LASER-CUT BOXES

design custom boxes using:

TinkerCAD

+

box generators

+

TTU Makerspace's Glowforge Plus

+

Glowforge thick basswood plywood

2025

Who am I?

Sean W Scully

Lead Administrator – TTU Libraries - Emerging Technology

Rhino3D, TinkerCAD, AutoCAD Inventor, Fusion360, Blender, Solidworks
MakeCode, Python, Scratch, C++, C, MATLAB, Arduino, JavaScript, Assembly, Verilog, Xilinx

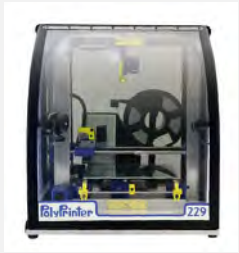
BGS, Math/Engineering/Renewable Energy, TTU
MFA, Studio Art - Metals/Jewelry/Enameling, Kent State U
BFA, Studio Art - Metalsmithing/Jewelry Design, TTU
AA, Fine Arts, South Plains College

linkedin.com/in/seanwscully

Find me on the First Friday Art Trail, ffat.org, CASP Work Studio H

MAKER SPACE

RYAN CASSIDY | SEAN SCULLY | JAKE SYMA | BRIANA MOODY

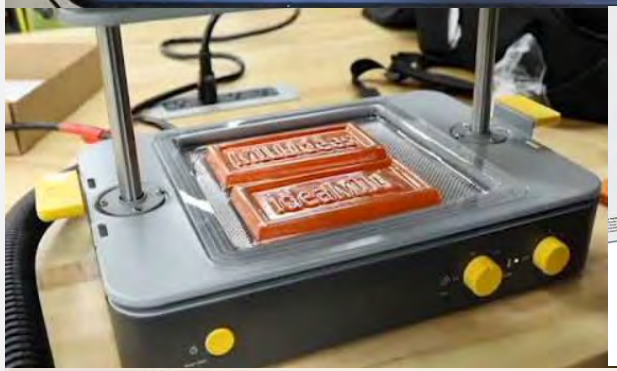


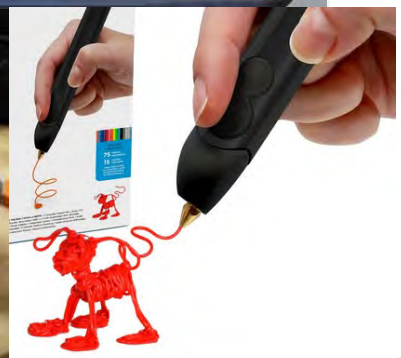
Emerging Technology Department:

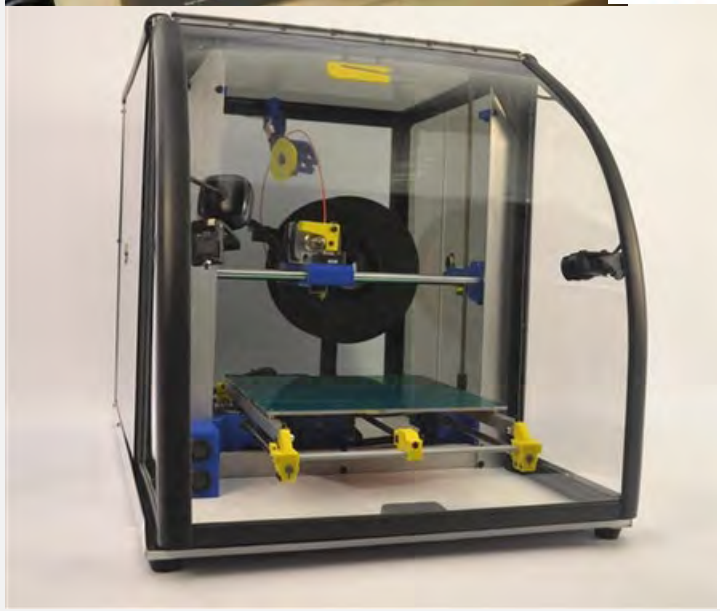
- Makerspace: Main Library, 2nd floor, room 210
- VR Lab: Main Library, 2nd floor, room 201A

