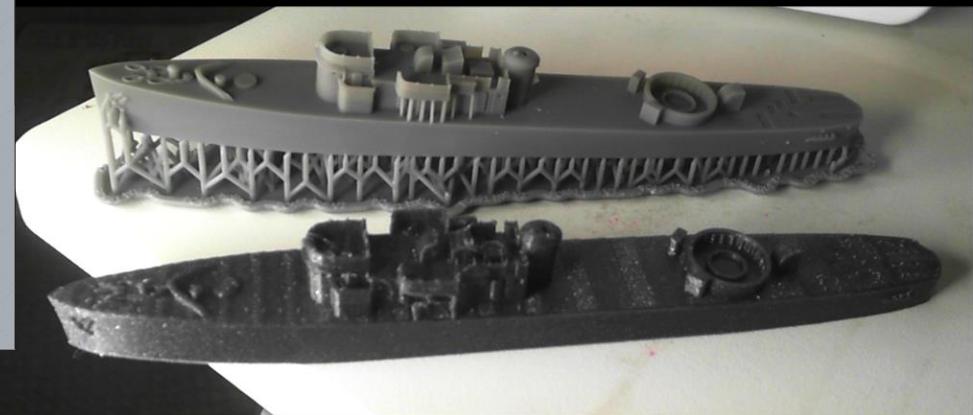
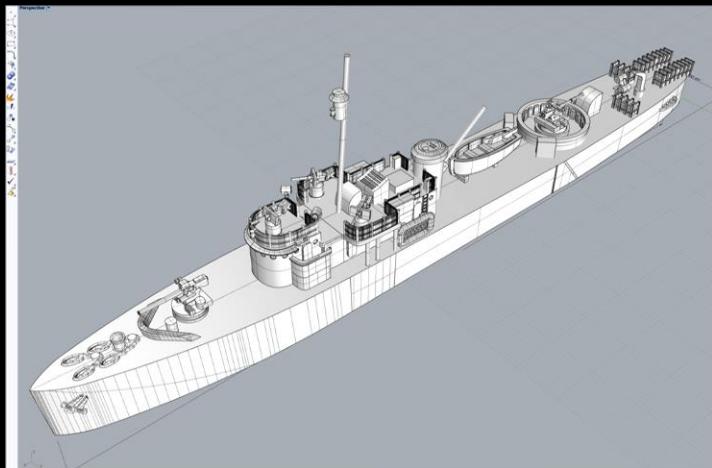


# CODEMASH MAKER LAB SERIES

From Idea to Physical:

An overview of the world of CAD and 3D printing.

Presented by Brian Carnes



# YOUR GUIDE TODAY: BRIAN CARNES

- A professional creative with a background in art and technology
- Long-time advocate for learning to make things, 3D printing, and other emerging technologies.
- Owns Sea Dog Game Studios, which makes tabletop games
- Owns Valkyrie Pewter, makers of Renaissance figures and jewelry.
- Transitioned his design studio from traditional hand sculpted/molded products to a much more customer reactive 3D-printed model.
- Brian owns /operates a farm of 3D printers of several types and uses them to make products for retail sale.
- Brian is an expert in 3D printing technology and CAD applications as well as 3D printer related software.
- Consultant to companies looking to use additive tech to transition legacy methods
- Freelance Rhino3D Digital Sculptor with clients in the tabletop gaming industry noted for both sci-fi and historical projects

## CONTACTS AND LINKS!

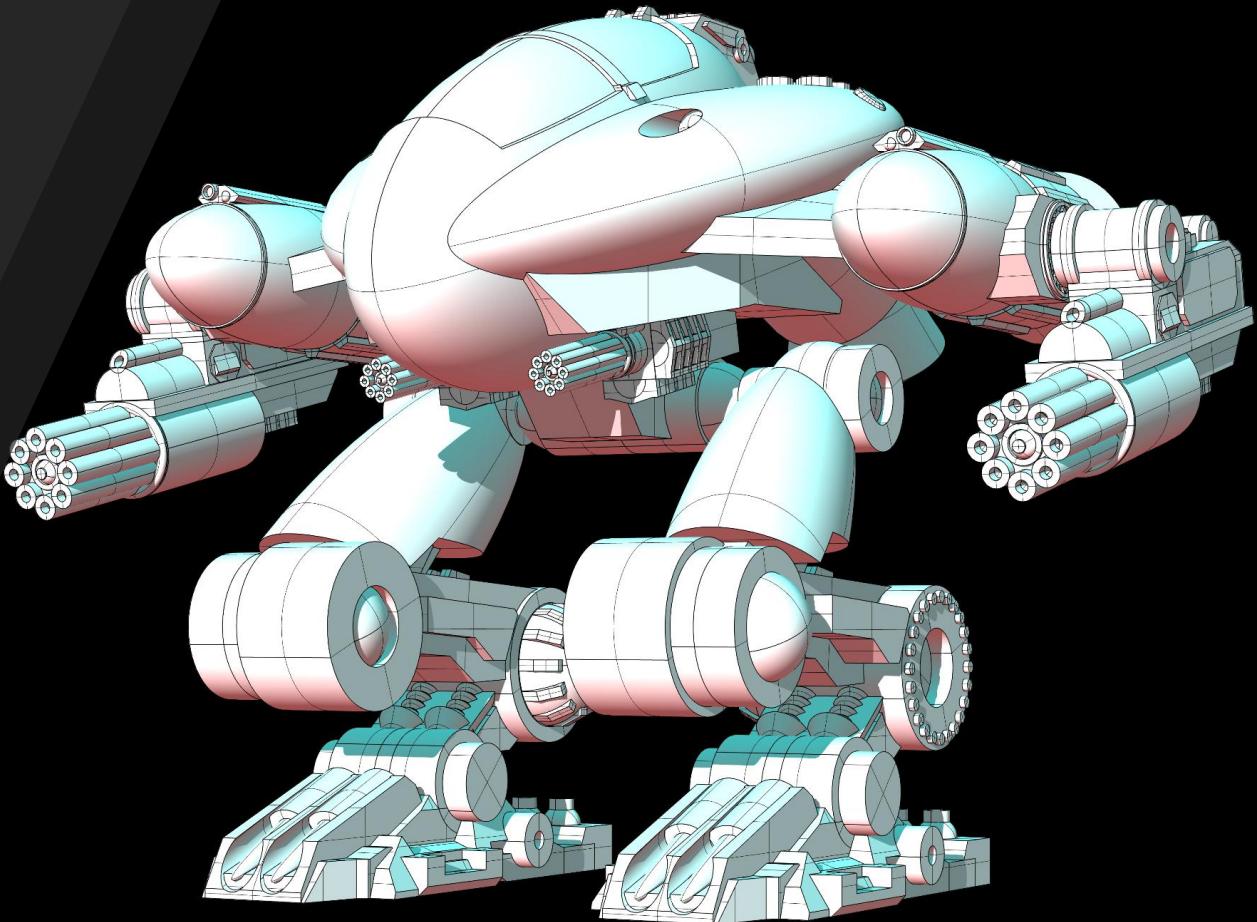
- Email: [Becarnes@gmail.com](mailto:Becarnes@gmail.com)
- Instagram @seadogbrian
- <https://www.linkedin.com/in/briancarnes/>
- Discord SeaDogBrian#0339
- [www.seadoggamestudios.com](http://www.seadoggamestudios.com)



# Why are we here?

My goal today is to give you a broad overview of the world of CAD and 3D printing so that you can make your ideas into workable, printable prototypes, models, or products.

In short, I want to get you from an idea in your head or drawn on a napkin to a real physical thing that you can use, share with others, or even sell!



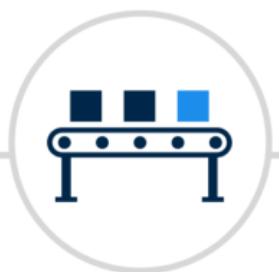
# Industry 4.0

## The Four Industrial Revolutions



### Industry 1.0

Mechanization and the introduction of steam and water power



### Industry 2.0

Mass production assembly lines using electrical power



### Industry 3.0

Automated production, computers, IT-systems and robotics



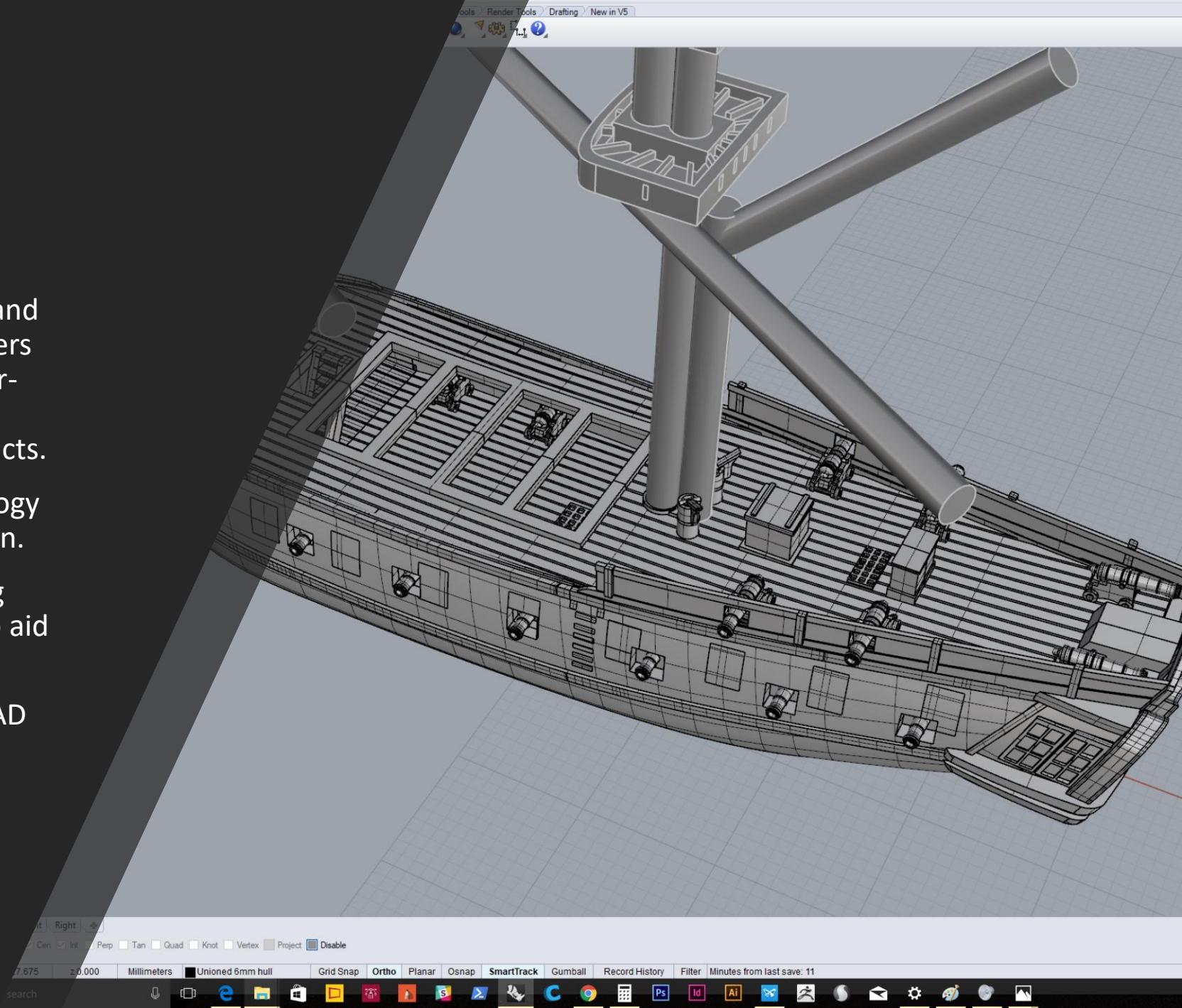
### Industry 4.0

The Smart Factory. Autonomous systems, IoT, machine learning



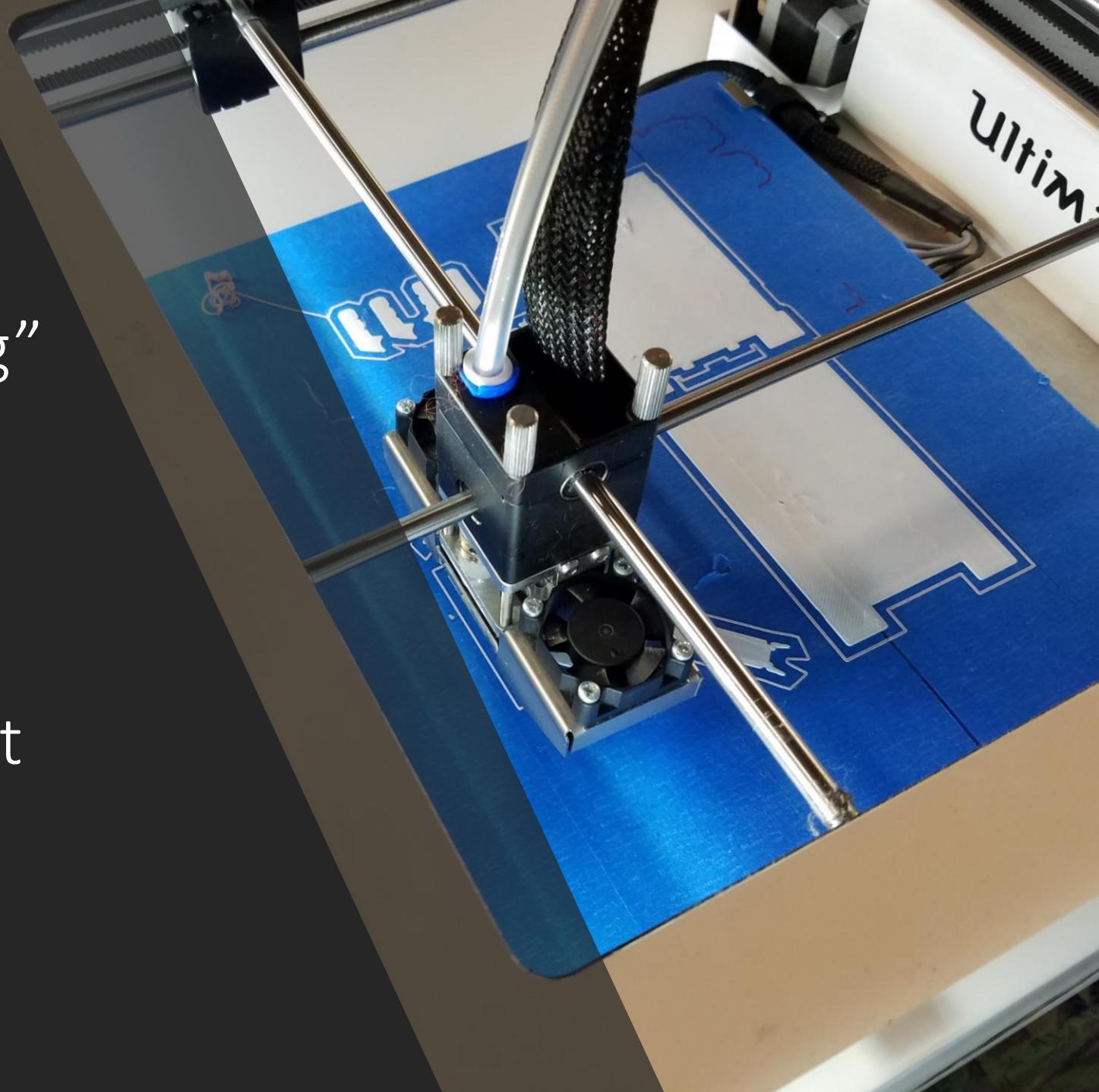
# CAD/CAM

- CAD/CAM (computer-aided design and computer-aided manufacturing) refers to computer software and computer-controlled hardware that is used to both design and manufacture products.
- CAD is the use of computer technology for design and design documentation.
- CAM is then, the extension of taking that design and using a computer to aid in its manufacture.
- We are going to learn how to use CAD to design a new thing then use 3D printing as CAM to make it.



All 3D printers are considered to be a form “Additive Manufacturing”

...meaning the printer builds the model up by *adding* material to it as opposed to cutting it out like the CNC or wood mills of old.



