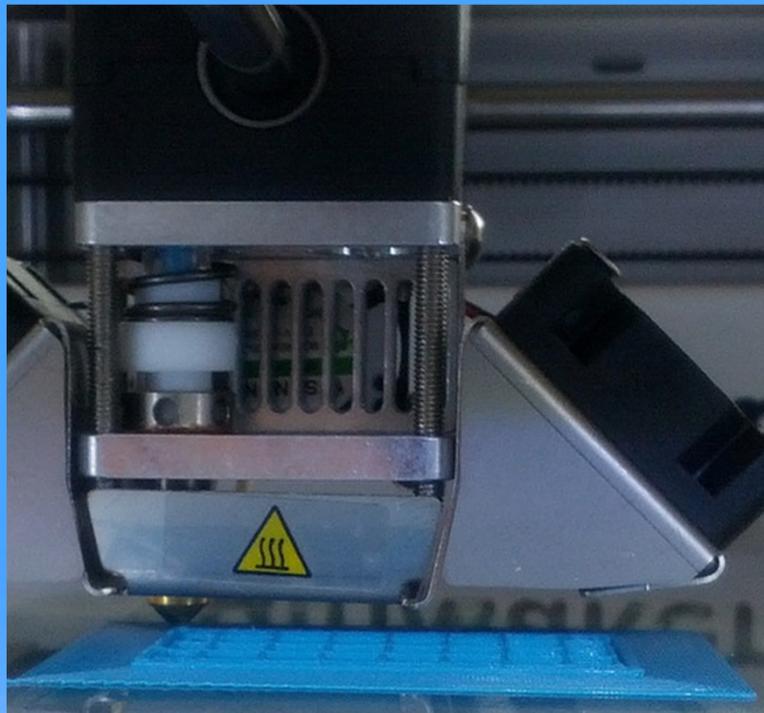
This model is then turned into horizontal slices, like a sideways deli meat cutter.

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



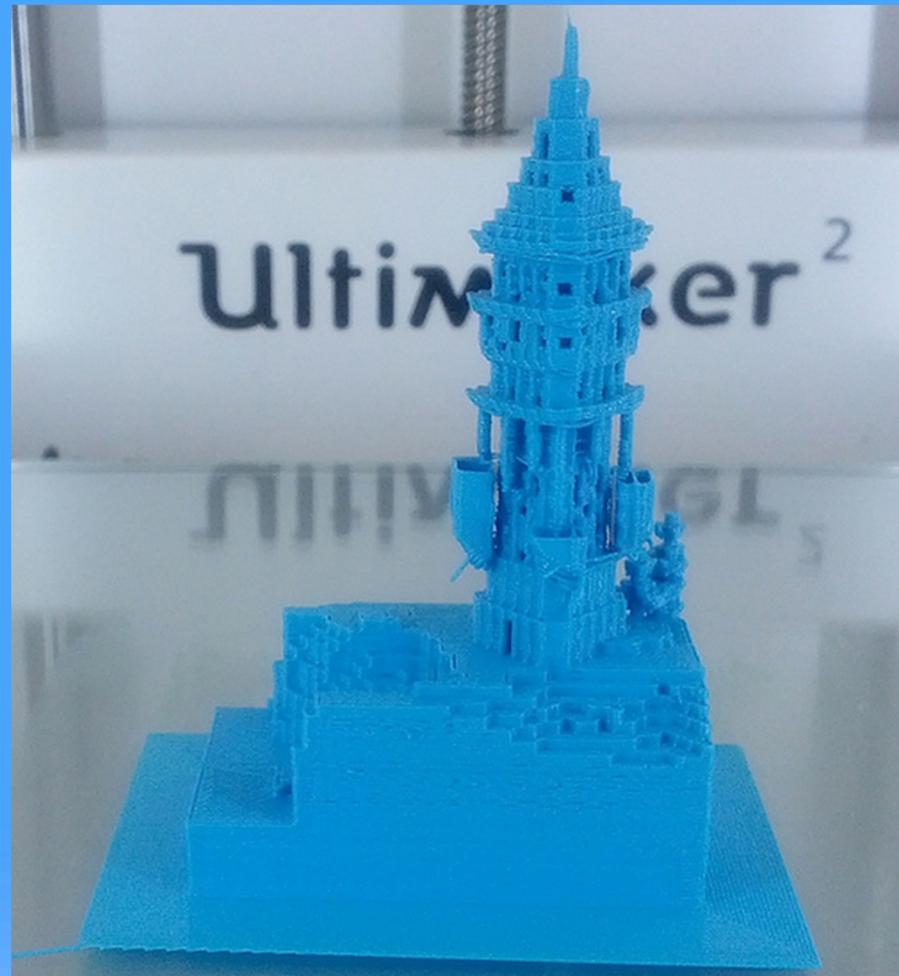
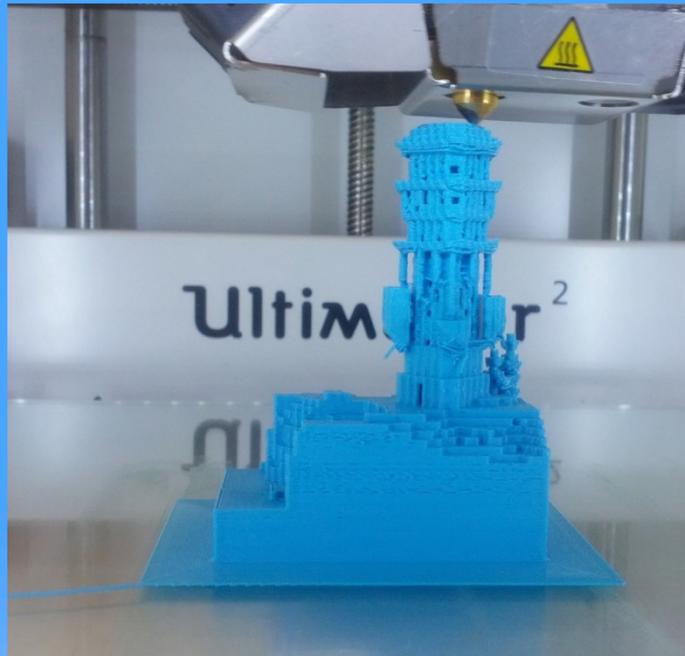
Printing a Model