make@ttu.edu

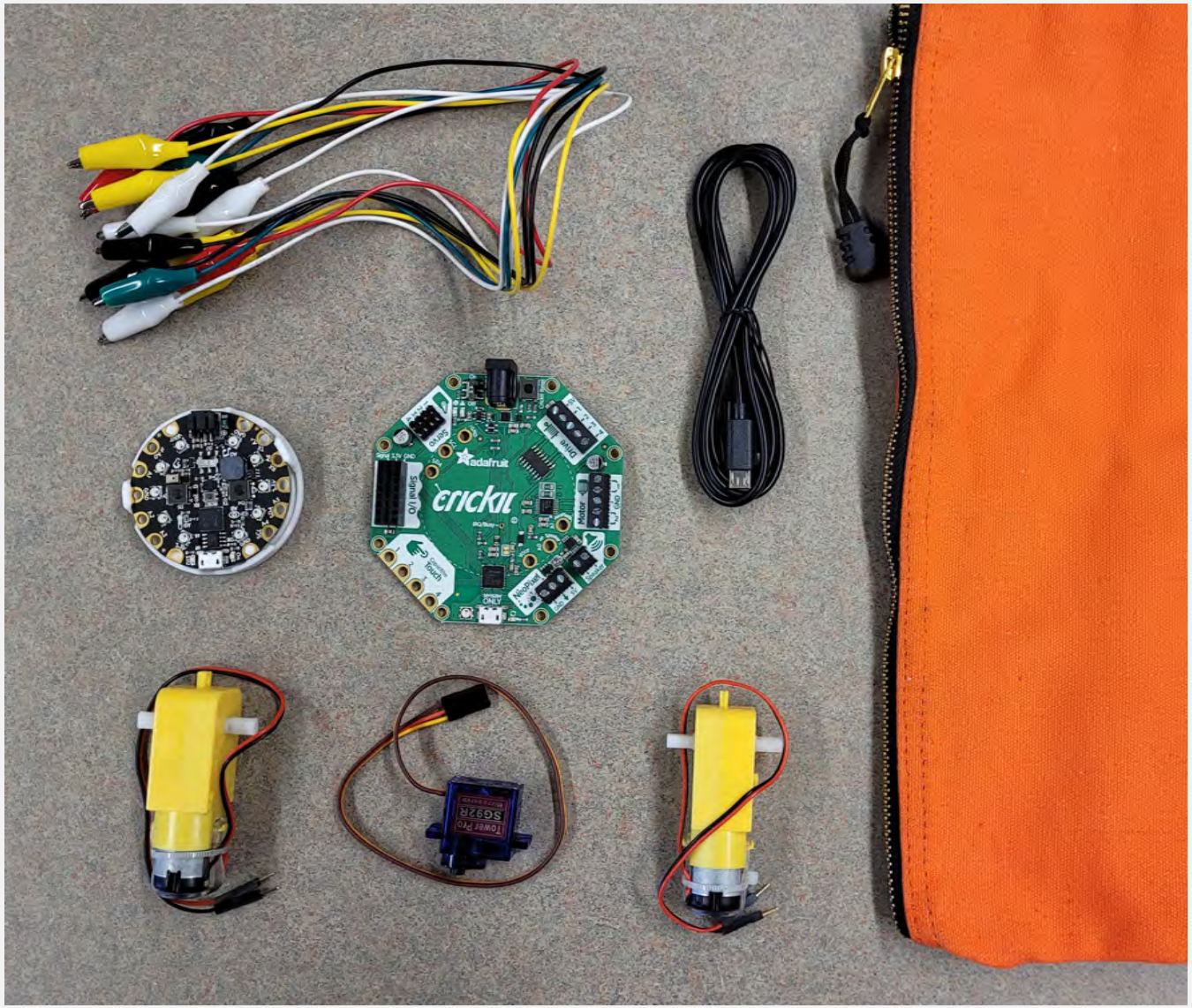
https://www.depts.ttu.edu/library/make/





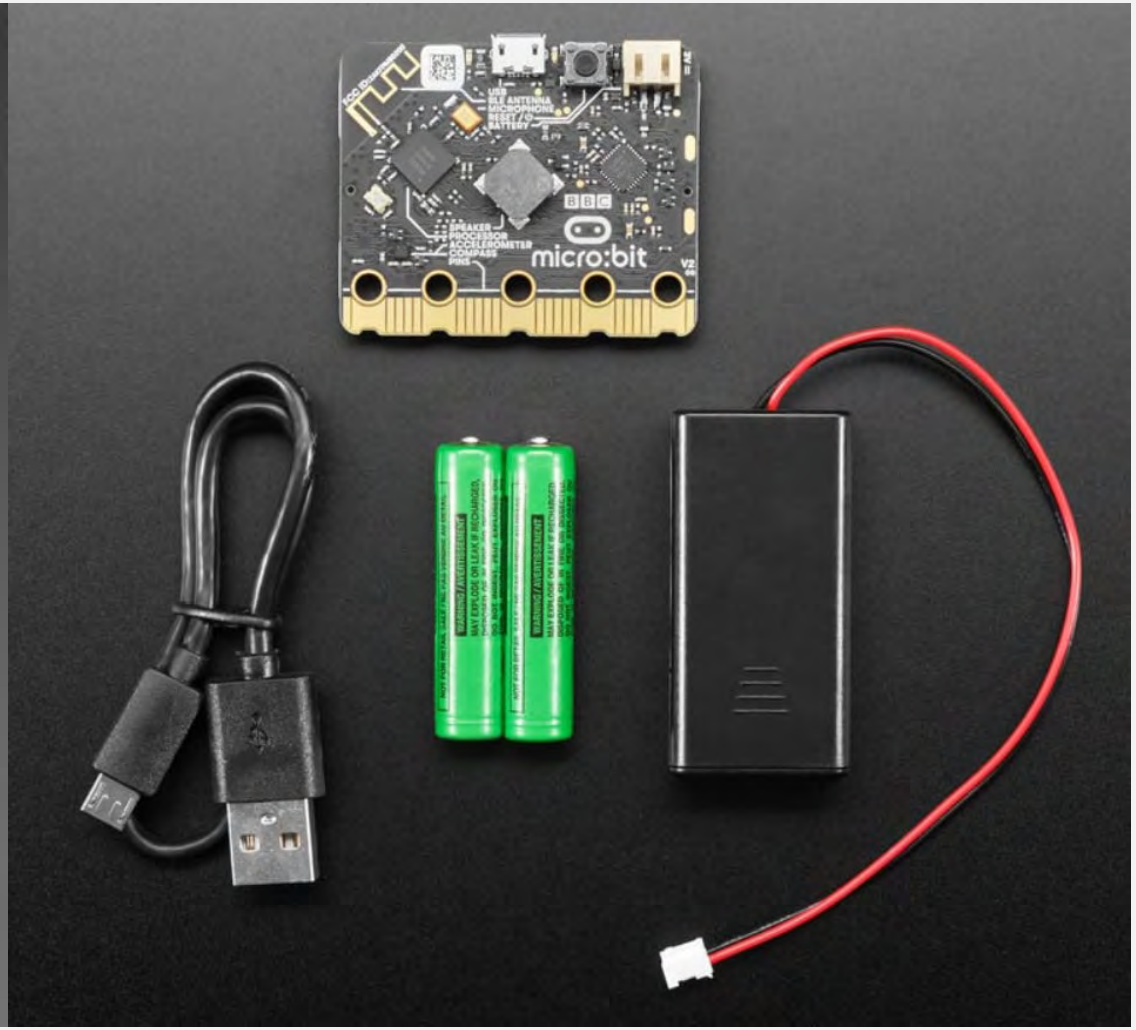


- Cricut Maker/Venture
- Glowforge Lasercutter
- Makyu Formbox
- Matter&Form 3D Scanner
- PolyPrinters 229 & 508
- Ultimaker 3, S7
- Sewing machines



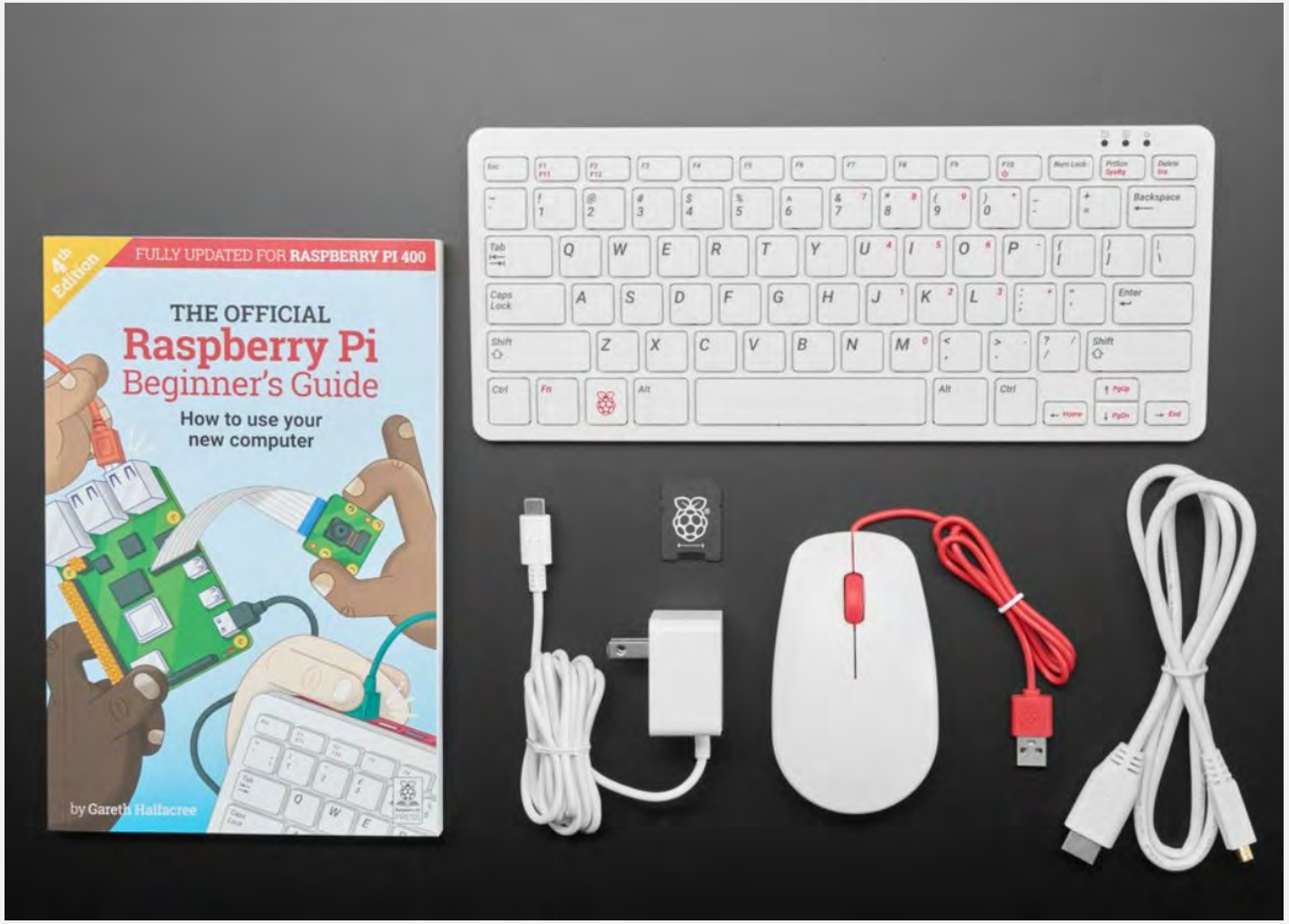
- Robo Kits (15)
  - *Adafruit's Circuit Playground Express (CPX)*
  - *Adafruit's Crickit robotic control board*
  - *geared motors (2), micro servo*
- ElectroSoldering Kits (5)