# This is the pipeline for getting something made

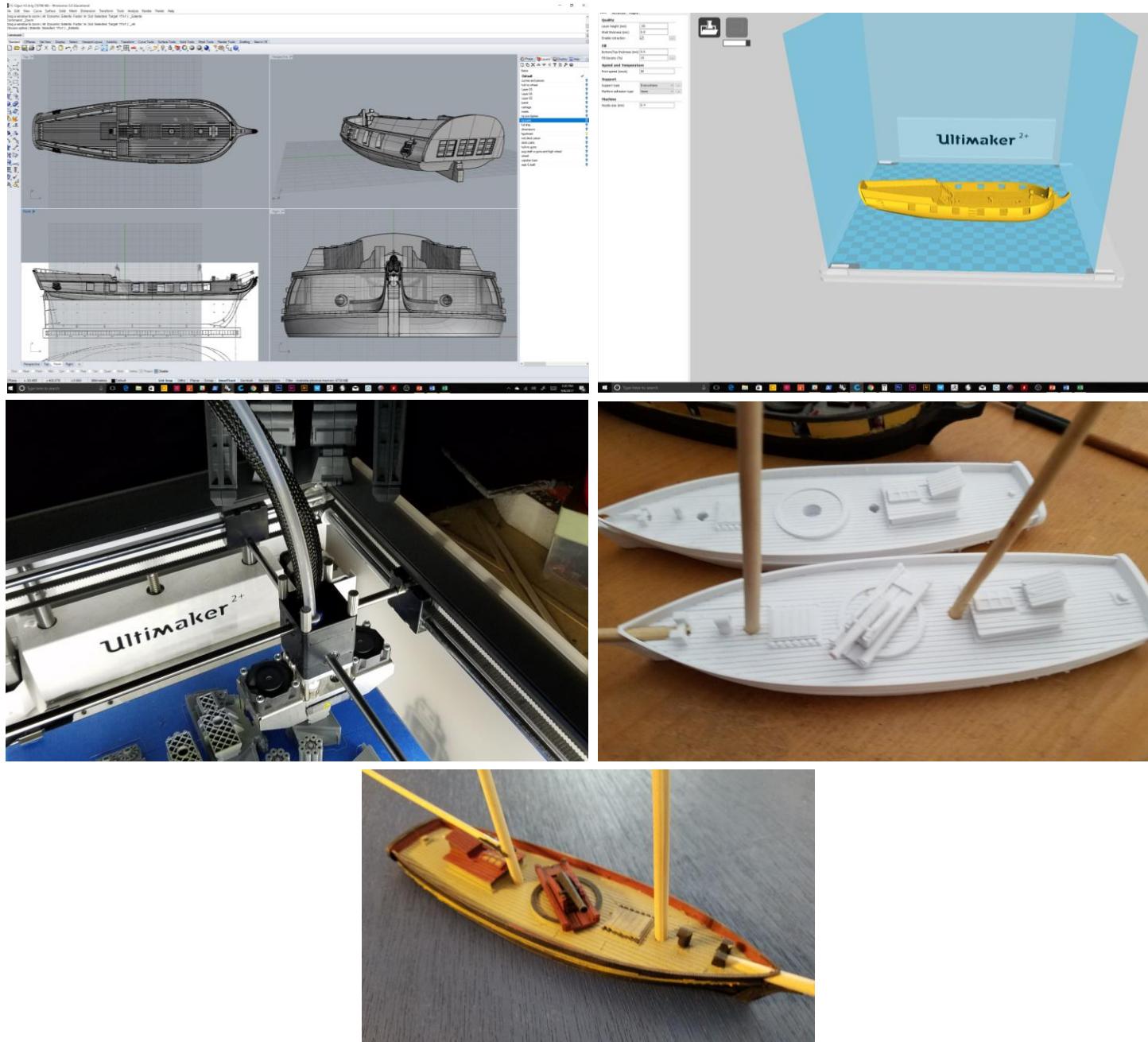
1. Find a thing online or make it in CAD.

2. Slicing. You need to then feed your model to a slicer that slices into something your printer can print

3. Printing it.

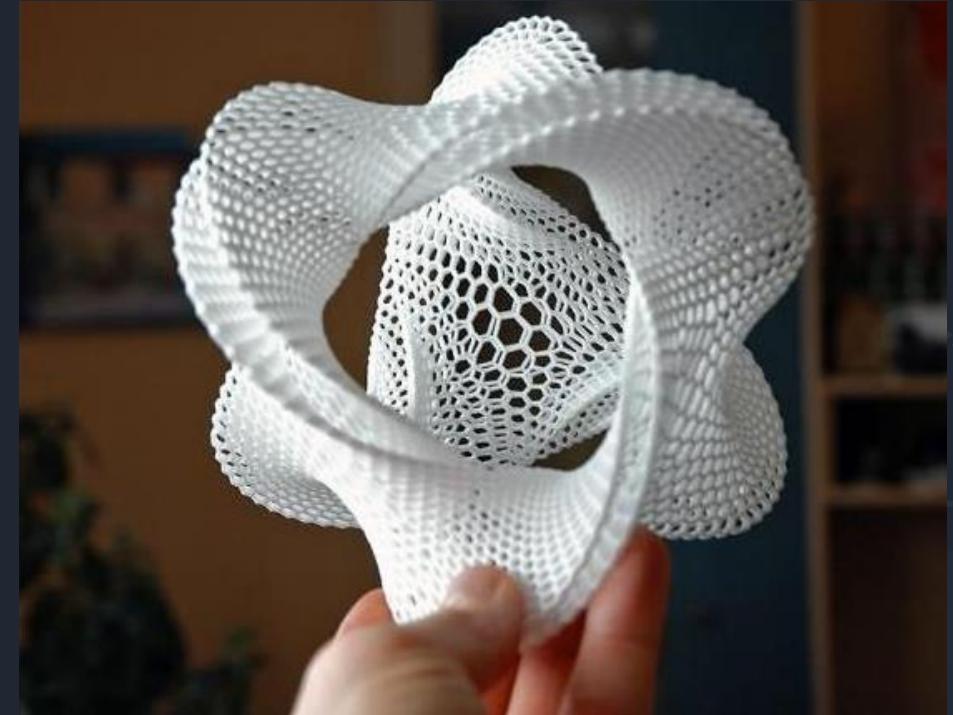
4. Testing and reprinting if needed!

5. Once finished you can use your thing! Or sell either the files or the physical things. You can also consider sharing your file with other makers



# Where are we today?

Some cool things in  
3D printing!



3D-  
printing  
Hypercars!



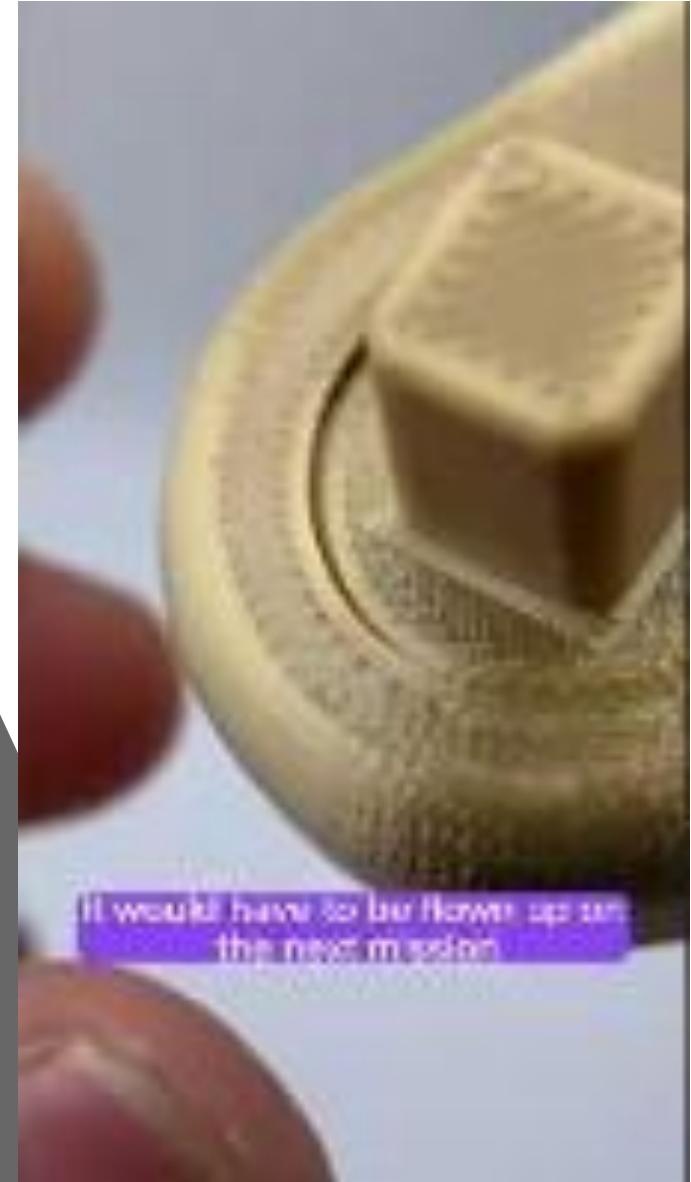
3D printing  
houses and  
buildings!



# 3D printing Prosthetics



# 3D printing tools in space!



3D  
printing  
food!



3D -  
printing  
Full Color  
3d models!

<https://www.mimakiusa.com>

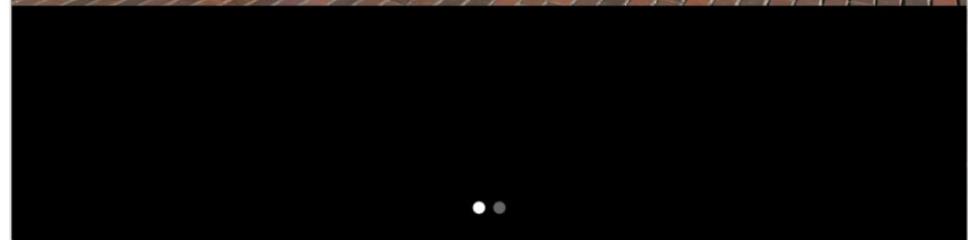


# 3D – printing Furniture



ic3d\_printers • 2d

...



34 likes

ic3d\_printers We're thankful to partner this month with @hilliardgov - bringing 3D printed furniture to @downtownhilliard. Take a seat next time you visit! We're proud to display large-format, custom pieces like these into our community's gathering spaces.

#madeinohio #IC3DPrinters #hilliardstationpark

# 3D printing fashion designs



# 3D printed sandals!

(hobbyist/maker)

Software Used:

- Illustrator
- Rhinoceros
- Cura (slicer)

Filament:

- FilaFlex 82A by Recreus
- RECIflex by Recreus

Printer:

- Artillery Sidewinder X1: (\$419)

Instagram: sewprinted



3D  
printed  
liquid  
metal  
circuits  
on  
clothing!



# 3D printing Jewelry!

3D-printed castable wax for  
SLA desktop 3D printers

[www.formlabs.com](http://www.formlabs.com)



# 3D printing Jewelry!

Casting pewter into high  
temp resin  
3D printed molds

Using SLA printing to make  
mold masters for traditional  
RTV or vulcanized molds

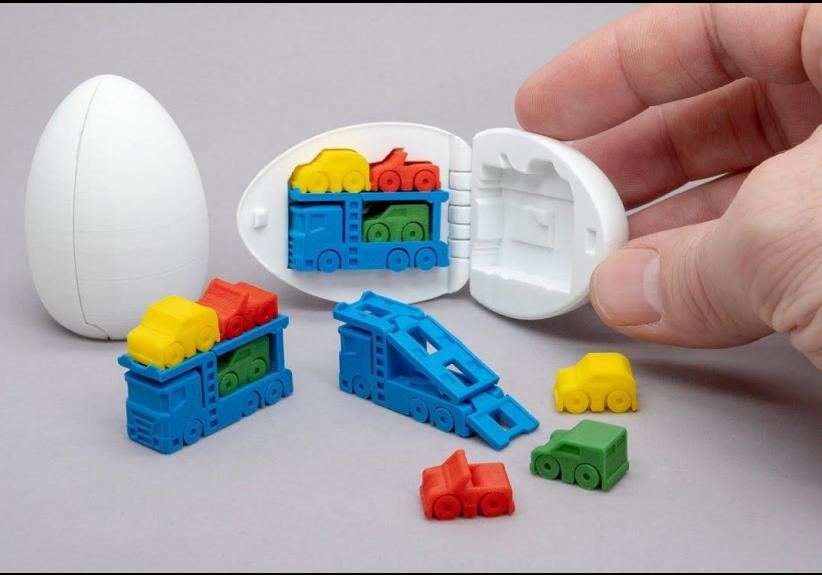
[www.facebook.com/valkyrie](http://www.facebook.com/valkyrie)  
[pewter.com](http://pewter.com)  
[www.formlabs.com](http://www.formlabs.com)



# 3D printing toys and models!



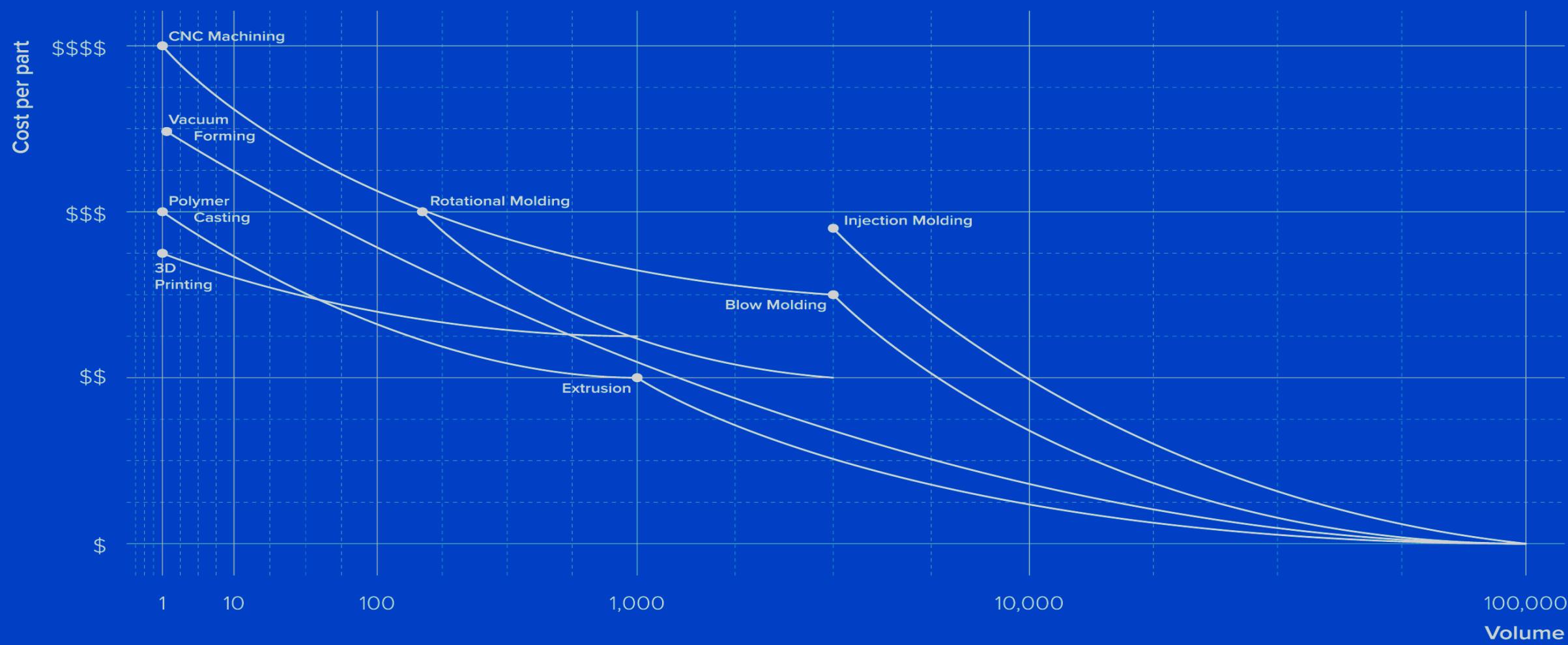
# 3D PRINT





## Using 3D printing as rapid customer reactive manufacturing wherever you need it:

- When 3D printing was introduced it was originally considered as a way to build rapid prototype models. This would be replaced by expensive tooling for production. Changes to a production models are difficult and take time and money.
- With Industry 4 this view is changing!
- A model can be sent via cloud to wherever it is needed, and a basic 3D printer farm can be stood up to make the product right where it is needed
- By switching to additive manufacturing, we can save time and money and can be more reactive to the needs of the user!
- A new model can be finished or modified and immediately produced for sale.
- Changes can be things as basic as size/scale or as awesome as being able to customize each item for a different user



	3D PRINTING	CNC MACHINING	POLYMER CASTING	ROTATIONAL MOLDING	VACUUM FORMING	INJECTION MOLDING	EXTRUSION	BLOW MOLDING
Complex shapes	● ● ● ● ●	● ● ● ● ○	● ● ● ○ ○	● ● ○ ○ ○	● ○ ○ ○ ○	● ● ○ ○ ○	● ○ ○ ○ ○	● ○ ○ ○ ○
Lead time	12–36 hours	24 hours–2 weeks	24 hours–1 week	4–6 weeks	4–6 weeks	8–10 weeks	2–4 weeks	4–6 weeks

## Rep Rap – machines that can make themselves !

Many big players in 3D printing still produce their printers with other printers and to varying degree run open source models for the company

(pictured are Prusa Research and Lulzbot)