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!

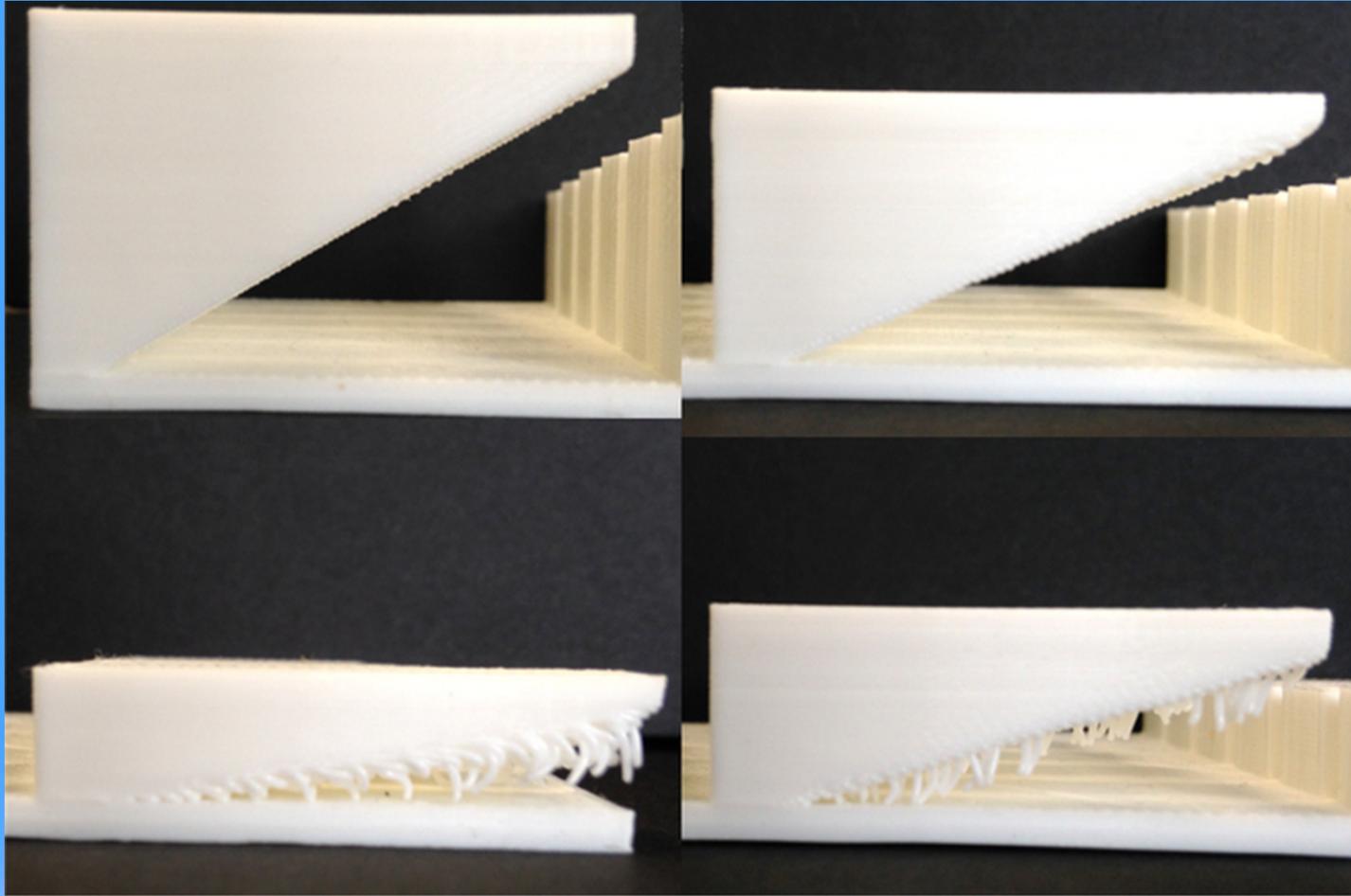
Would
toothpaste
work?