TTU Library's Makerspace *CuteBot* and *Micro:Bit v2* Kits



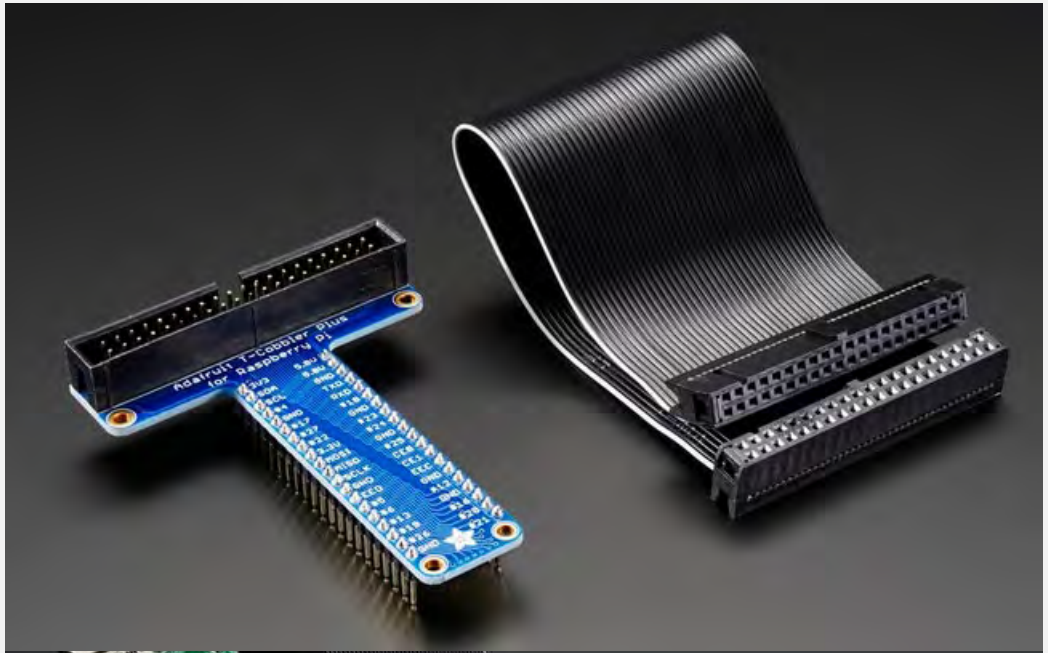
Images of our CuteBot kit and Micro:Bit v2 kit

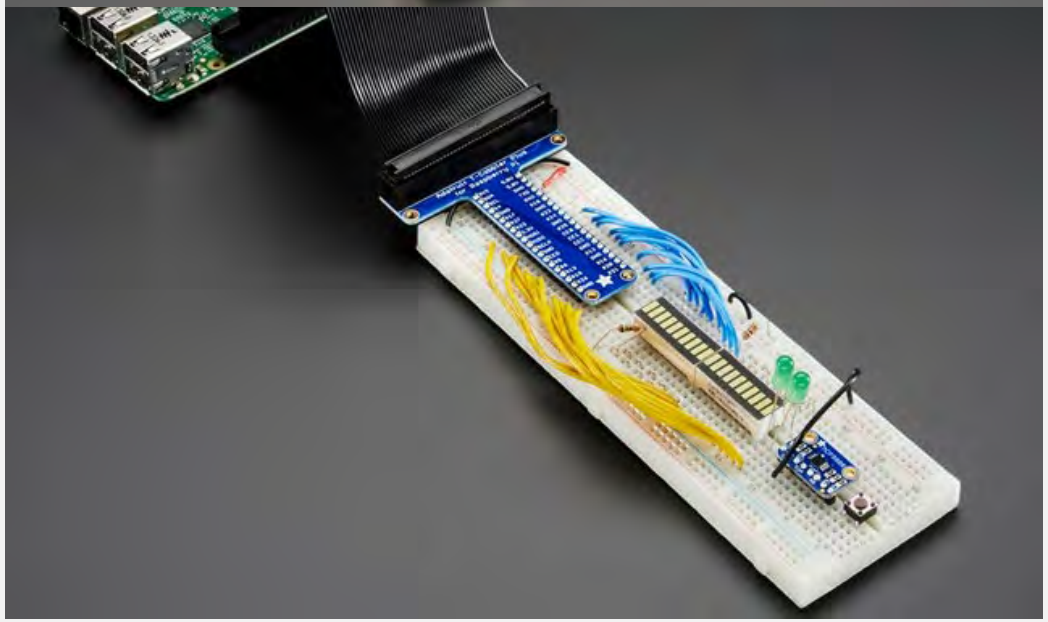
TTU Library's Makerspace *Pi-400* and *Pi-Zero W* Kits

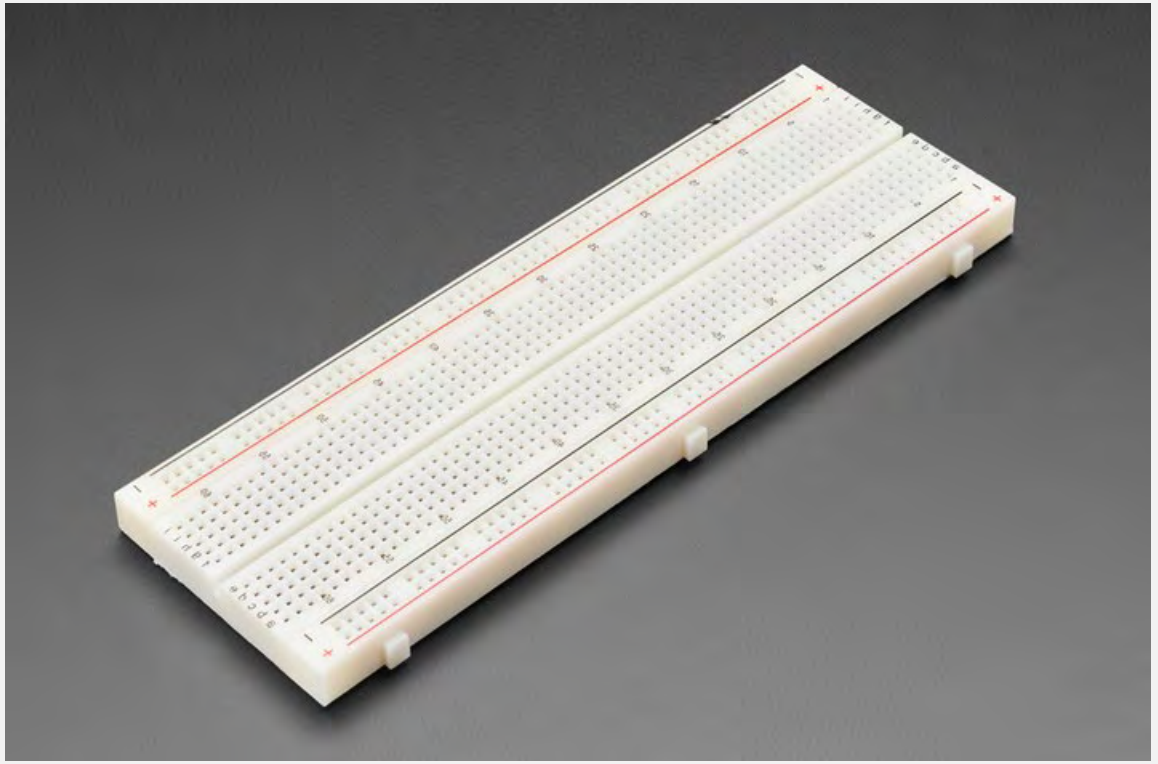


6 kits of each is available: recommend supplying your own microSD card (minimum size: 8Gb)