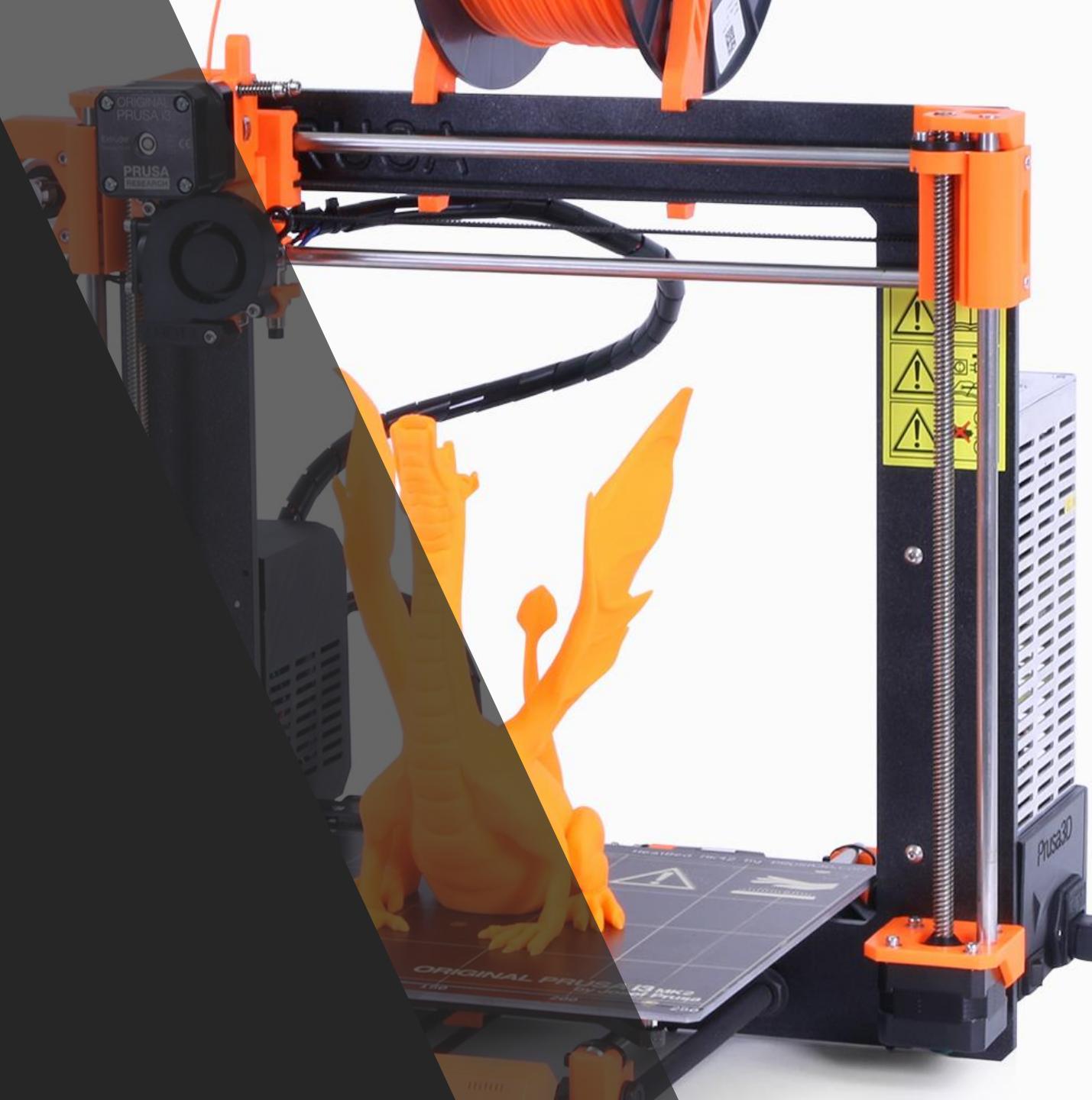


APPROXIMATELY A SINGLE PRINTER IS ABLE TO PRINT  
A COMPLETE SET FOR A NEW PRINTER

EVERY DAY

# Types of 3D Printers

DIY  
Consumer  
Low Cost Consumer  
Prosumer  
Commercial



## “DIY” Do it yourself or Kit class

Refers to printers that can be built from kits or parts.

In addition to assembly, they require significant tweaking to get a good result.

If you like to build things and are willing to put in the time to save money this might be for you.

ALSO: some of the coolest hobbyist printers out there such as the Voron MUST be built rather than bought assembled.



## “Consumer” class printers

These are designed to lower the barrier of learning for printers

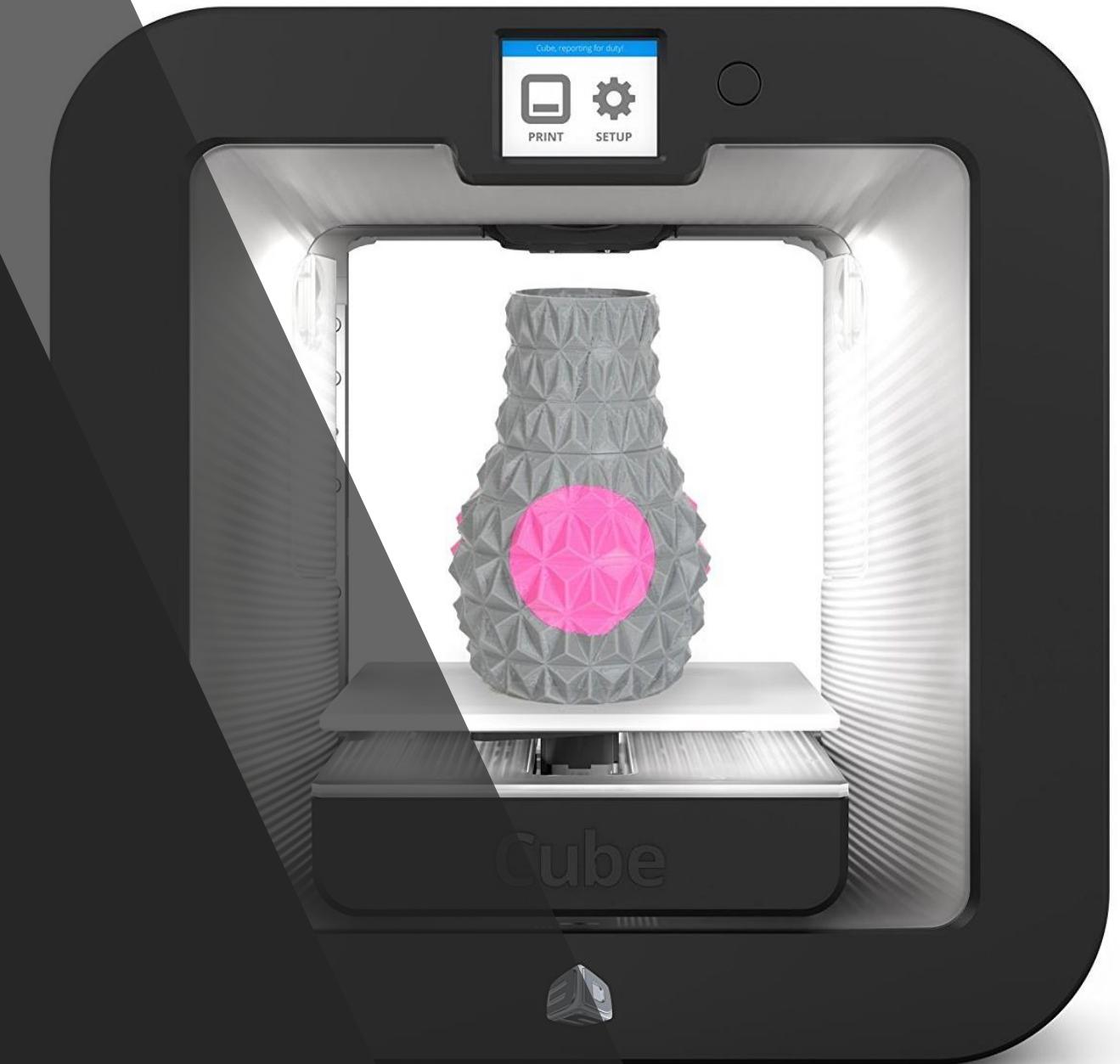
Designed to require little or no tweaking and be easy to use.

They tend to be proprietary in nature and limited in their ability to be upgraded.

Because they can't be upgraded they tend to be limited in what you can do with them.

They also often require you to use materials provided specifically for the printer.

(makes the consumer a captive customer audience)



# “Low-Cost Consumer” class printers

Another way to appeal to consumers is to be as low cost as possible. (lower the financial barrier of entry)

Often designed to be as cheap as possible either by simplifying or cutting features or lowering part quality (although some are better quality than others)

These printers tend to be made in China and often have lots of similar clones.

Some of these brands are literal junk brands others can be made serviceable and are very popular

Even within these better low-cost brands, printers may have quality issues and/or may require tuning.

Many can be upgraded into reliable printers if you have the skill and take the time and effort!

For customers new to 3D printing the learning curve and quality issues might make this not a good choice.

A cheap printer that breaks right away can be a big reason for people thinking 3D printing is too hard or can't work for them.

Examples: Creality, Anycubic, Elegoo, Wanhao



## “Prosumer” class “desktop” printers

Designed to provide the highest quality prints possible from a desktop printer. They can be purchased assembled although some are also available as kits. They will produce an excellent result with little tweaking although some of the open designs can be upgraded or tweaked to add capability.

Some use proprietary parts and materials in an effort to either increase reliability by standardization, or lock the customer into the ecosystem

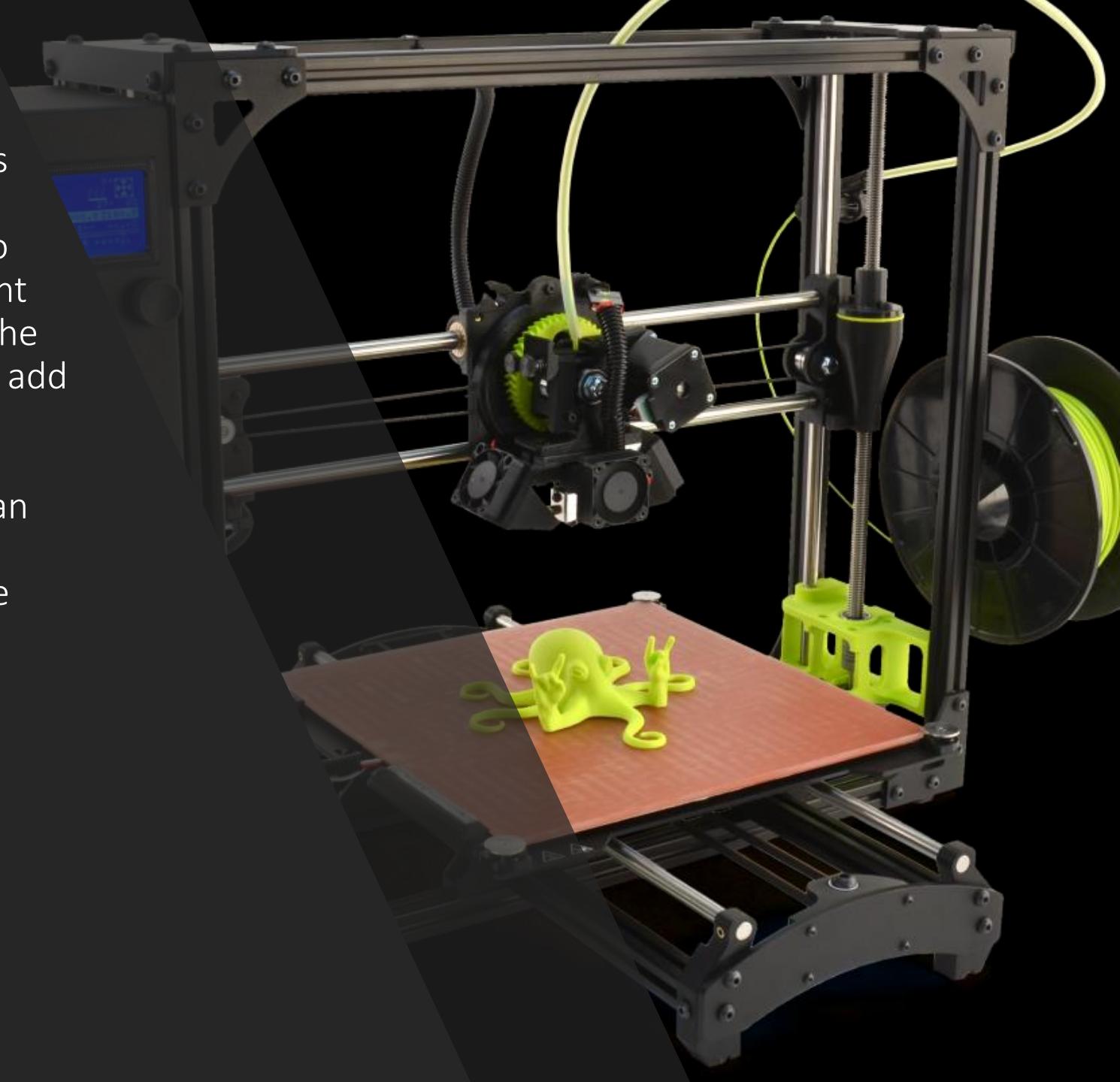
Examples:

Prusa (Open)

Lulzbot (Open)

Ultimaker (Semi – Proprietary)

Formlabs (Proprietary)



“Commercial” class printers are designed to provide the highest quality prints possible out of many materials. They are very expensive thus the best way to print on them may be to use a service such as Shapeways (more on that later!)

Some of these companies like 3Dsystems and Stratasys are some of the original companies founded by the inventors of 3D printing!



# Terms for Printer Technology...

Fused deposition modeling (FDM)

Fused filament fabrication (FFF)

Stereolithography(SLA)

Masked SLA (MSLA)

Digital Light Processing(DLP)

and more ...

Multi-jet printing (full color)

Selective Laser Sintering (SLS)

Selective laser melting (SLM)

Electronic Beam Melting (EBM)

and SO many more!

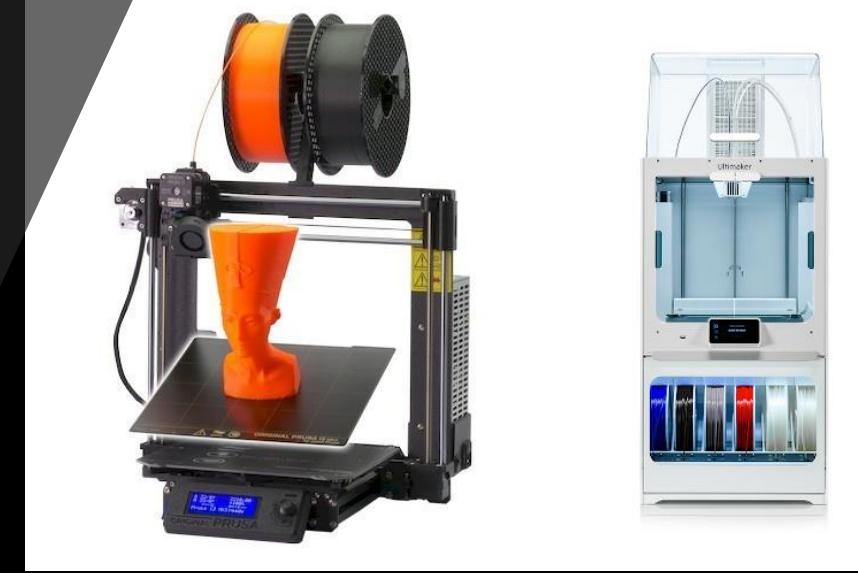
Let's look at a few!