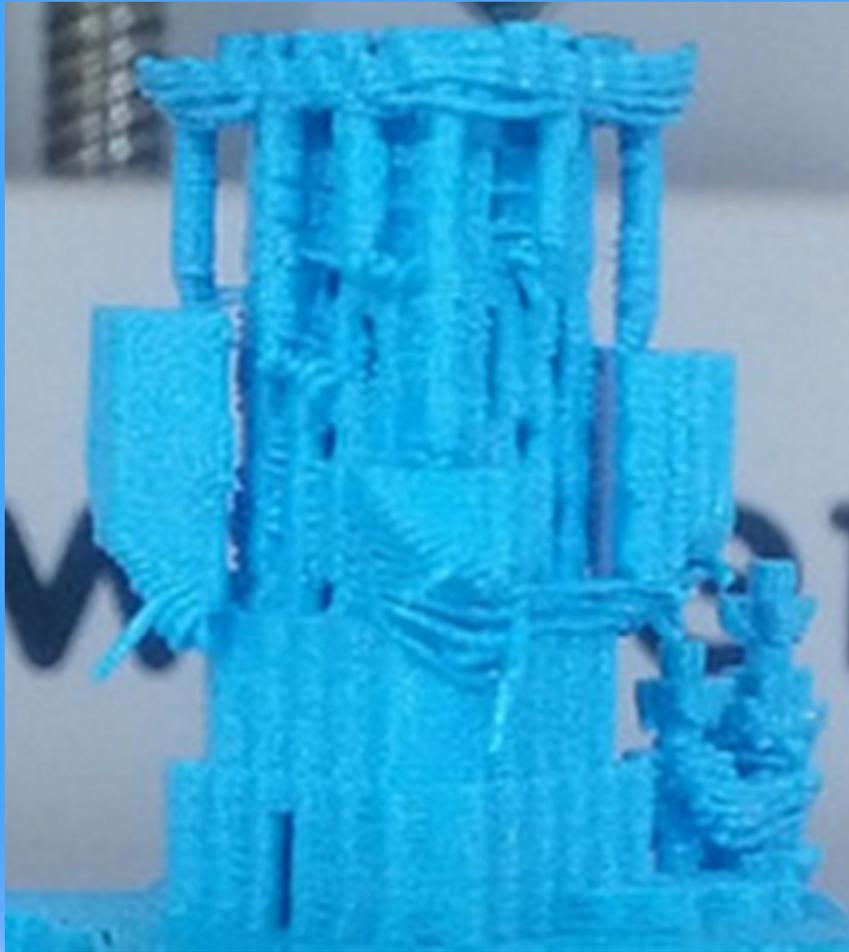
Toothpaste Minecraft



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.