TTU Library's Makerspace *Pi – Interface* Kits







6 kits of each is available, one for every Pi-400

- Pi T-Cobbler Plus
  - GPIO Breakout - Pi A+, B+, Pi 2/3/4, Zero
- Full Sized Premium Breadboard
  - 830 Tie Points

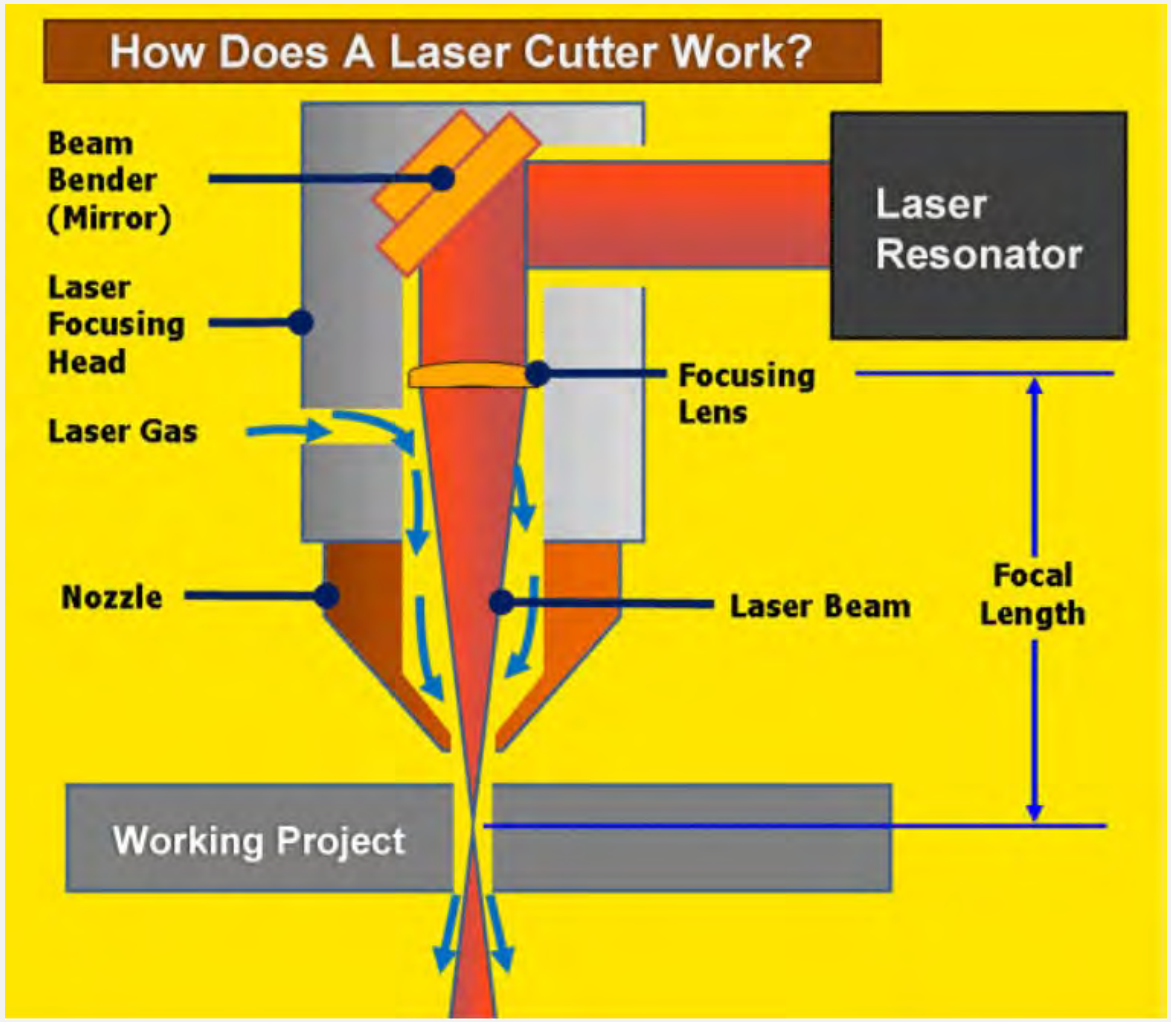
TTU Library's Makerspace *iFixit* Kits

6 kits of each is available, one for every Pi-400

- all kinds of screwdriver tips, 64 total
- larger kit has spudgers and plastic pryers

what is a lasercutter?

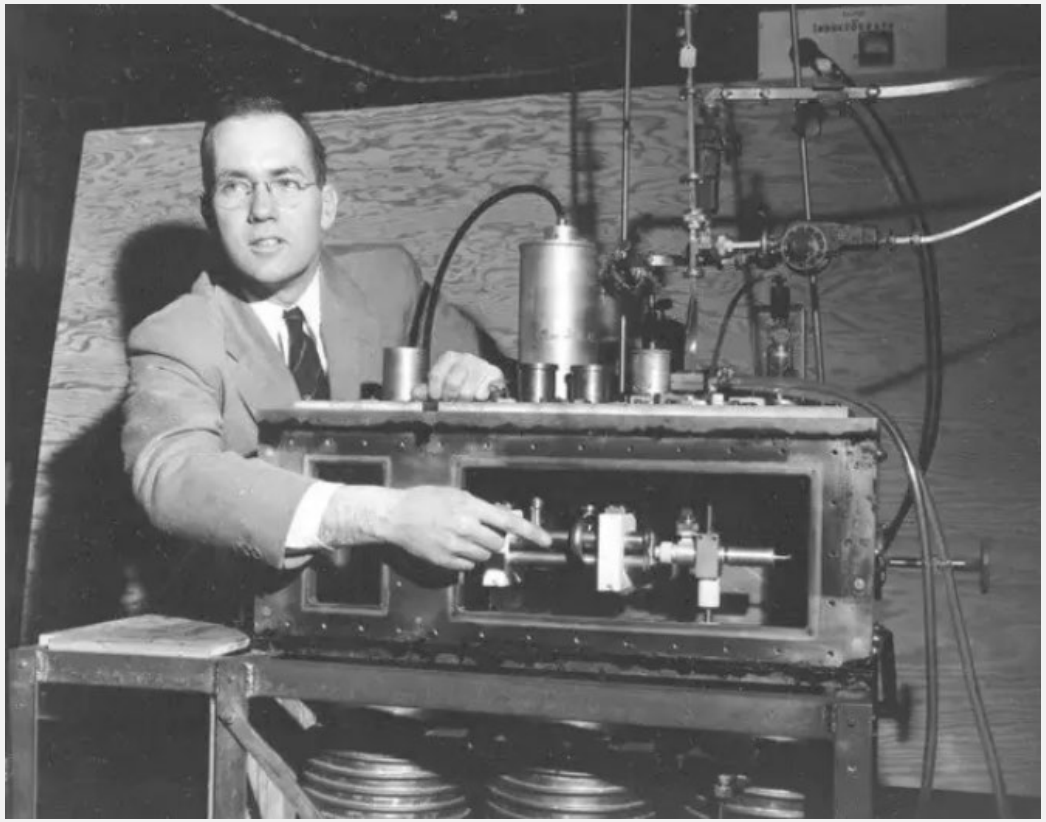
- CNC – computer numerical control
  - motors control x,y axis movements
  - beam is variably powered
  - cooling and exhaust system
- subtractive vs. additive
  - burns away material – engraver/cutter
  - fuses ink onto a material – laser printer
- laser beam types/categories/sources
  - CO2
  - fibre
  - UV – ultraviolet
  - plasma beam
  - diode – highpower LED