Fused deposition modeling  
(FDM)

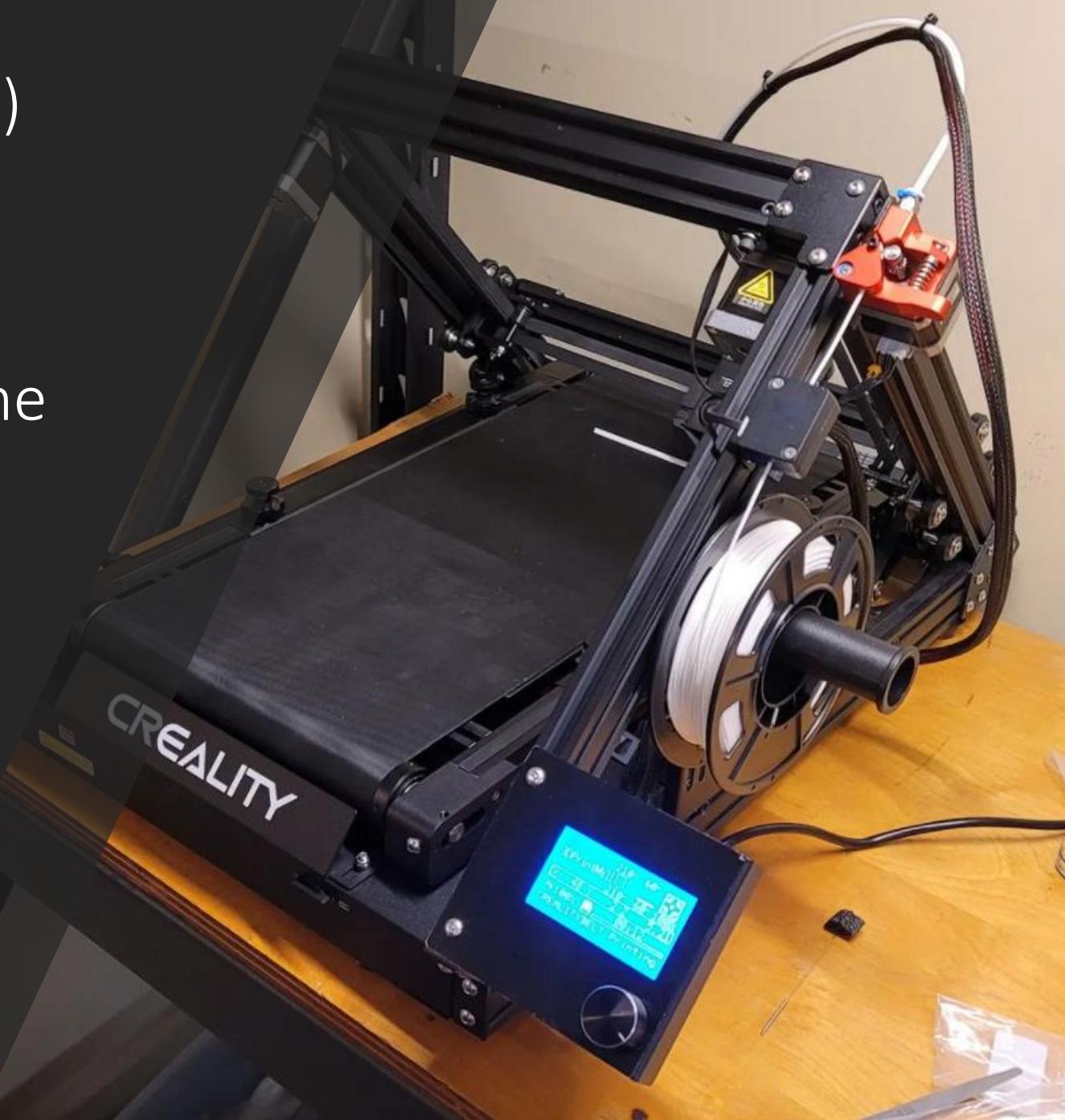
Fused filament fabrication  
(FFF)

“classic” 3D printing  
Available in pretty much any  
class from low cost to  
commercial



Fused deposition modeling (FDM)  
Print mill or 3D belt printer

Creality CR30  
Based on older designs such as the  
Blackbelt 3D



# Stereolithography(SLA)

This is a commercial model Made by Stratasys  
Large build volume: (this one is 20"W x 20"D x 23"H)

Super expensive! Ones like this start around \$300,000-\$500,000

If you need large SLA parts and don't need to have the printer cost on your project budget, you can send a job to a service such as Shapeways



# Stereolithography(SLA)

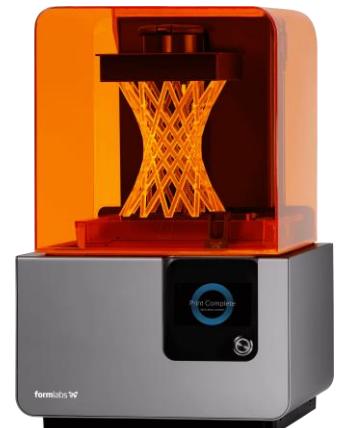
“Prosumer” (desktop)

[formlabs.com](http://formlabs.com)

Form2 and 3

Expensive, but affordable compared to larger commercial printers. The printer runs about 3500 with a large model around 11,000 and a few thousand in recommended accessories and warranty!

SLA printers produce a part that is coated in uncured resin and must be washed and generally post cured



# Masked Stereolithography (MSLA) (LCD)

Generally “Low Cost Consumer” (desktop)  
although some higher end models exist

Anycubic Photon  
Elegoo Mars or Saturn  
Creality  
Prusa  
Phrozen Sonic Mega 8K Large  
Peopoly

MSLA is very close but not as good as SLA quality.  
Slicers have very little validation and are not user friendly compared to FDM  
Some resins have strong odors! Carbon filtration helps.  
Major post processing compared to FDM! (wash and cure)  
Generally, very fast compared to FDM.

Inexpensive! These printer can run as little as just under 200 dollars. Most  
are Chinese built, but Prusa makes one as well albeit more expensive

There are bigger printers available in this type (Elegoo Phrozen and  
Peopoly)



# DLP

Examples:

Elegoo

Asiga

DLP swaps out the LCD of a MSLA printer for an LED DLP light engine

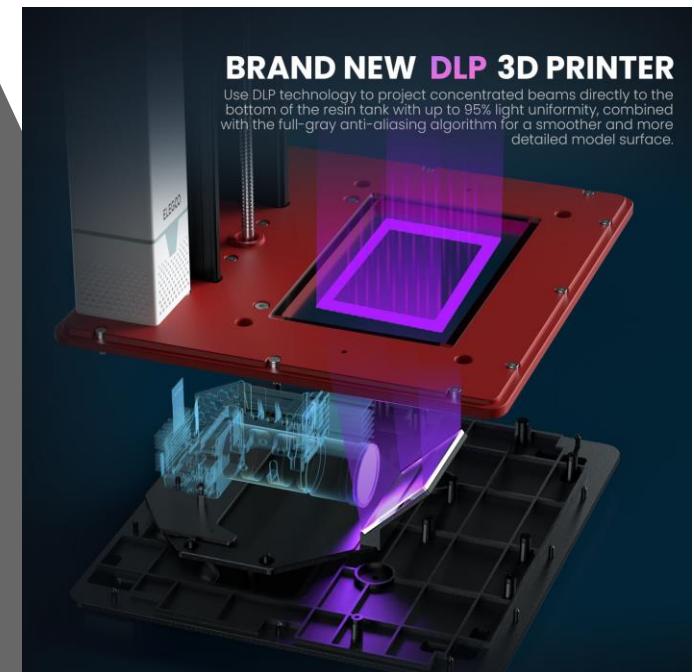
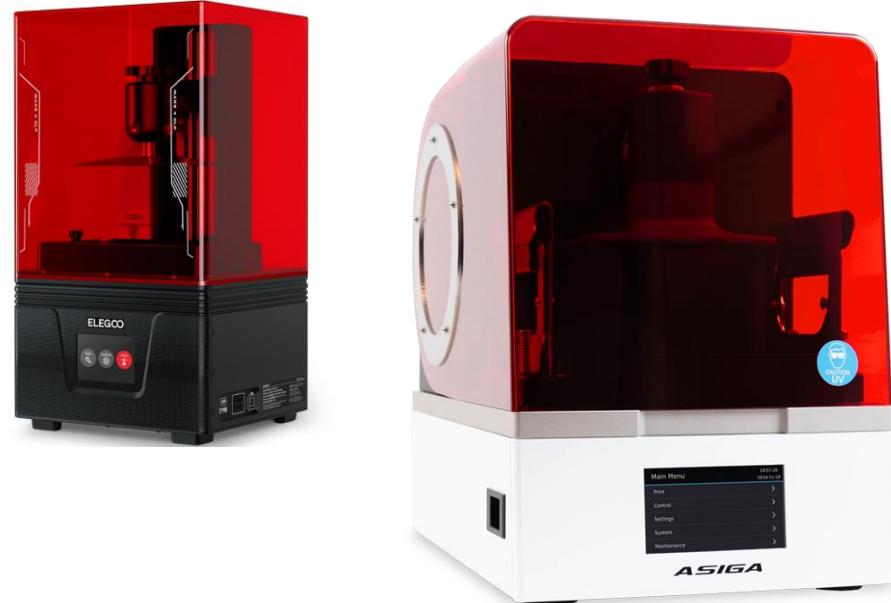
Tends to cost more ...

Longer life without having to swap LCD screens

Pixel control allows curing of supports at separate exposure levels to make them easier to remove

Varying the focal distance increases the resolution but lowers the printable area

While MUCH faster, still not quite as good as SLA which draws the part with a laser.



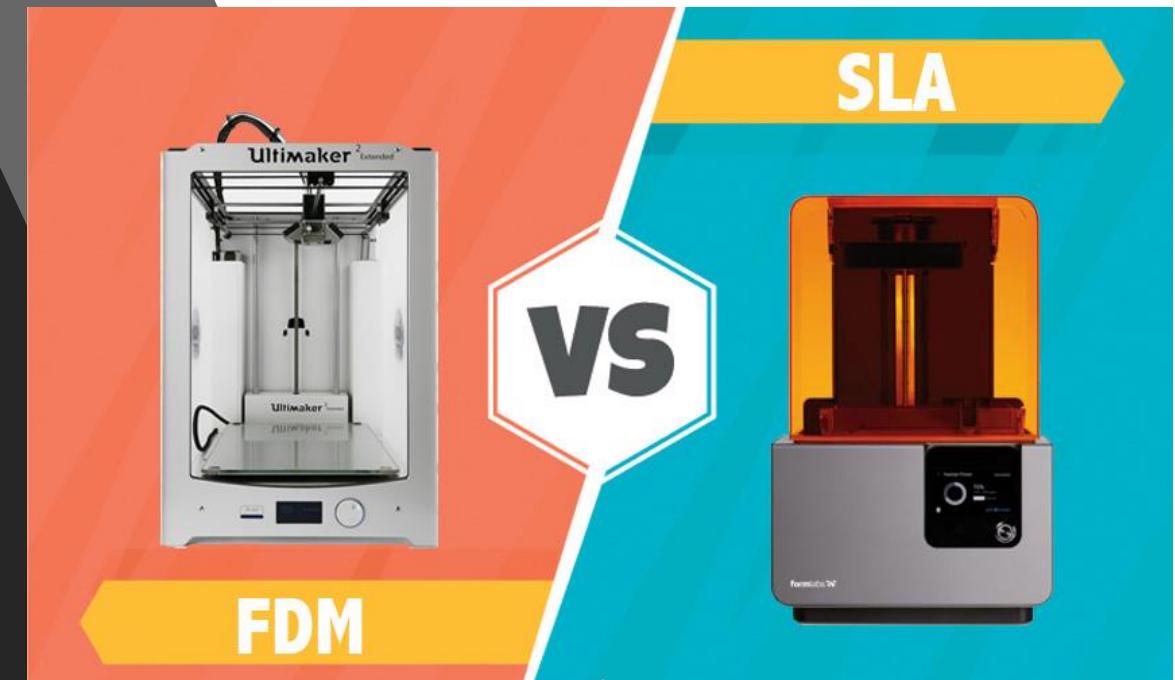
<https://formlabs.com/blog/resin-3d-printer-comparison-sla-vs-dlp/>



If you want to produce large models at a low cost a FDM printer is what you need. Good ones that done require much tuning or tweaking will start around 1000 built or 800 for a kit (example Prusa)

If you hate seeing lines in your prints, or want to print very small things very precisely with good engineering to prevent failure and can afford a printer that runs \$3500 you may want a SLA printer (example Formlabs)

If you really want an SLA printer but can't afford it. You might try a MSLA printer (example Elegoo Mars)



Why am I adding low cost MSLA printers when I already have pricey super nice Prosumer SLA printers?

Earlier this year I learned my industry peers are using farms of the Elegoo Mars 3 printers. This allows them to provide more model for less money!

Models cost 4.38 times as much on the formlabs resin as it does on the Elegoo ABS like resin!

Material:

LEFT: Elegoo grey ABS like - \$34 per liter.  
RIGHT: Formlabs Grey V4 – \$149 per liter

Printers (Drop in replacement)

LEFT: Elegoo mars 3 pro with wash and cure and a liter of material = \$514

RIGHT: Formlabs printer is 3800 + 1200 for 2-year curbside swap warranty

So I can swap my Elegoo printer 4 times for the cost of the warranty on the Formlabs!

The screenshot shows a shopping cart interface on the Formlabs website. The cart contains two items: a Form 3+ Basic Package and a bottle of Grey Resin 1 L.

Product	Quantity	Price
Form 3+ Basic Package	1	\$6,350.00 USD
Grey Resin 1 L	1	\$149.00 USD
<b>Subtotal</b>		<b>\$6,499.00 USD</b>

**CART** x **formlabs** Sign In Cart 2 Store Continue Shopping

**My Cart (2)**

**Create an Account** or **Sign In** to save your cart items to your account.

**Product** **Quantity** **Price**

ELEGOO Mercury XS Bundle  
Washing And Curing Machine -  
[Pre-order]  
Pre-order (Second Batch)  
- 1 + \$180.00

ELEGOO Mars 3 Pro 4K 6.66"  
MONO LCD MSLA Resin 3D  
Printer -[Pre-order]  
Pre-order (Second Batch)  
- 1 + \$300.00

ELEGOO ABS-Like LCD UV-  
Curing Photopolymer Rapid  
Resin For 3D Printers  
US / 1000g / Grey  
- 1 + \$34.00

Form 3+ Basic Package  
\$6,350.00  
Includes ▾

Form 3+ Basic Package Includes

- 1x Form 3+ 3D Printer
- 1x Form 3 Resin Tank V2.1
- 1x Build Platform
- 1x Form 3 Finish Kit
- 1x Form Wash
- 1x Form Cure
- 1x Form Pro Service Plan 2 Years

Grey Resin 1 L  
\$149.00

**QTY**  
- 1 + Remove

**QTY**  
- 1 + Remove

**Clear Cart**

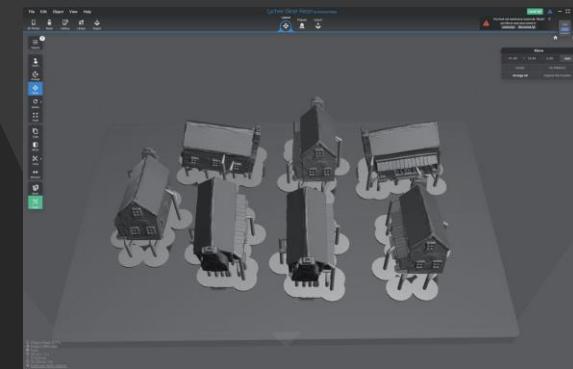
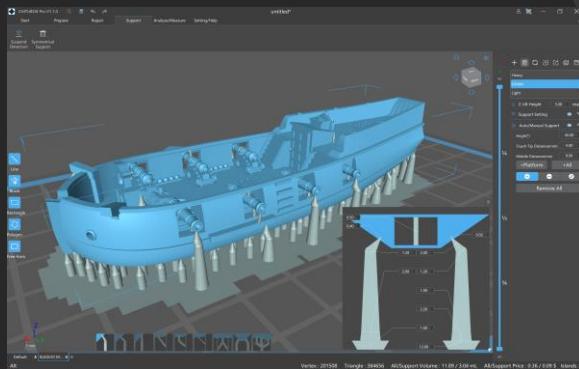
**Subtotal \$6,499.00 USD**

# A bit more about Slicers

Chitubox and Lychee Slicer. MSLA/RESIN

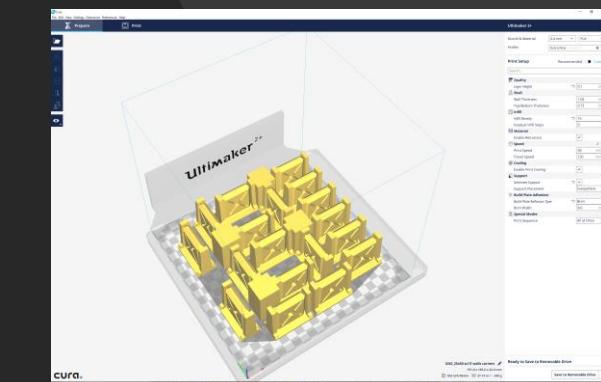
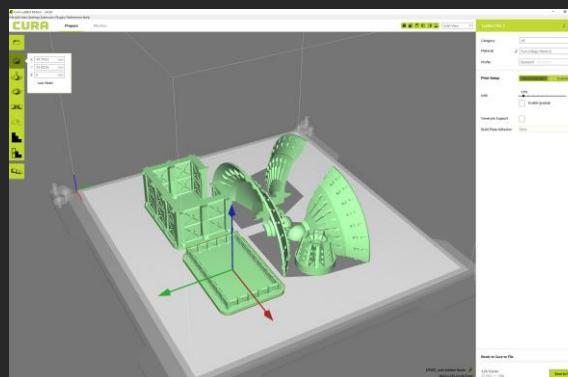
free and pay per year PRO versions

Lychee now supports FDM as well



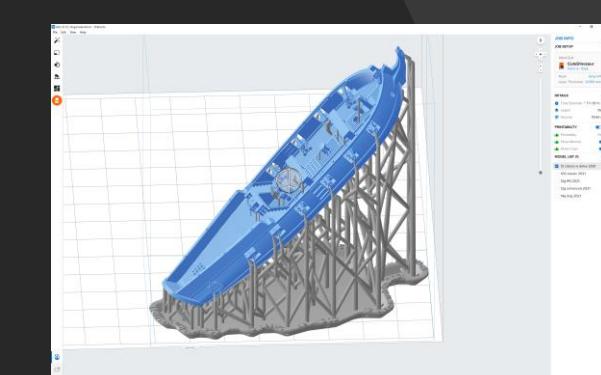
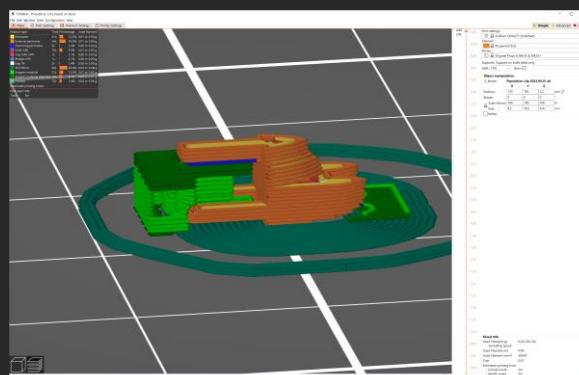
Cura (FDM) (by Ultimaker) - Free – Open source.  
Forks by Lulzbot and Creality (belt)