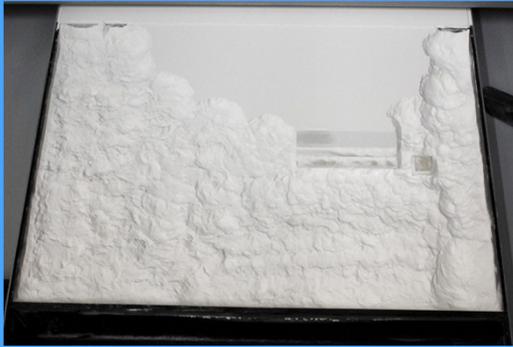


Mineways tries to help by adding blocks to glue floating pieces to other pieces.

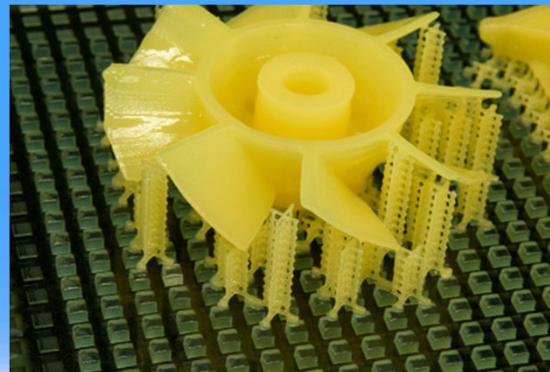


Overhangs Can Be Fine

Some 3D printers need no support structures:



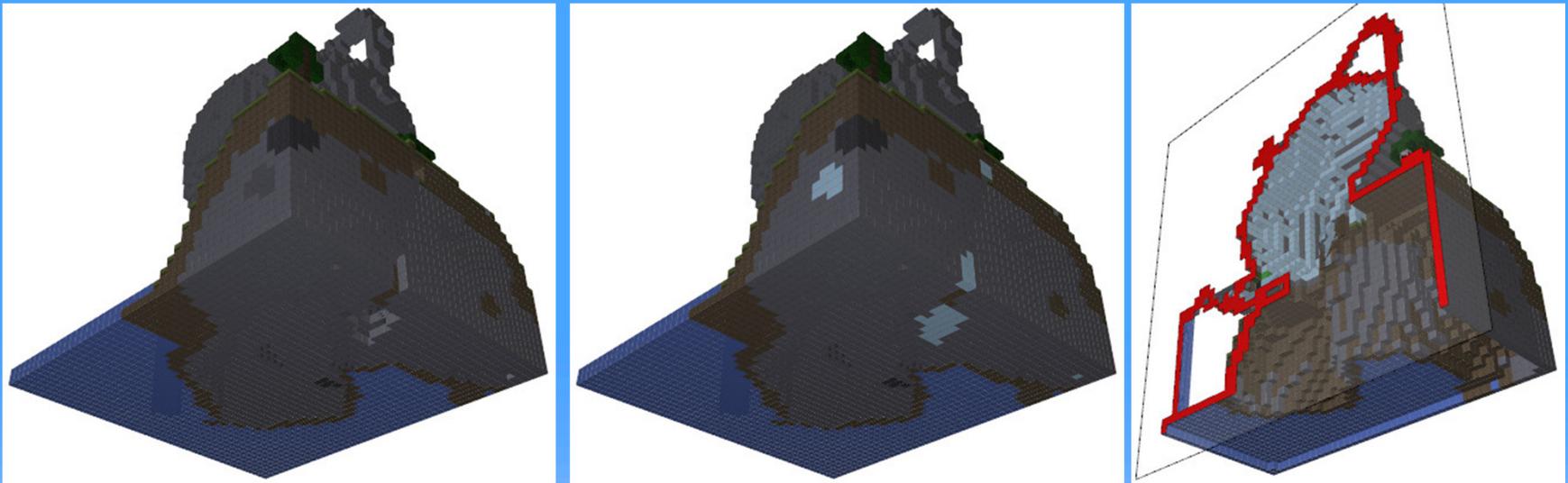
Some printers do:



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.