- uses adjustable mirrors and lenses to focus the beam

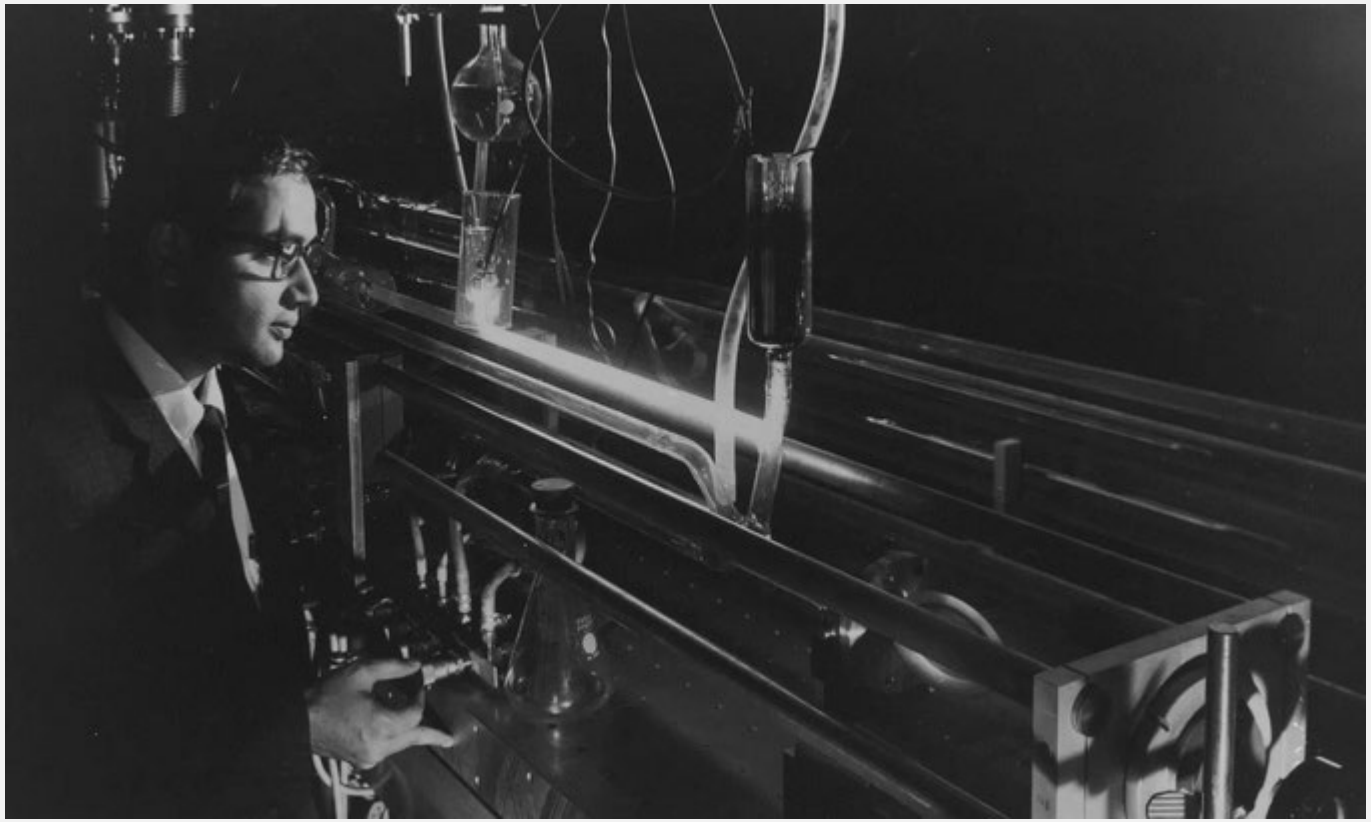
lasercutting history

- MASERs (1950s) vs LASERs (1960s)



Charles Townes

MASER - Microwaves Amplification by Stimulated Emission of Radiation

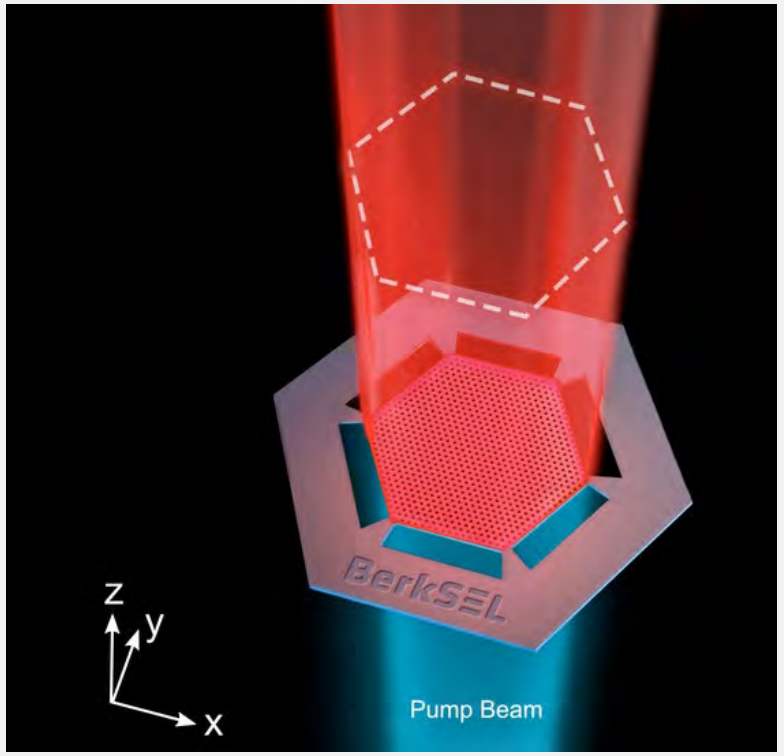


Kumar Patel

LASER - Light Amplification by Stimulated Emission of Radiation

lasercutting into the future

- Einstein, *On the Quantum Theory of Radiation* (1917)
- synthetic ruby (1950s)
- CO2 & gas-based (1960s)
  - *titanium, diamond, ceramics*
- Fibre (1980s-2007)
  - *super thick steel*
- BerkSEL (2022)
  - *Berkeley Surface Emitting Lasers*
  - *semiconductor membrane-based*



what materials can the Glowforge Plus cut/engrave?

- paper
- wood
  - *plywood*
  - *veneer*
  - *draftboard*
- acrylic
- leather
- fabric (natural fiber)

engrave only

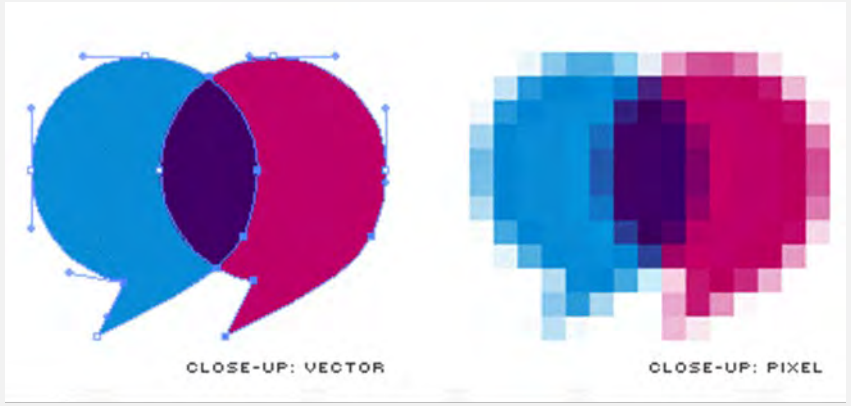
- metal
- stone (shale)

where to find materials for the Glowforge Plus?