Slic3r Free open source Also PRUSA Slic3r  
Works with MSLA or FDM



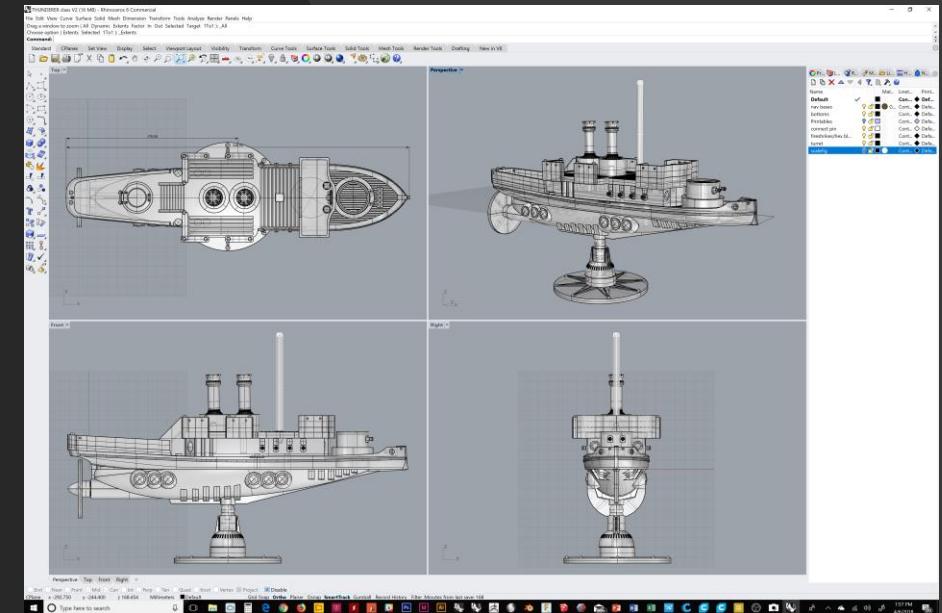
Preform (free proprietary slicer for Formlabs)

Simplify3D \$149



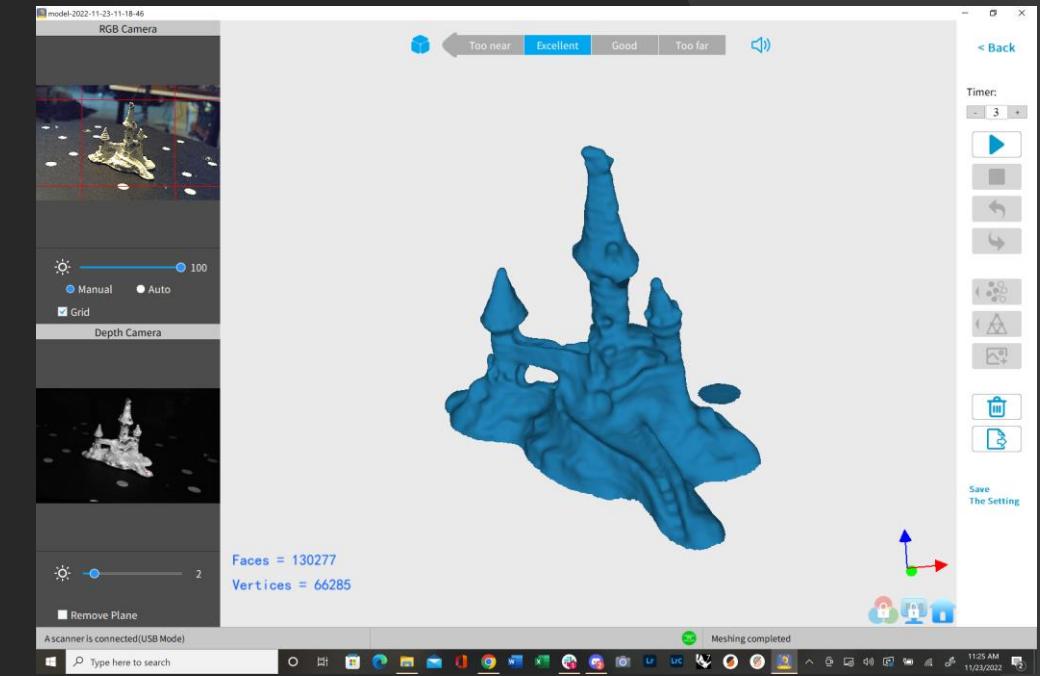
# How do you get your ideas into the Computer?

- This is one of the most common questions I get while on the road with my 3D printer and all the cool stuff I make..
- So let's step back from the 3D printer and talk CAD!



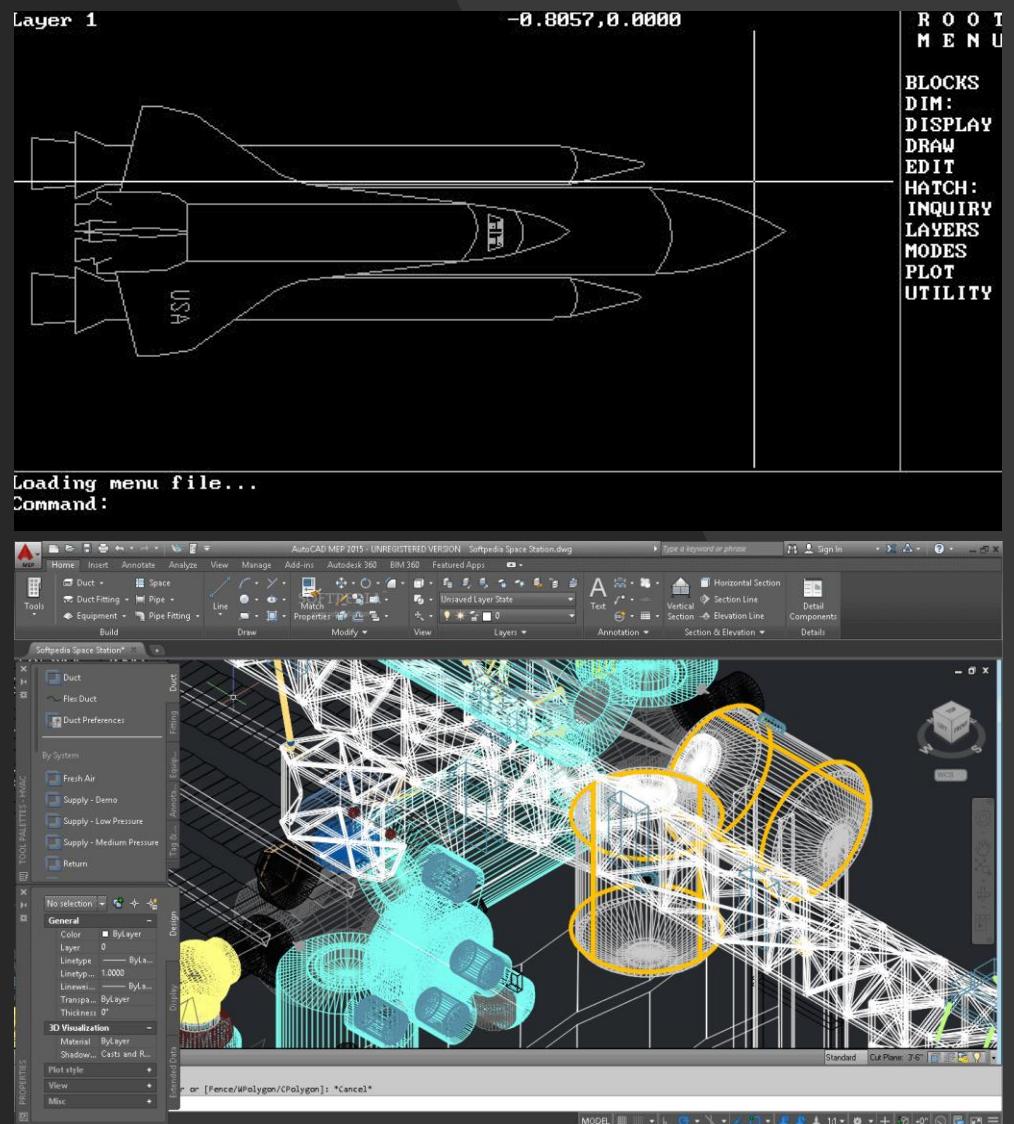
# Can I just scan my model in?

- Can be very difficult
- Photocopier effect – loses and softens details
- Models require repair
- Not very good at tiny high detail or moving items.
- Much better for large items you want to make smaller
- IP issues!



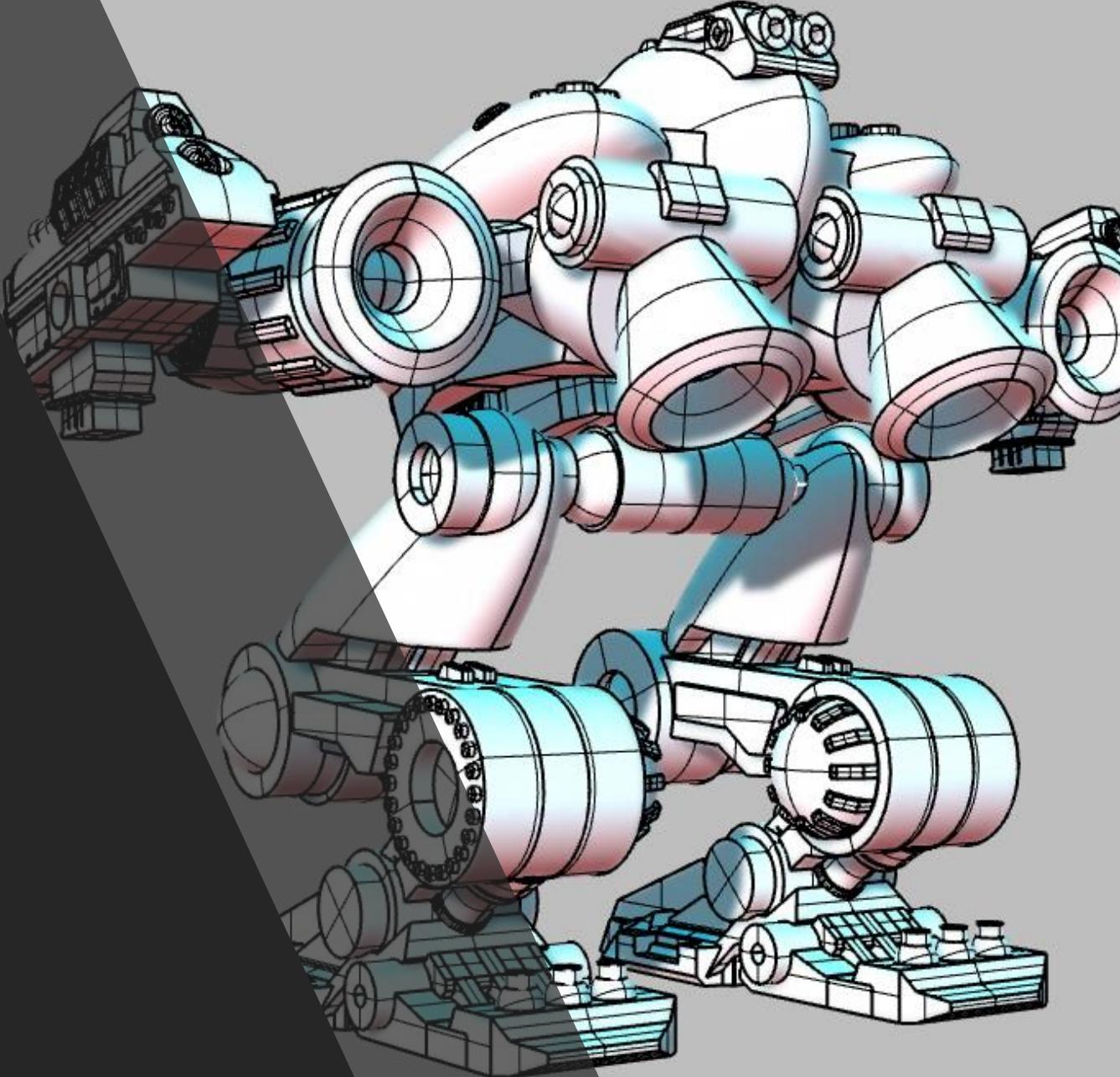
# Computer aided design (CAD)

- When CAD was first introduced it was run on massive mainframe computers. AutoCAD was the first major CAD package to come to the then new “personal computer” (PC) market
- The first release of AutoCAD was AutoCAD 1.0 December 1982 (also known as Release 1)
- There have been over 24 releases in the last 40 years!
- For fun, the screens to the right compare a version of 1985 (release 2) to a more current version
- There are currently hundreds of CAD apps of all types



# Types of CAD programs

Let's talk about the  
software that makes  
models!

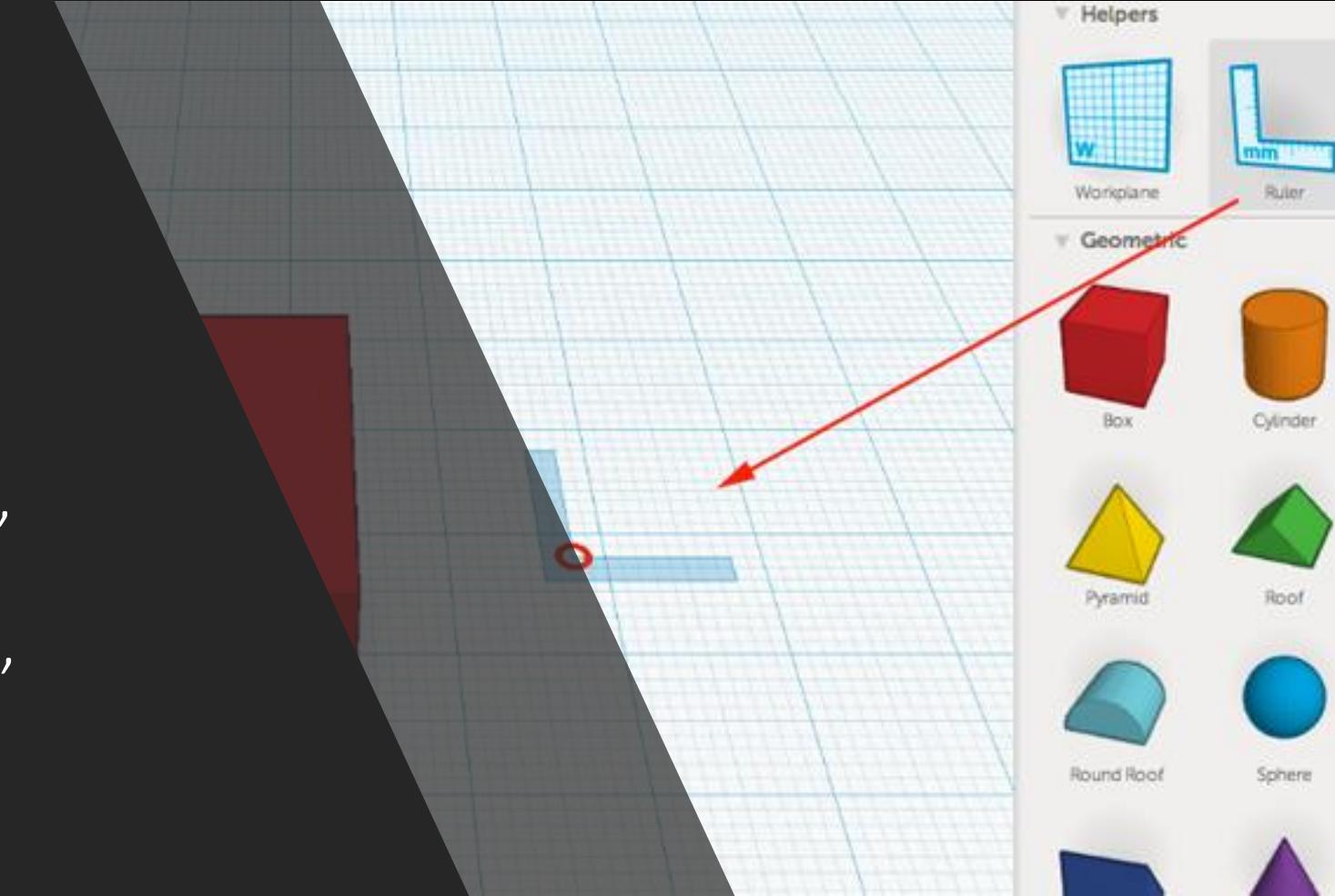


# TERMS!

“Free” vs “Commercial”

“Entry level” vs “Professional”

“Organic” versus “mechanical”



# Free!

(Or basic version is free).