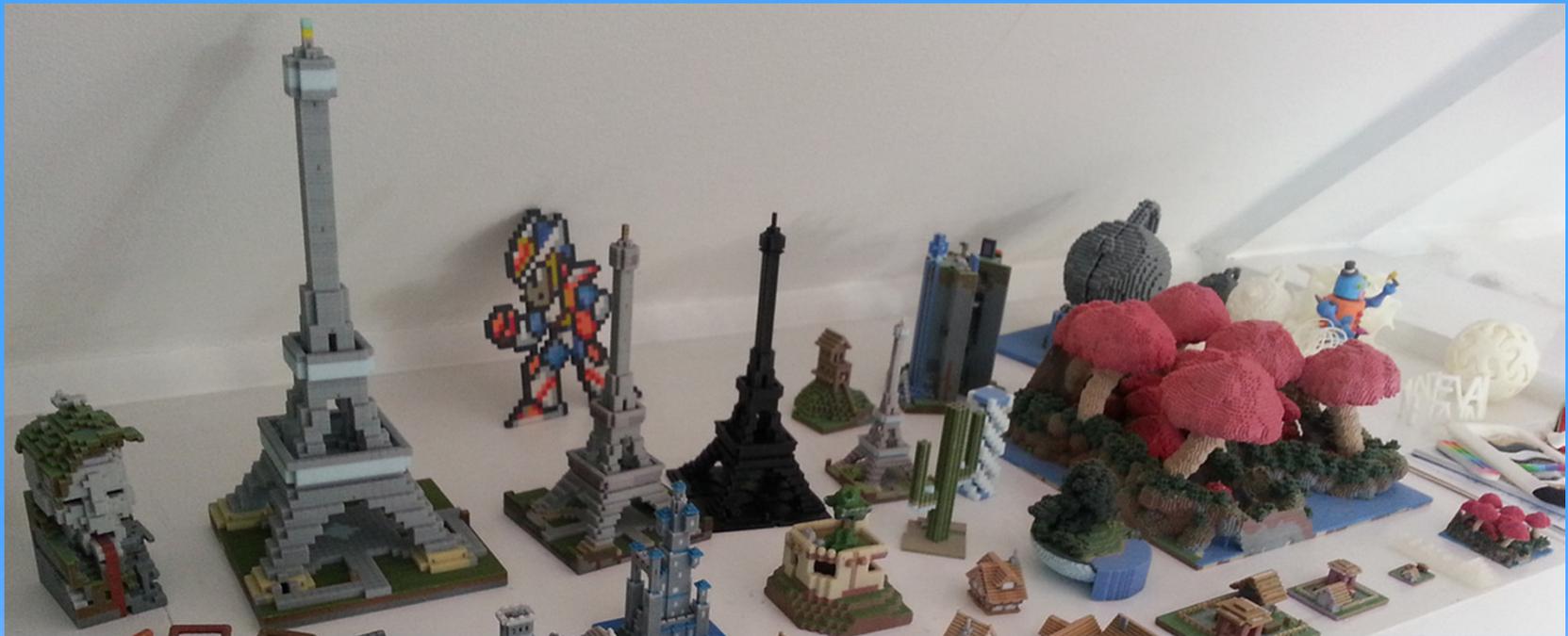
Big is Fun

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!