- Glowforge Website - recommended
  - https://shop.glowforge.com/
- local hobby shops
  - Michaels/HobbyLobby
  - Walmart/DollarTree/DollarStore
  - Joann's Fabrics
- local consumer/prosumer wood suppliers
  - Acacia Hardwoods – recommended (https://www.acaciahardwoods.net/)
  - Lowes/Home Depot
- online suppliers
  - Amazon.com
  - DickBlick.com

file types

- why is a JPG not an SVG?



Vectors Pixels

Bitmap/Raster/Pixels vs. Vector Graphics

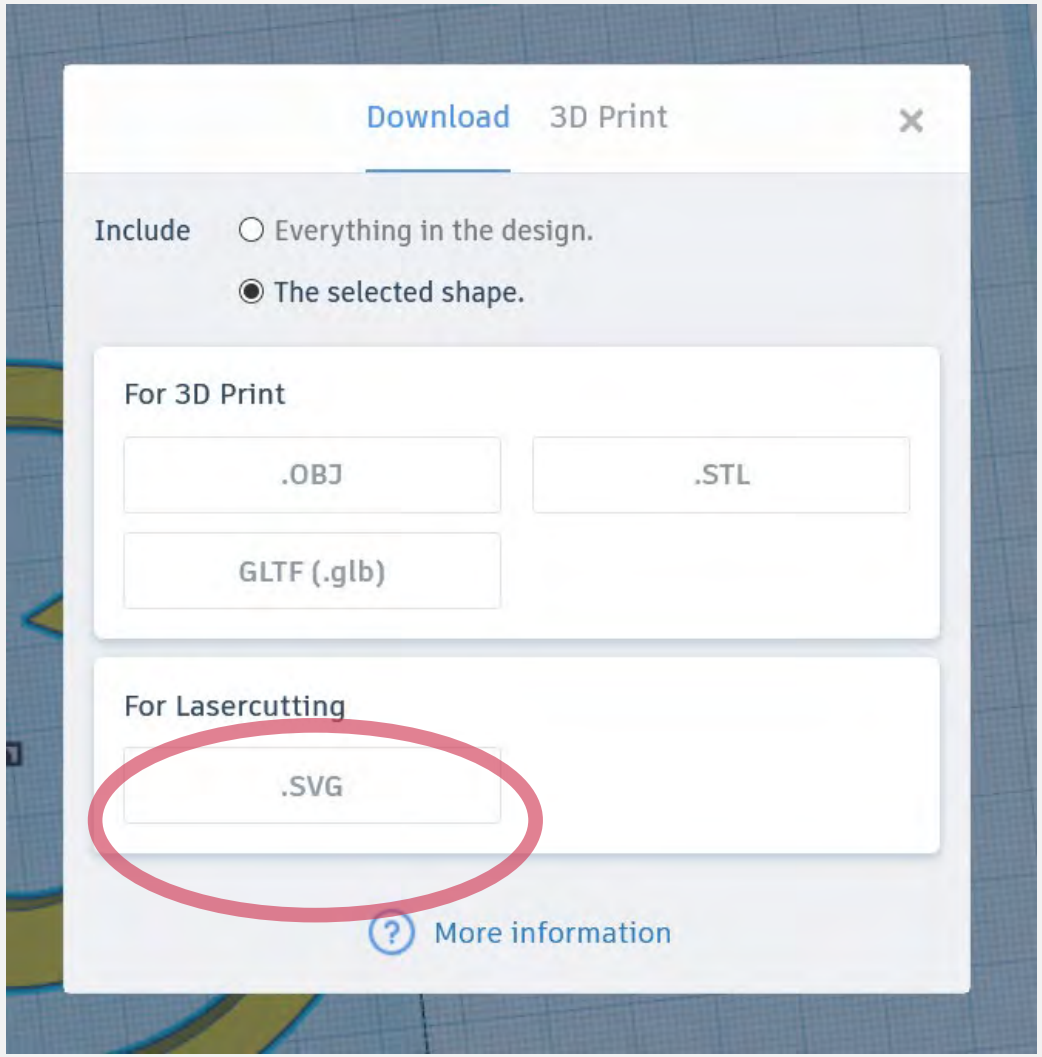
- Bitmap (JPG, GIF, PNG):
  - made of dots/pixels that distort when the image is scaled

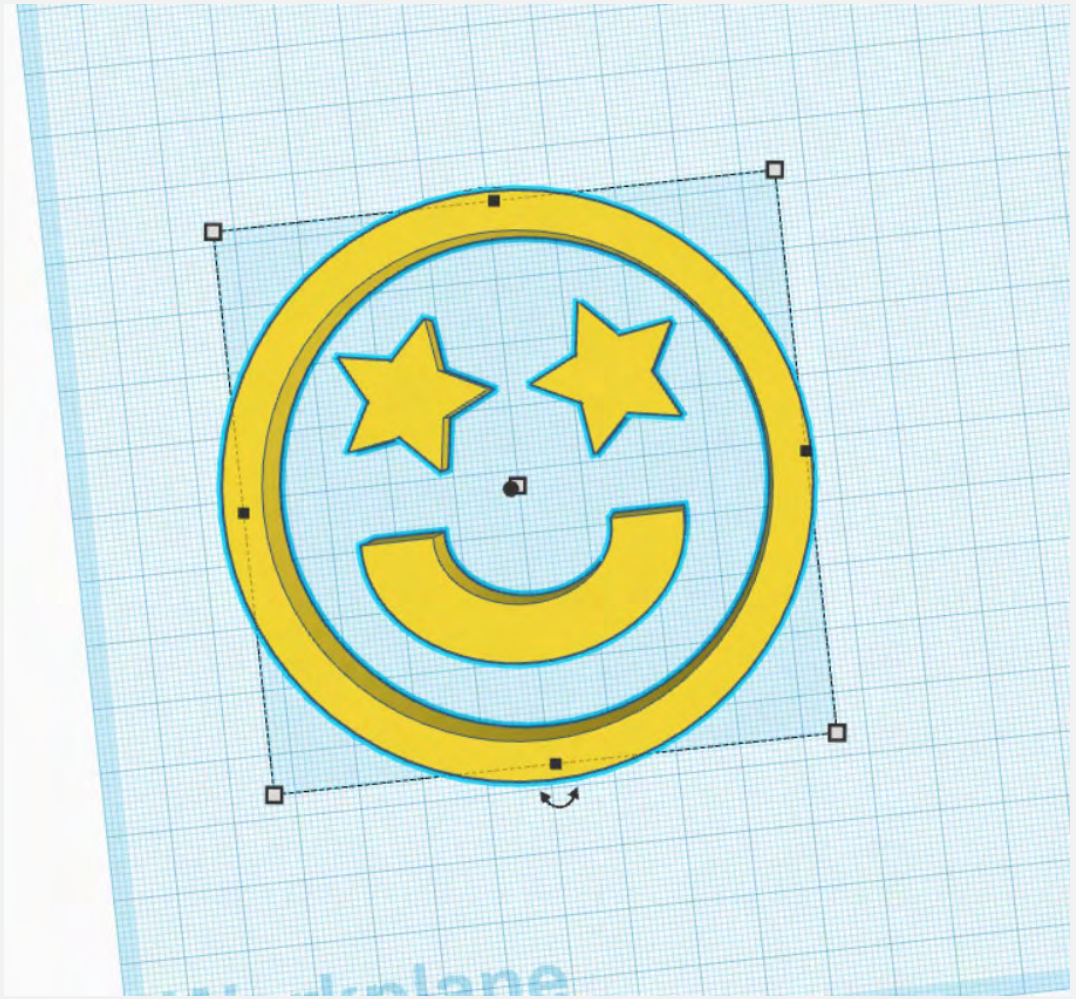
- Vector (SVG, AI, PDF):
  - calculation of points connected with lines that will not lose clarity when scaled up or down (math path)