Sketchup (1 view)

Freecad

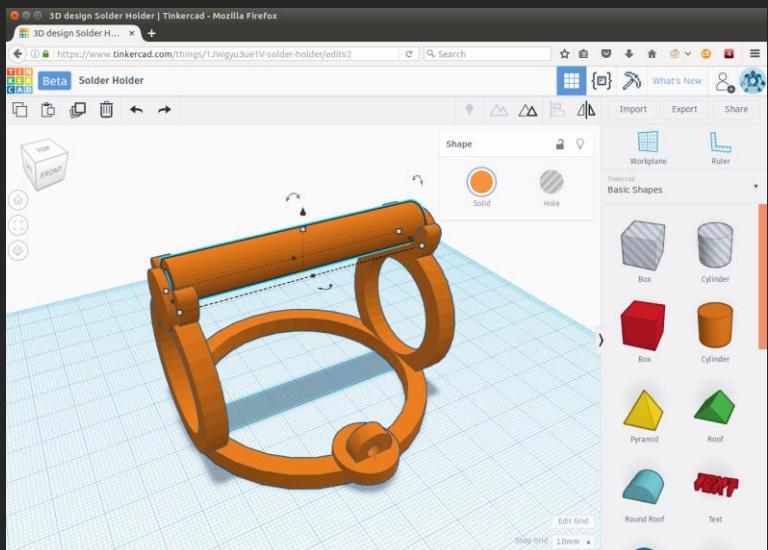
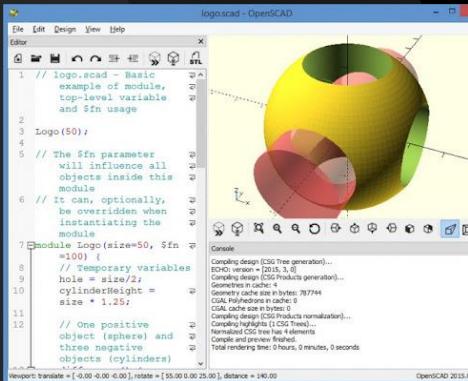
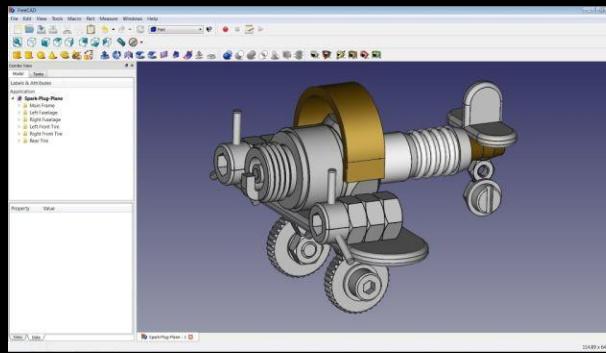
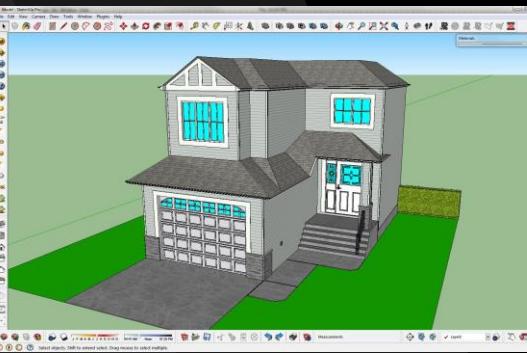
OpenSCAD (programming)

ZbrushCoreMini (organic)

Tinkercad (web based)

Blender (high learning curve)

Gravity Sketch (VR)



# Free! (With a catch!!)

Autodesk, the maker of Autocad, Fusion360 (and more recently buying out many small cad packages) provides “free” CAD apps until it’s not.

Once they have you used to the program and it’s hard to change, you find out the education version expires, or the free version can’t be used commercially, and they want you to buy super expensive software on a subscription basis

The screenshot shows two parts of the Autodesk website. The top part is a product page for AutoCAD, showing a large image of the software interface, a price of \$1,575.00/year, and a 'SUBSCRIBE' button. The bottom part is the Fusion 360 pricing section, featuring a banner about a 30% discount on extensions, followed by four pricing options: Monthly (\$60), Yearly (\$495), 3 Year (\$1,335), and Custom. Each option includes an 'ADD TO CART' button and a brief description.

This screenshot shows the Autodesk website's education section. It features a large image of a cartoonish, multi-eyed character with a butterfly on its head. The text 'Education Community SOFTWARE FOR STUDENTS' is prominently displayed. Below the main image, there's a 'Software for students' section with a brief description and links for 'SECONDARY' and 'COLLEGE & UNIVERSITY'. A blue call-to-action button says 'Sign in or create an account for the Education Community to get free software.' There are also links for 'Students' and 'Educators'.

This screenshot shows the Fusion 360 landing page. It features a question 'Are you a student?' with a link to 'Get Fusion 360 free for 3 years'. Below that is another question 'Are you a startup or hobbyist?' with a link to 'You may qualify for free use'. A callout box for startups explains the offer: 'For startups generating <\$100k/year in total revenue or wholly non-commercial users:' followed by steps 1 and 2. At the bottom, there are 'GET IT ON Google Play' and 'APK DOWNLOAD' buttons.

This screenshot shows the Fusion 360 product page. It features a large image of a 3D model of a mechanical part. The text 'FUSION 360' is at the top, followed by 'Cloud-based 3D CAD/CAM/CAE software for product design'. It lists 'Product details' and 'PLATFORM: Windows, Mac'. A large button at the bottom says 'Starting at \$495.00 /year' with 'FREE TRIAL' and 'SUBSCRIBE' buttons. Other options like 'COMPARE' and 'SEE LESS' are also present.

# Not free/ Commercial

Solidworks (High end) \$3995

Cinema4D (Animation) \$3995 Free Student version

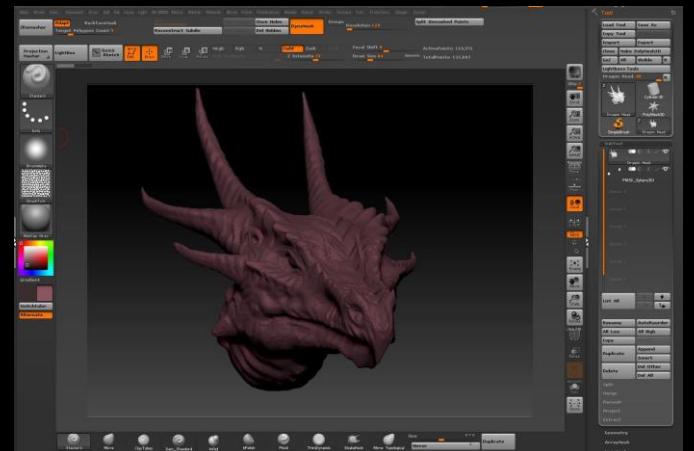
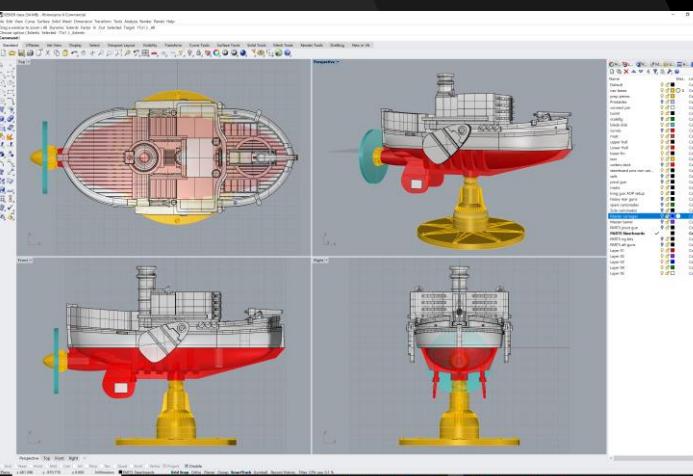
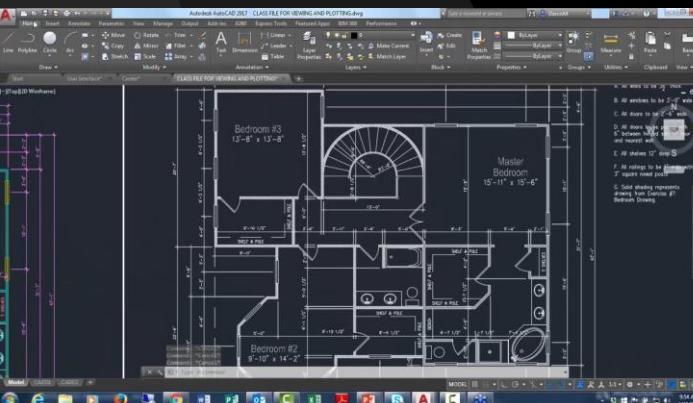
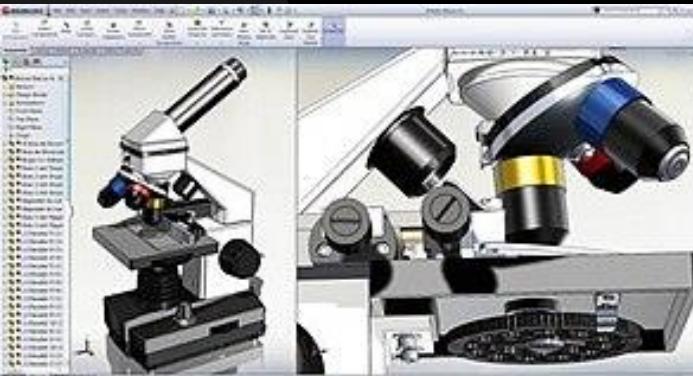
Autocad (High end) \$1775 per year Free Student version

Zbrush (organic) 39.95 a month \$895 \$475 Student version

Rhinoceros (NURBS) \$995 (\$695 mac) \$195 Student version

Medium (VR) \$29

**PRO TIP:** Many commercial apps have cheaper student versions!  
Almost all have a free trial period to see if it's something that will work for you



# Entry level vs professional

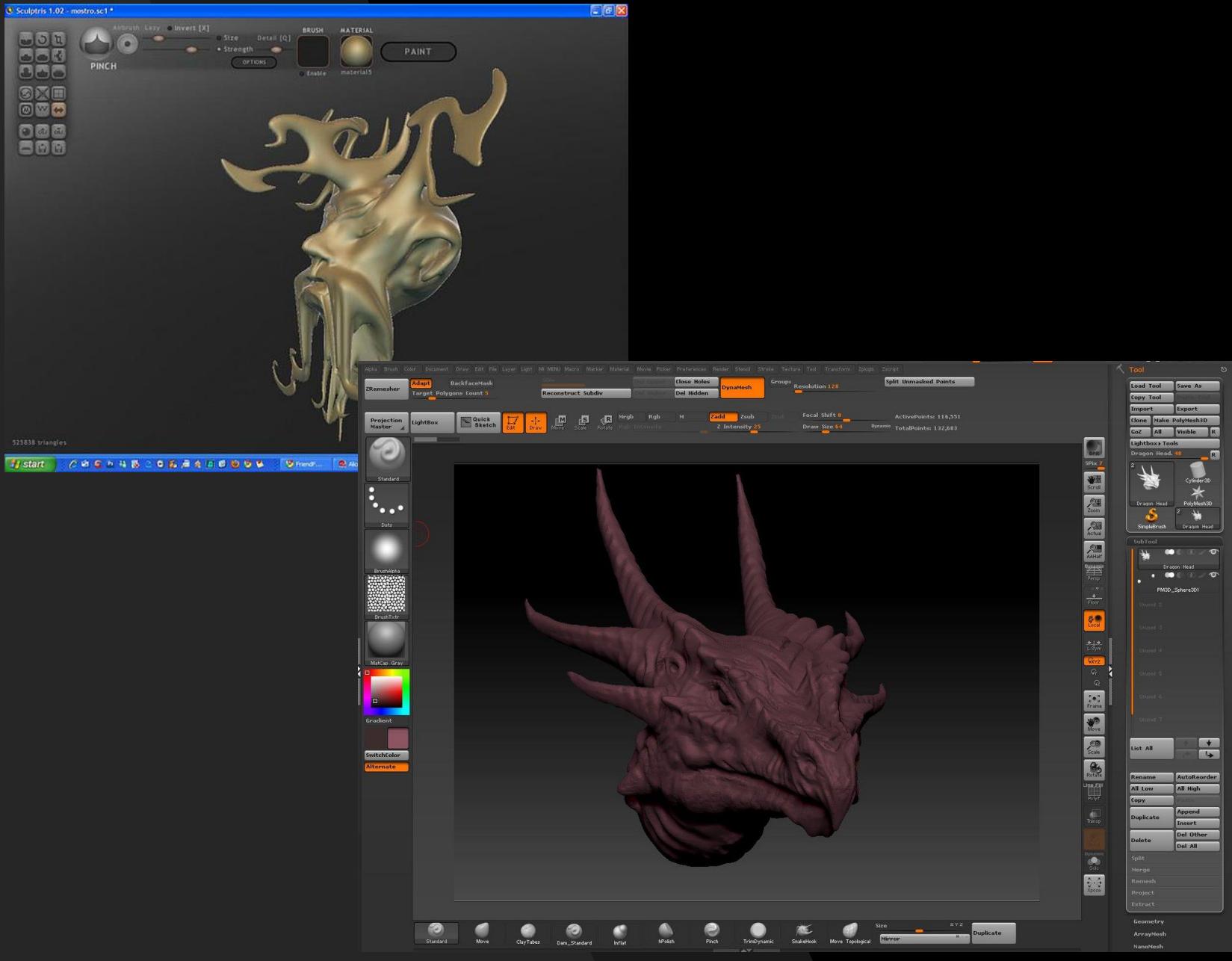
Consumer based applications that are designed for an average user are referred to as “entry level.”

They typically are easier to use because they have less features.

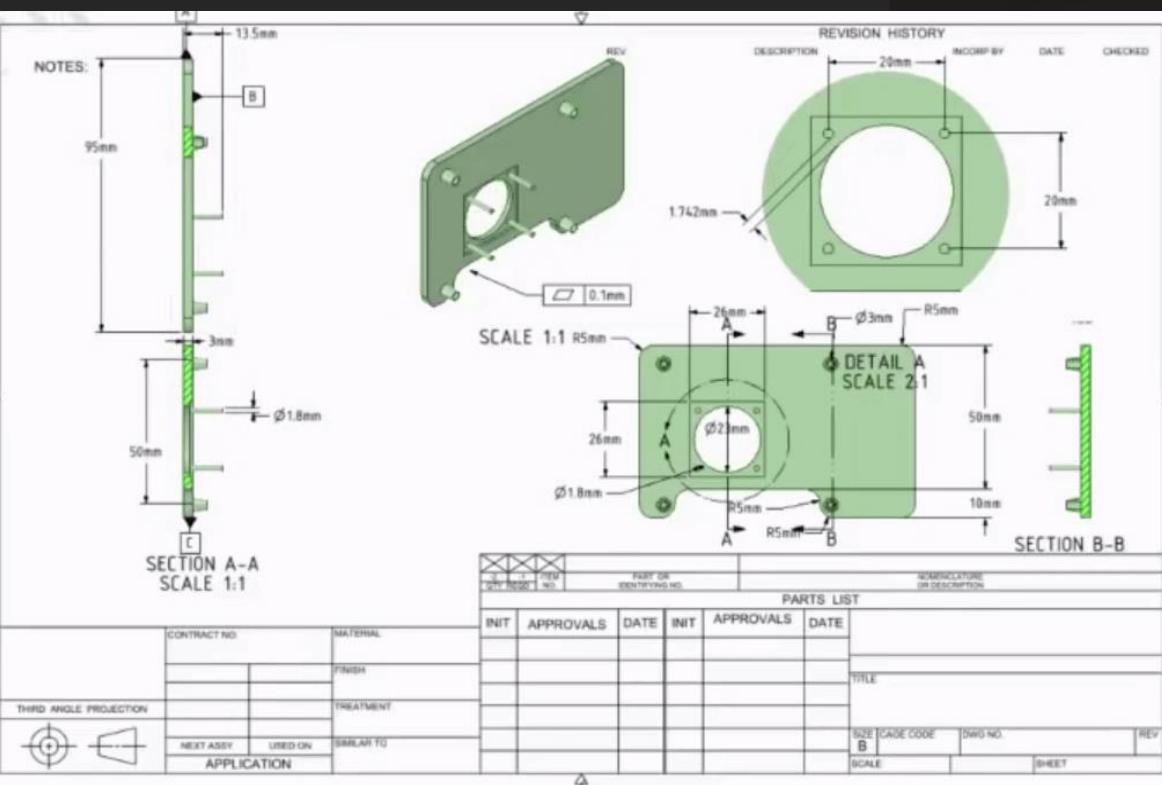
In many cases the same company will often make a more involved version with a more complete set of features that professionals will need.

The entry level version may still be rather powerful and because it's streamlined it may be faster for some projects.

This is so true that some pros will sometimes build out basic forms in one app and finish them in another.