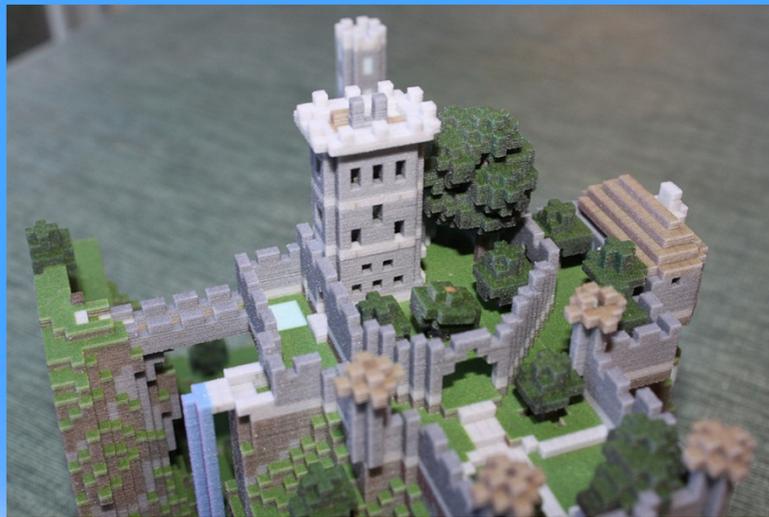
Some Examples



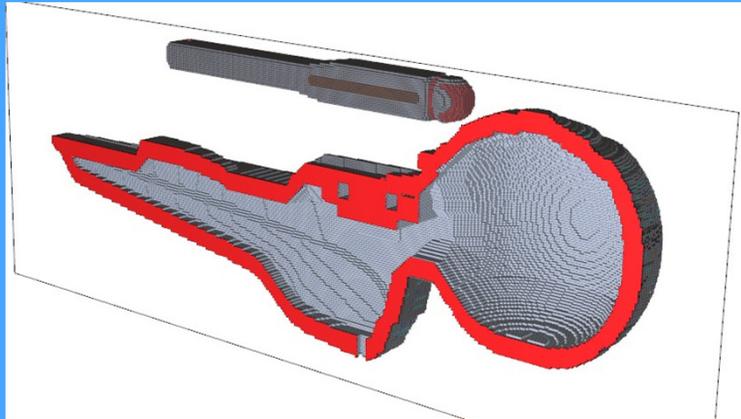
Sentinel Castle, by Mauricio Vives



World in a Bowl, by Nefashu



Still More Examples



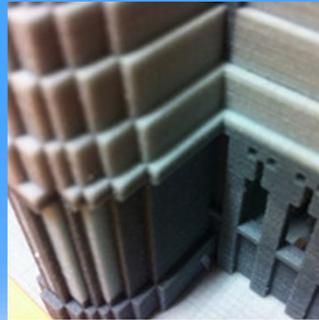
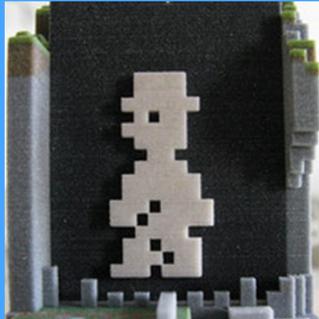
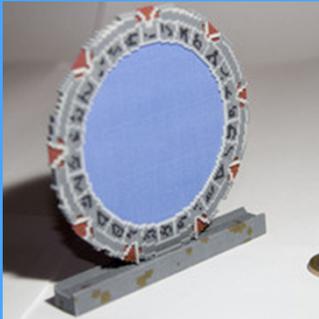
Olympic starship, by Momentaneously



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...



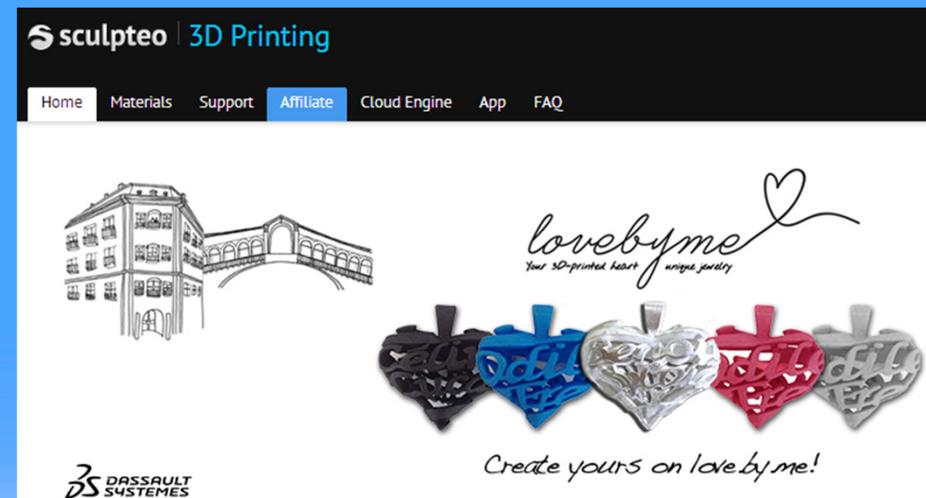
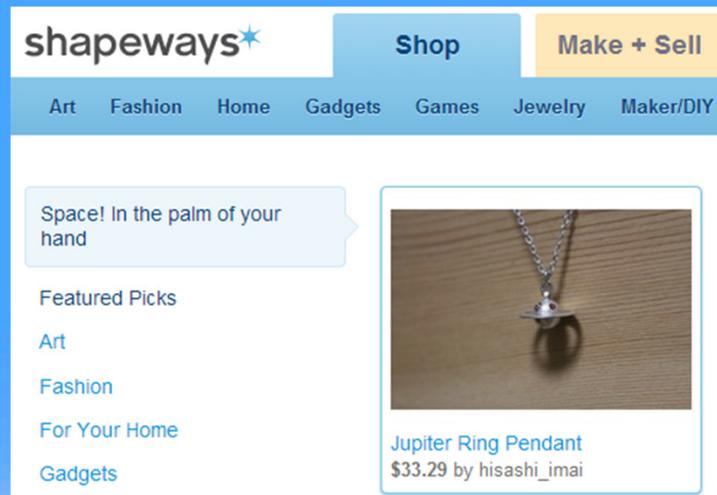
Northwestern University, by Ben Rothman