software – freeware: TinkerCAD

- free online Autodesk CAD software, simplified for kids
- runs in your browser – Chrome/Firefox
  - *https://www.tinkercad.com/*
- complex and simple shapes available for remixing
- export file options
  - *SVG – lasercut or Cricut Maker it*
  - *STL – 3D print it*
  - *glb/glbTF– 3D model optimized for web design*

software – freeware: TinkerCAD



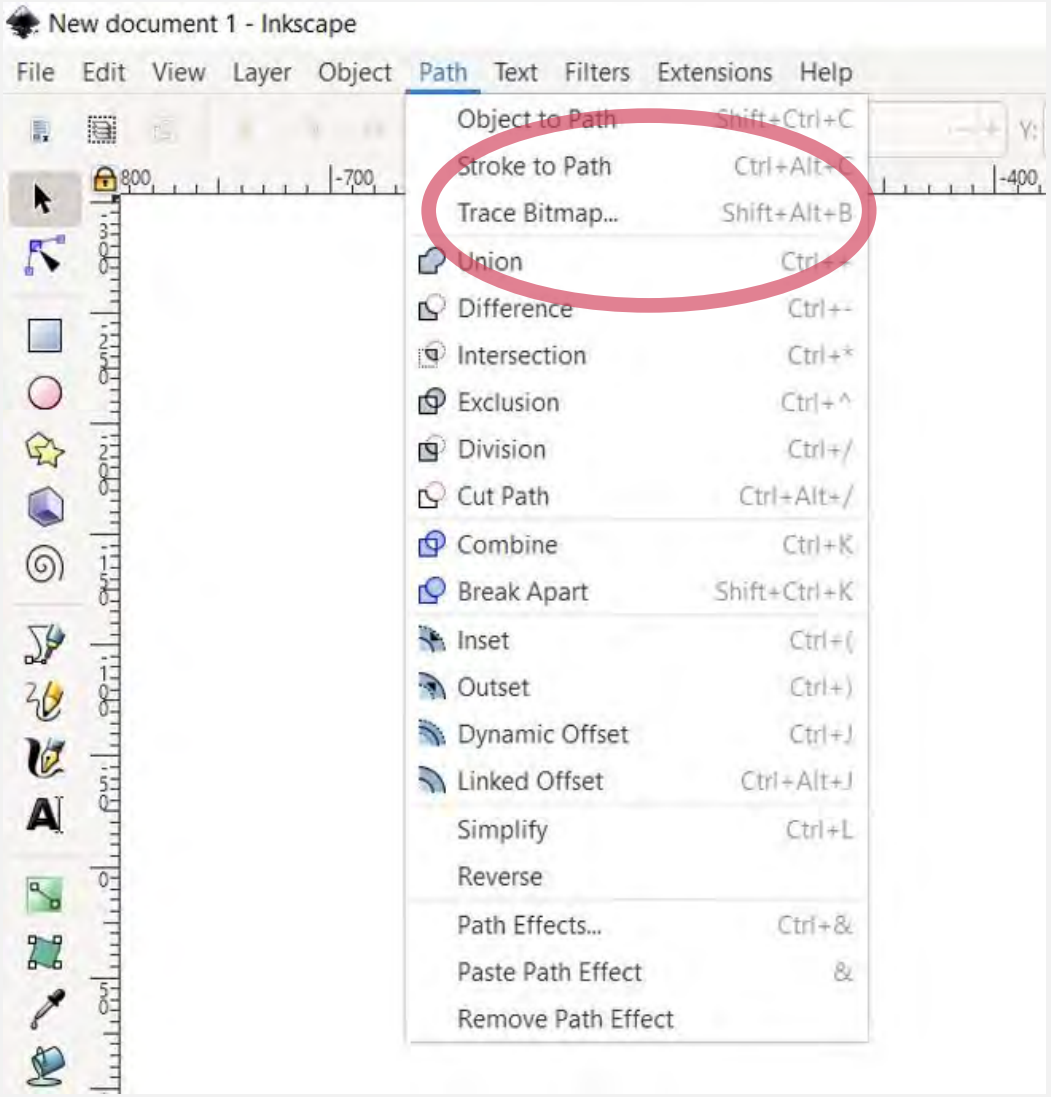


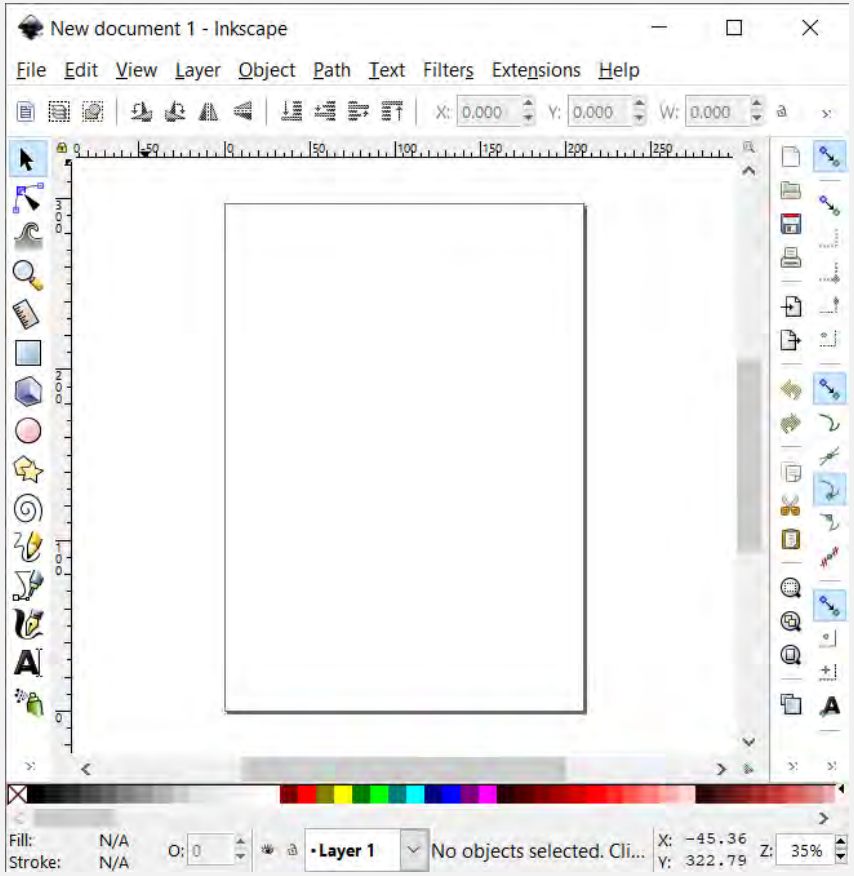
- all objects the same height (5-10mm)

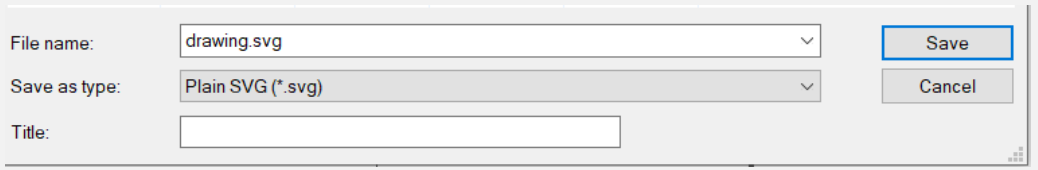
software – freeware: Inkscape

- free offline vector graphic software
- Illustrator-style program
- install software from
  - https://inkscape.org/
- importing images to make custom SVG files
- trace your vector design over an existing image
- start a vector drawing from scratch