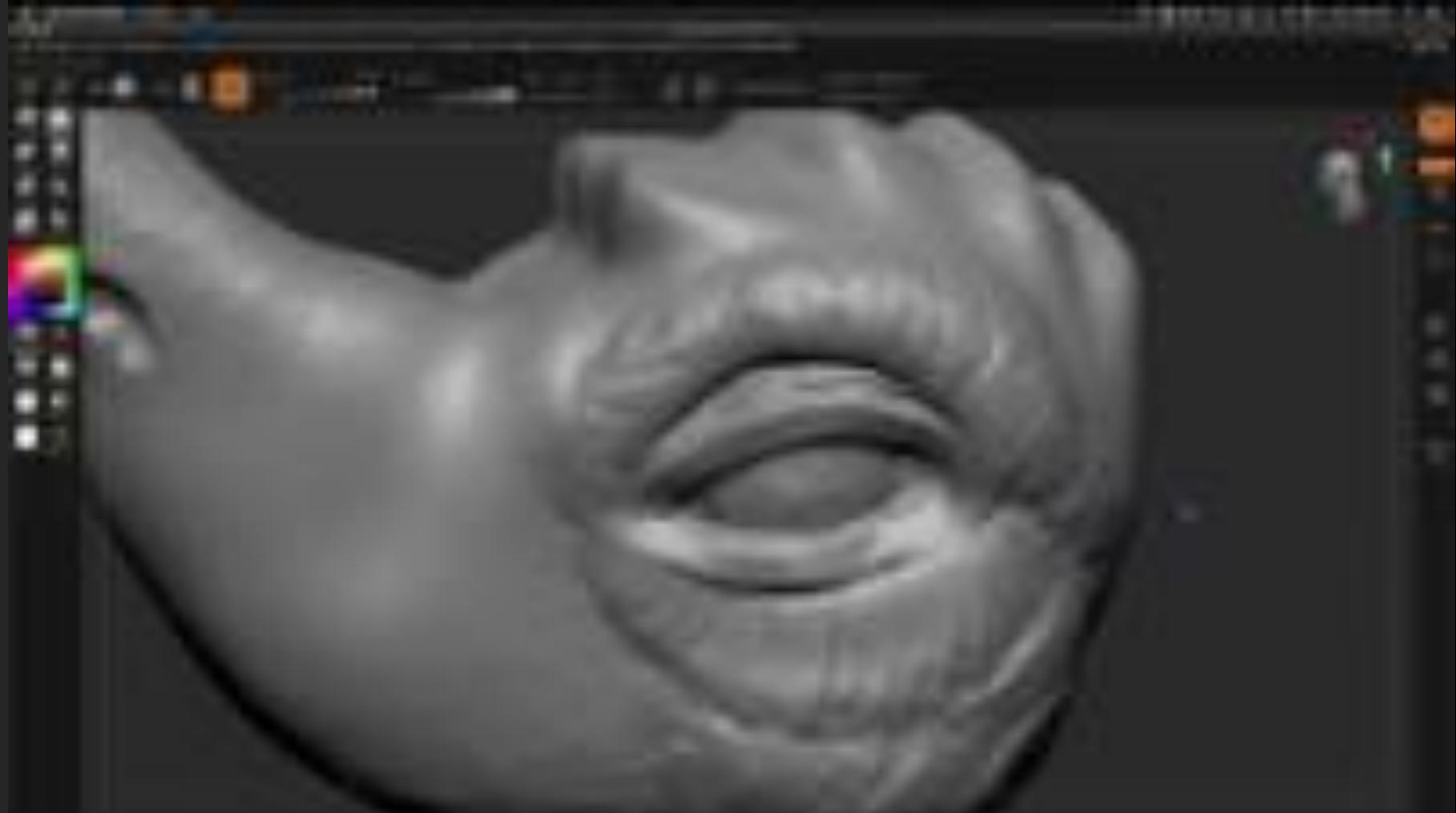


What is “Organic”  
versus  
“Mechanical?”  
And “Design” versus  
“Drafting”



Organic  
“Clay ball”  
modelers.

Zbrush  
Core Mini  
and  
Zbrush



Organic  
“Clay ball”  
modelers.

Zbrush  
is just a  
progression  
in  
capability



# Organic “Clay ball” modelers.

... with a MUCH  
more complex  
interface



Organic  
“Clay ball”  
modelers.

... Full version  
of Zbrush



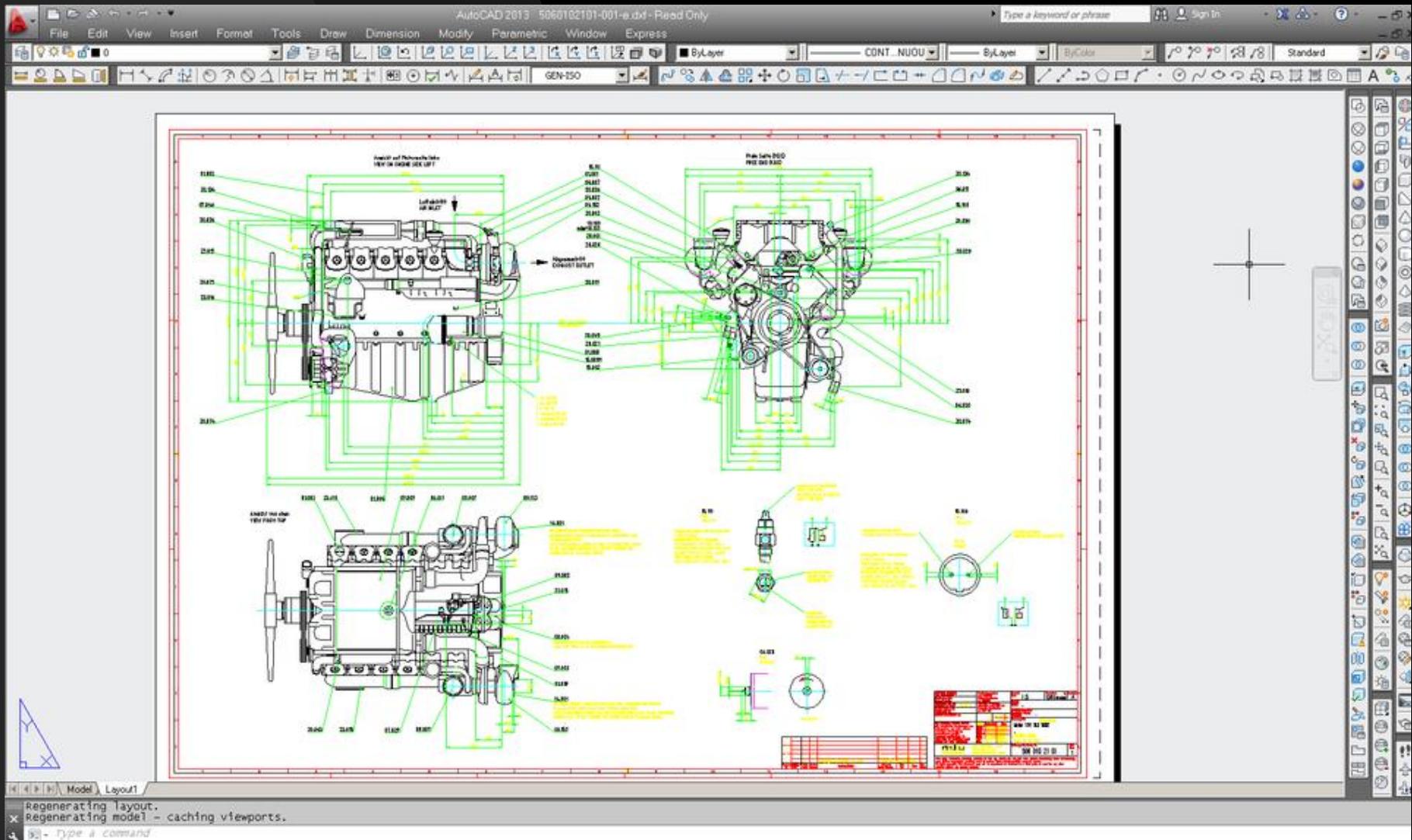
Mechanical  
“Design”  
tools

Rhino3d or  
Alias



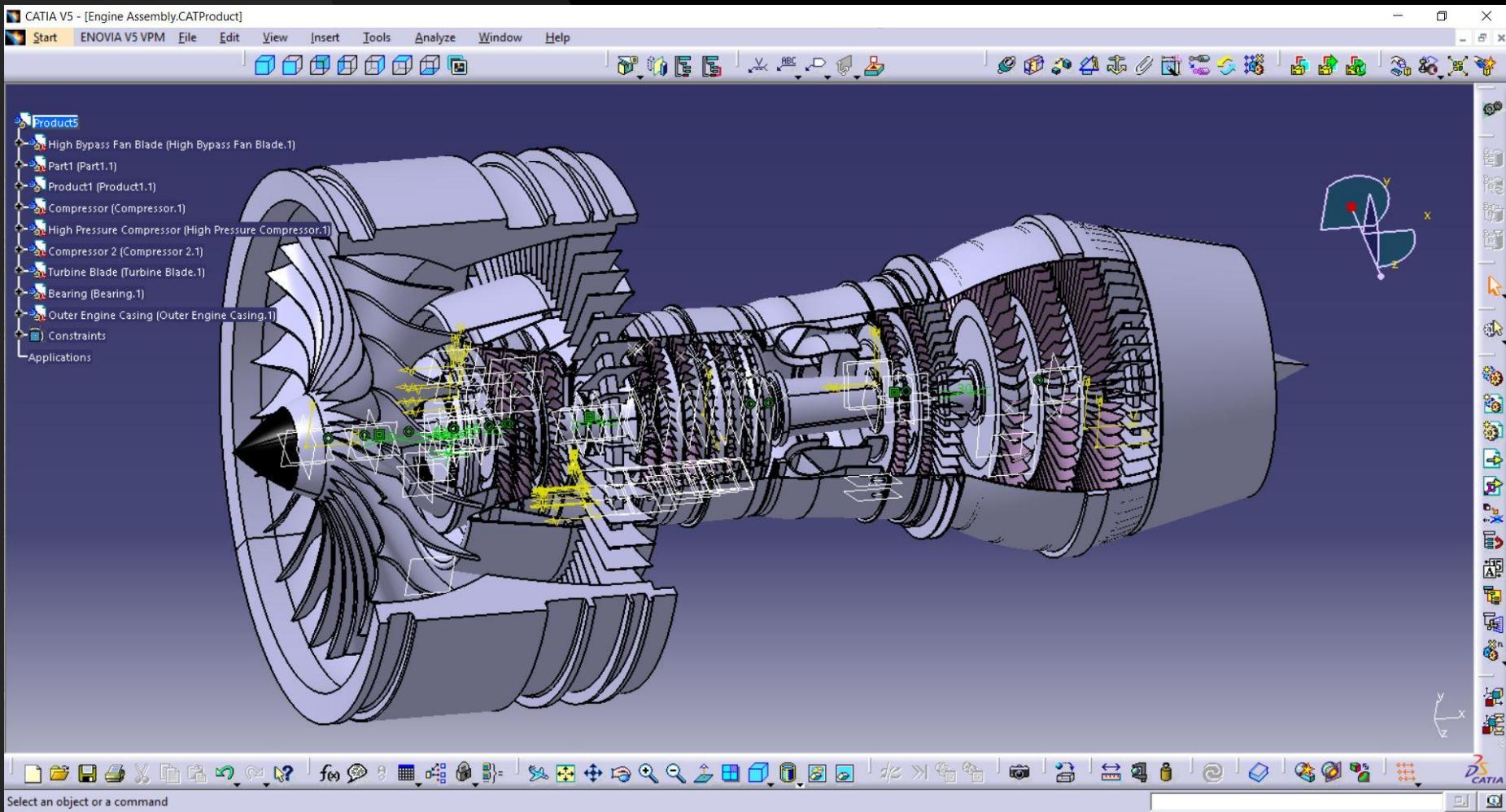
# Mechanical “Drafting” Engineering tools

# Autocad

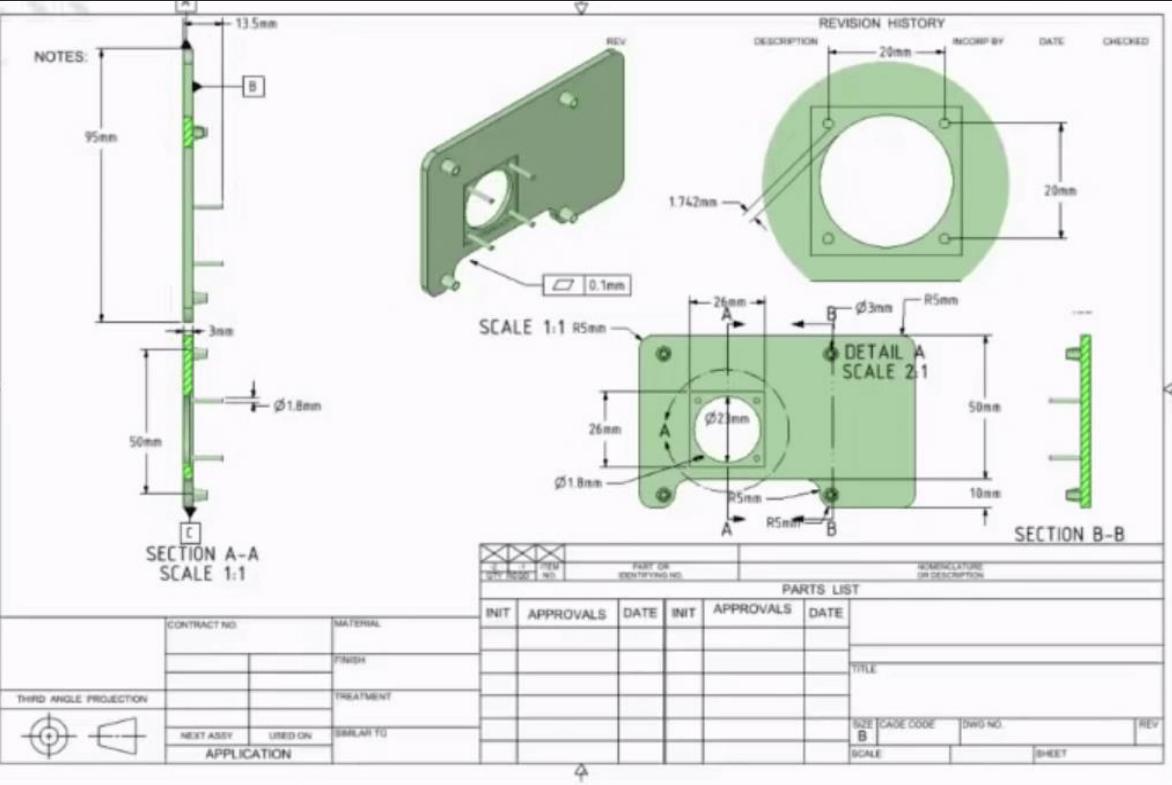


# Mechanical “Drafting” Engineering tools

Catia



So... what programs produced these models?



# VR Cad

Gravity Sketch

Adobe Medium

SculptVR

Integrations for Autocad,  
Rhino3D, and others

Not as good for precision  
Great for visualization

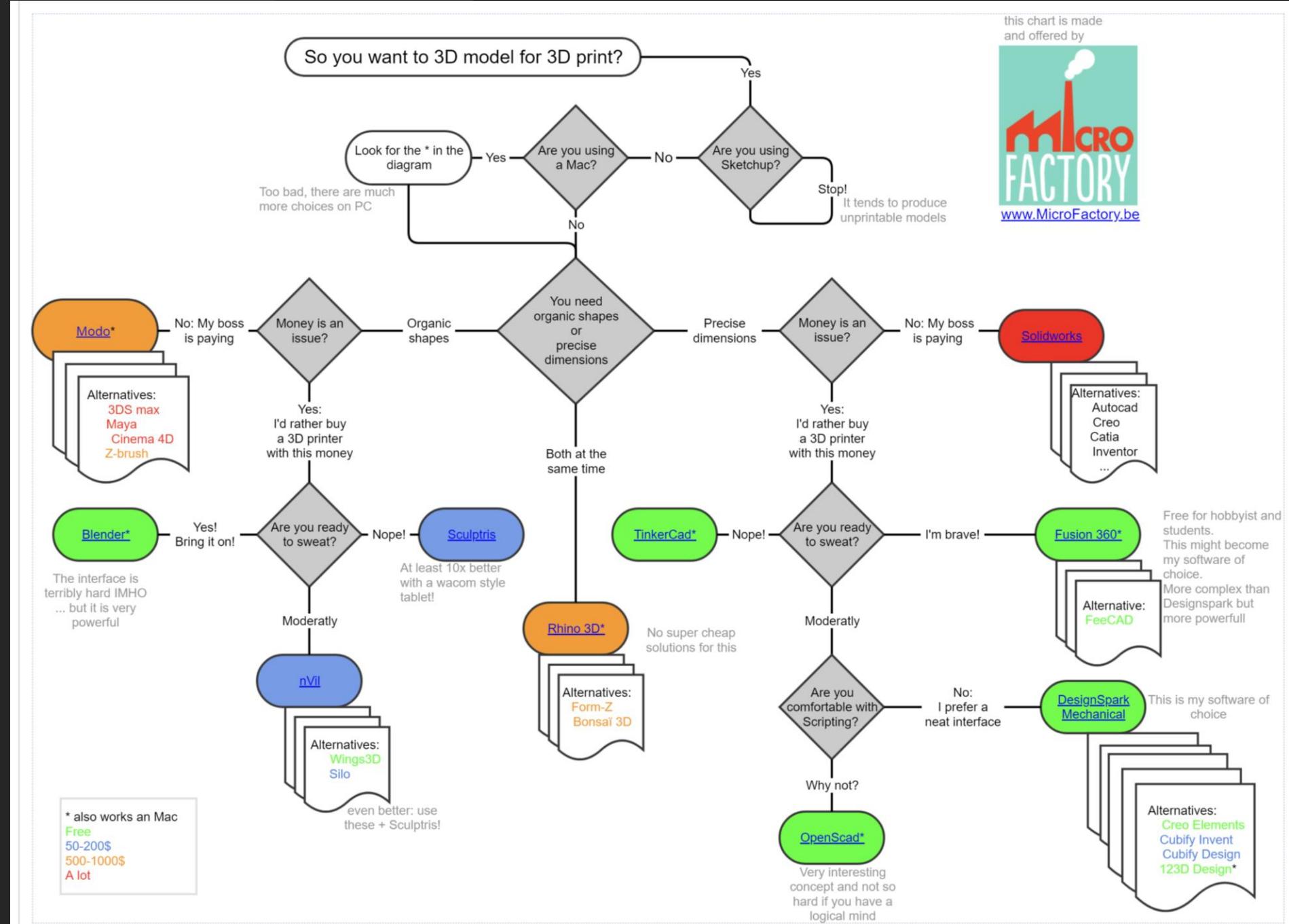


# So what should you learn/get?

Picking a Cad app is like getting married...