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.

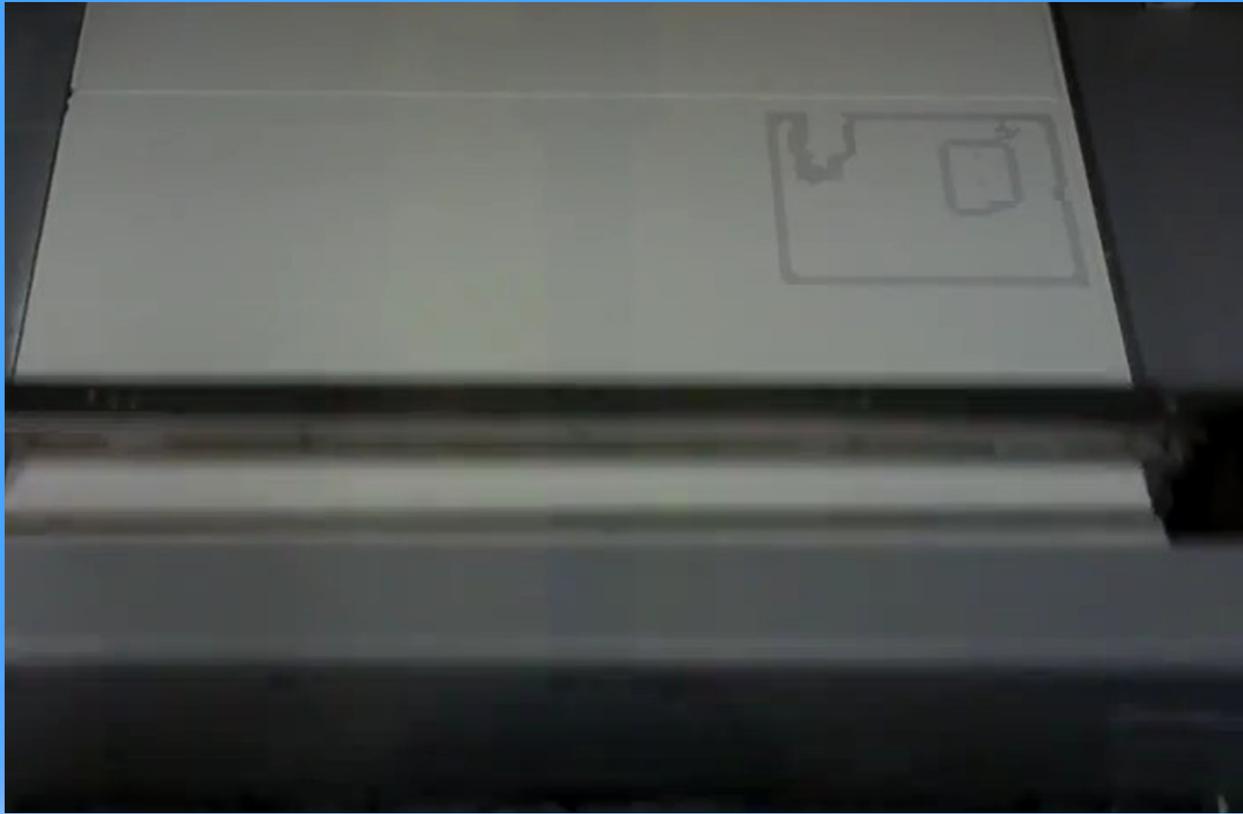


More at mineways.com



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.