It's a process, and not every app is right for every person.

Also, once you learn one it's hard to change as everything else feels wrong!



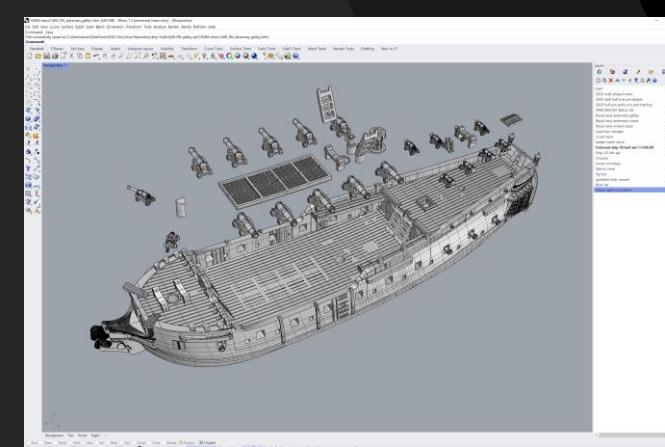
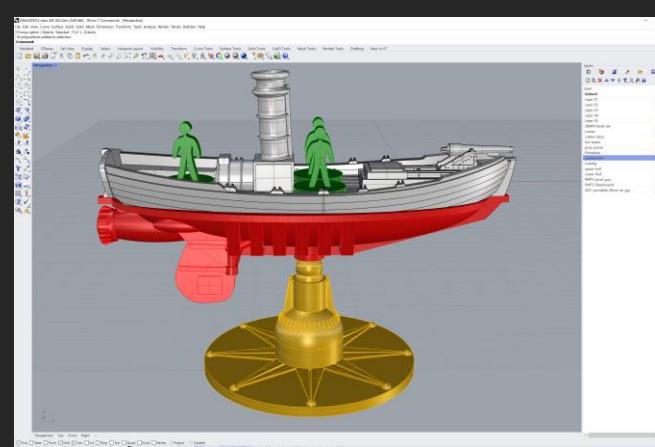
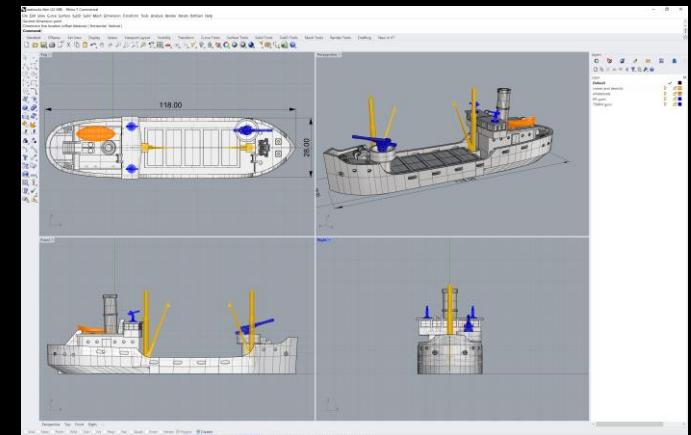
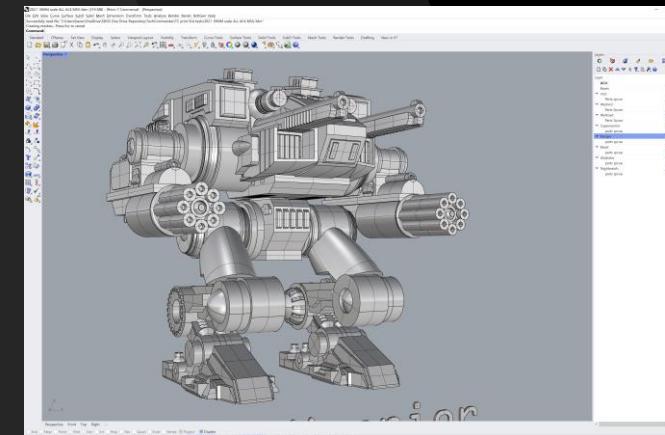
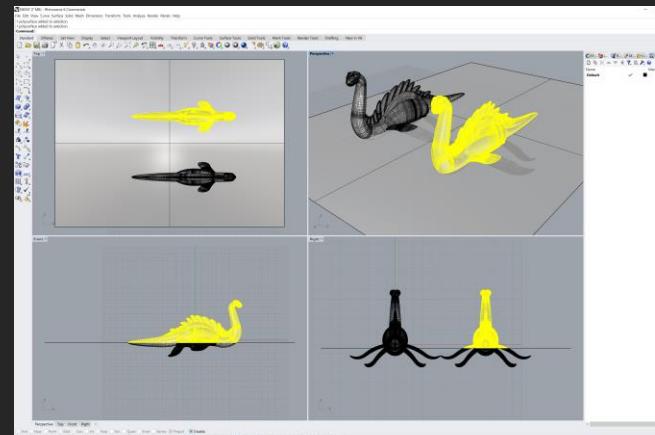
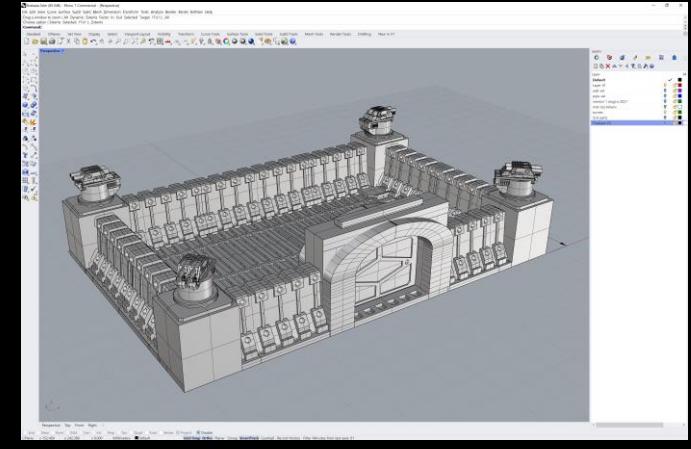
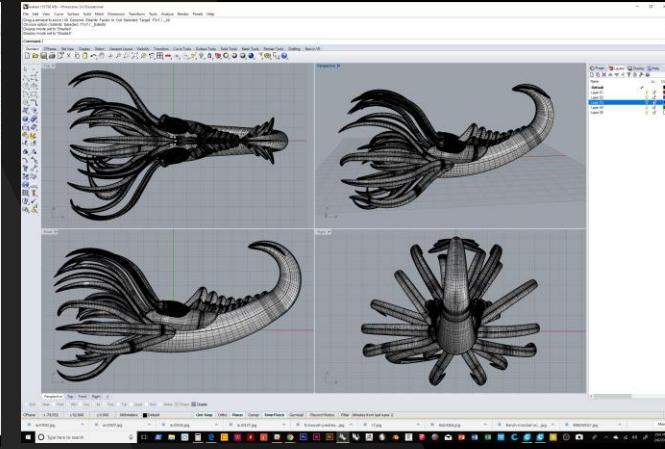
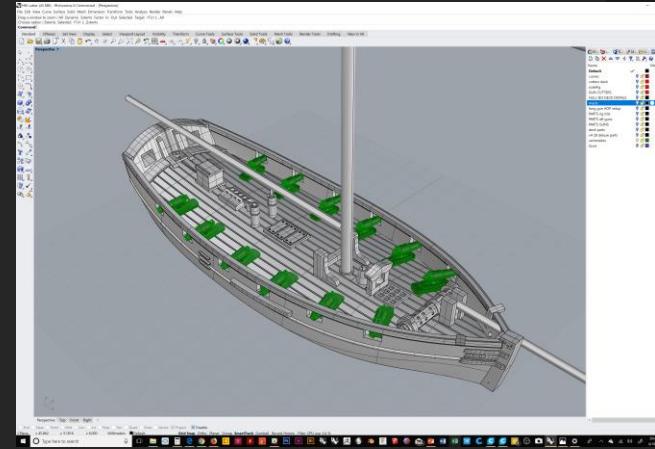
I Use Rhino3d  
which has been  
around since  
1998!

I have been using  
it since version 2 in  
2001!

Rhino is very good  
at building precise  
and complicated  
geometry very  
fast.

It is a commercial  
app, but the  
license is  
reasonably priced.

I also own Zbrush  
as well as Gravity  
Sketch, SculptVR,  
and Adobe  
Medium.



A photograph showing a man from behind, wearing a red and white t-shirt, sitting at a workbench and working on a 3D printer. He is looking down at the machine. In the background, there are shelves with various items, including spools of colorful filament (yellow, green, red) hanging on the left. A computer monitor is visible on the left side of the workbench.

# Do you need a printer or CAD skills to join this revolution?

## Places to get models and print them...

- Places to print: Maker spaces, Schools, Libraries
- Service Bureaus (services that offer printer time)
- Online file repositories and sharing (Thingiverse)
- Hybrid service bureaus/object library (Shapeways)
- File creation services (Heroforge)
- Crowdsourcing (Kickstarter)
- Web based file sale sites (more in a minute)

# Thingiverse

- A repository of uploaded models for free
- Look here first for things before you spend time to build your own
- Note the licensing. Most are GNU non-commercial
- Check the “I made one” stat
- Look for variants or “remixes”
- Not everything here will print

Thingiverse DASHBOARD EXPLORE EDUCATION CREATE Enter a search term SIGN IN / JOIN

Tiger 1 Tank Sized for Memoir '44 by rbross, published Oct 28, 2013

[Download All Files](#)

Like 310 Collect 430 Comment 7 I Made One 19 Watch 6 Remix It 0 Share

Thing Apps Enabled Order This Printed View All Apps

Thing Details Thing Files Apps 7 Comments 19 Made 430 Collections 0 Remixes

Contents Summary

This is a remix of Henrik Bjorkman's excellent "simplified tiger tank" (<http://www.thingiverse.com/thing:90265>), reduced in scale and adjusted here and there for use in the Memoir '44 board game.

As I think Henrik does, I print these vertically, and I've found that a fairly large base is needed to keep the model from breaking away from the platform when printing at this scale. The disc base in the vertical model is easily cut away after the build.

I'm continuing Henrik's practice of including the OpenSCAD source for the model, in case someone would like to hack on it.

Tip Designer Report Thing

Tags

boardgame Memoir memoir44 openscad tank

Remixed From Simplified Tiger Tank by xehpuk

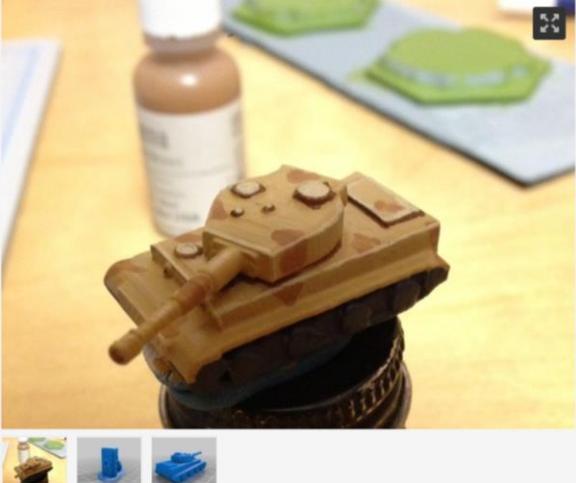
License

GNU GPL SOME RIGHTS RESERVED

Tiger 1 Tank Sized for Memoir '44 by rbross is licensed under the GNU - GPL license.

Liked By View All >

More from Toy & Game Accessories view more >



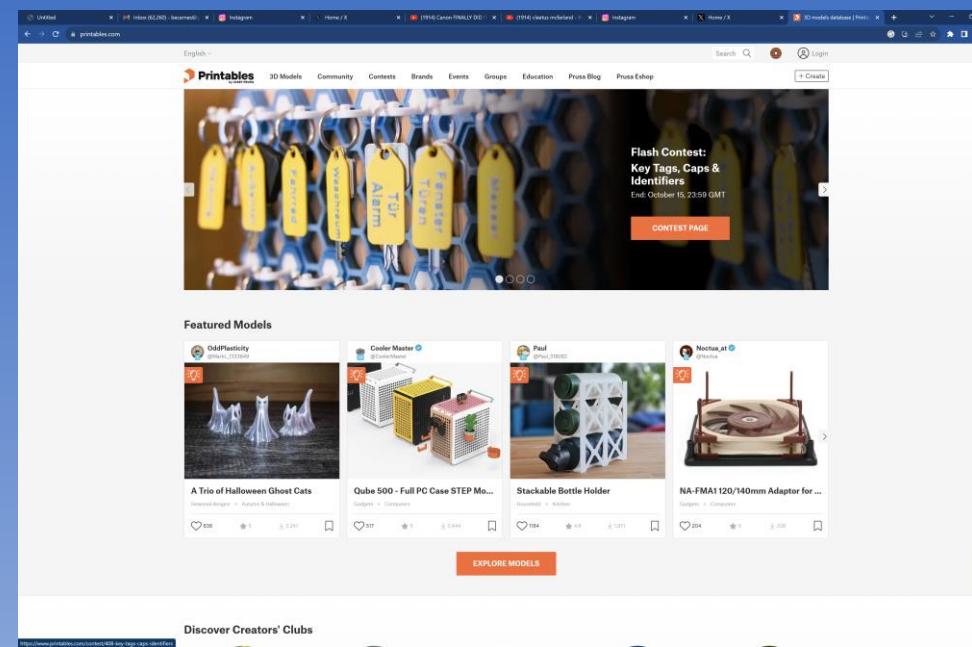
# Thingiverse Alternatives

## Commercial CG sources

- <https://www.cgtrader.com>
- <https://www.happy3d.fr/en/>

## Model sources

- <https://www.kickstarter.com>
- <https://cults3d.com>
- <https://heroforge.com/>
- <https://www.printablescenery.com/>
- <https://www.myminifactory.com>
- <https://www.wargaming3d.com>
- <https://www.printables.com>
- <https://www.youmagine.com>
- <https://www.crealitycloud.com>



# Shapeways

- A repository of uploaded models that Shapeways can print for you on commercial printers
- Can be expensive depending on material and size
- A good choice for high resolution prototypes
- Many materials including metals
- Capable of full color MultiJet printing

The screenshot shows a web browser window displaying a product page on Shapeways. The title bar includes tabs for 'How to setup your comp...', 'Facebook', '(1411) Twitter', and '1/144 Fokker D VIII x 2'. The URL is <https://www.shapeways.com/product/S446L4HDX/1-144-fokker-d-viii-x-2?optionId=41160833&li=marketplace>. The main navigation menu has 'Shop' selected, along with 'Make A Product' and 'Community'. Below the menu, the breadcrumb trail reads 'MARKETPLACE > MINIATURES > AIRCRAFT >'. The product title is '1/144 Fokker D VIII x 2' made by 'Decapod Models'. A dropdown menu titled 'CHOOSE A MATERIAL' lists three options under 'PLASTIC': 'White Strong & Flexible' (\$7.83), 'Frosted Ultra Detail' (\$15.49), and 'Frosted Extreme Detail' (\$21.57). A large image shows two green and red biplane models standing on a base. Below the image is the text 'Picture by Andrzej'. At the bottom of the page are three smaller images of the model from different angles.

1/144 Fokker D VIII x 2

MADE BY  
Decapod Models

CHOOSE A MATERIAL

Material Type	Material Name	Price
PLASTIC	White Strong & Flexible	\$7.83
	Frosted Ultra Detail	\$15.49
	Frosted Extreme Detail	\$21.57

BUY NOW

Picture by Andrzej

Questions or  
discussion?