software – freeware: Inkscape



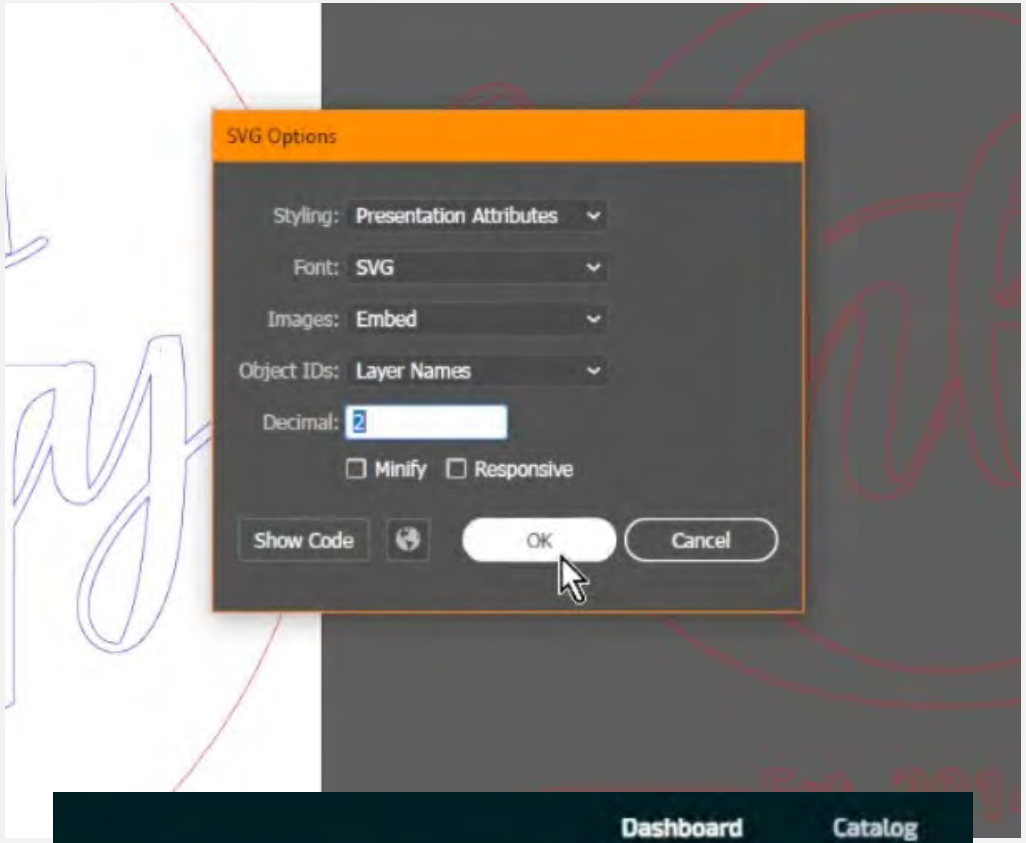


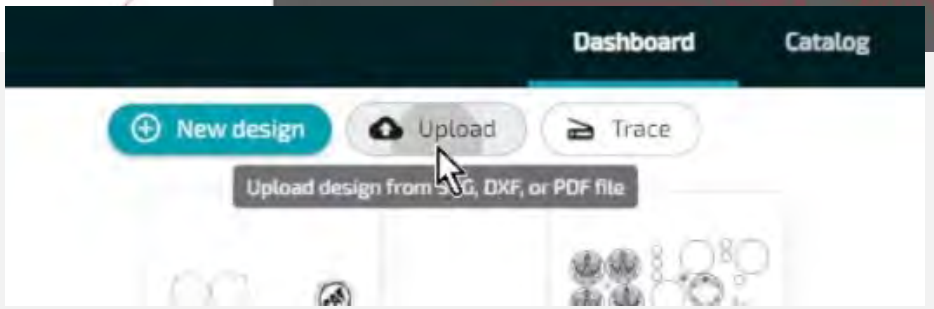


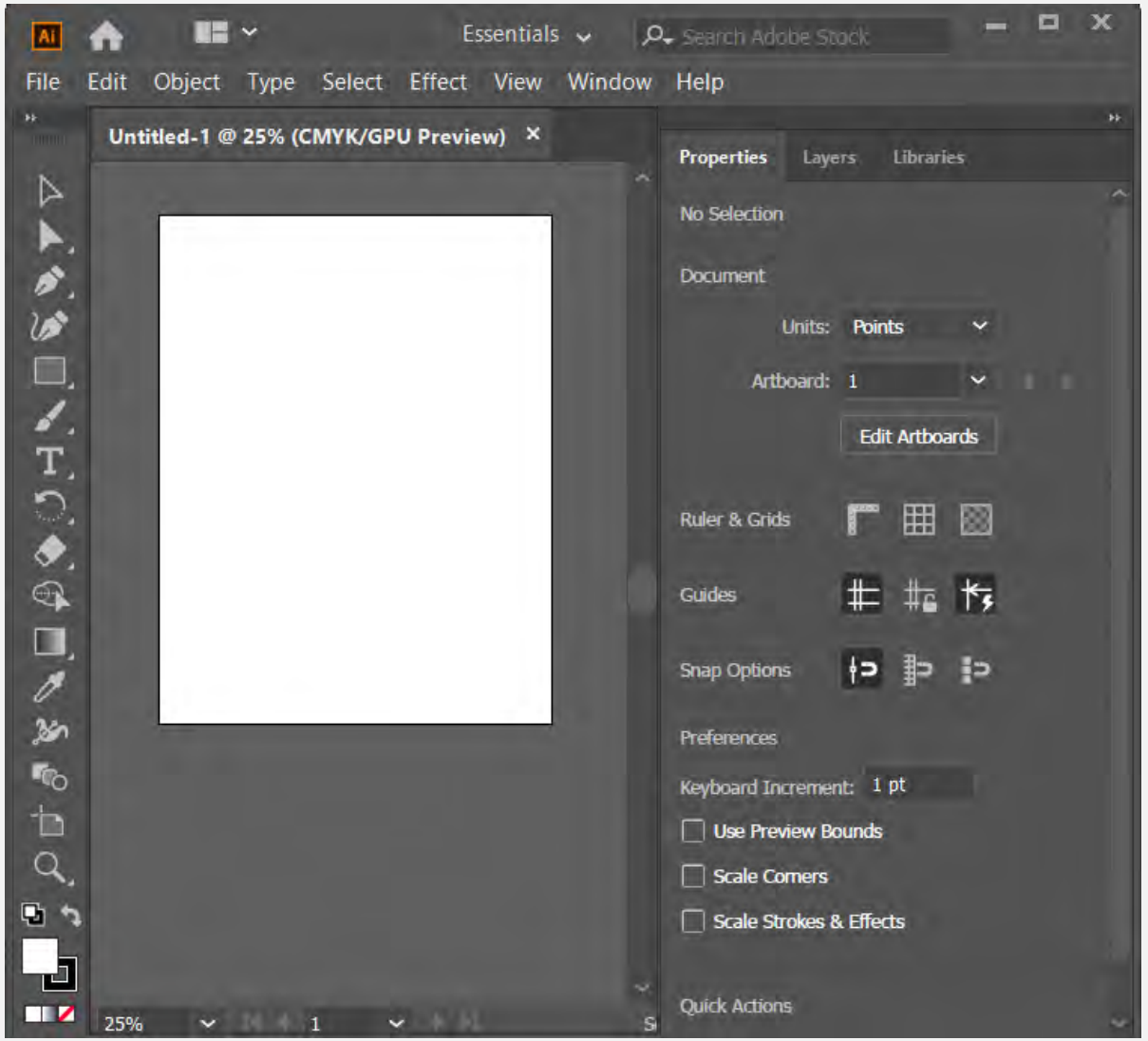
software – Adobe Illustrator

- offline vector graphic design software
- wide array of tools available
  - *fonts/Lettering*
  - *graphic effects/textures*
  - *starting a vector drawing from scratch*
- export as
  - *bmp, png, or jpg file*
  - *SVG is possible, but can be complicated*
- install software from your Adobe account (free/low cost for students)

software – Adobe Illustrator





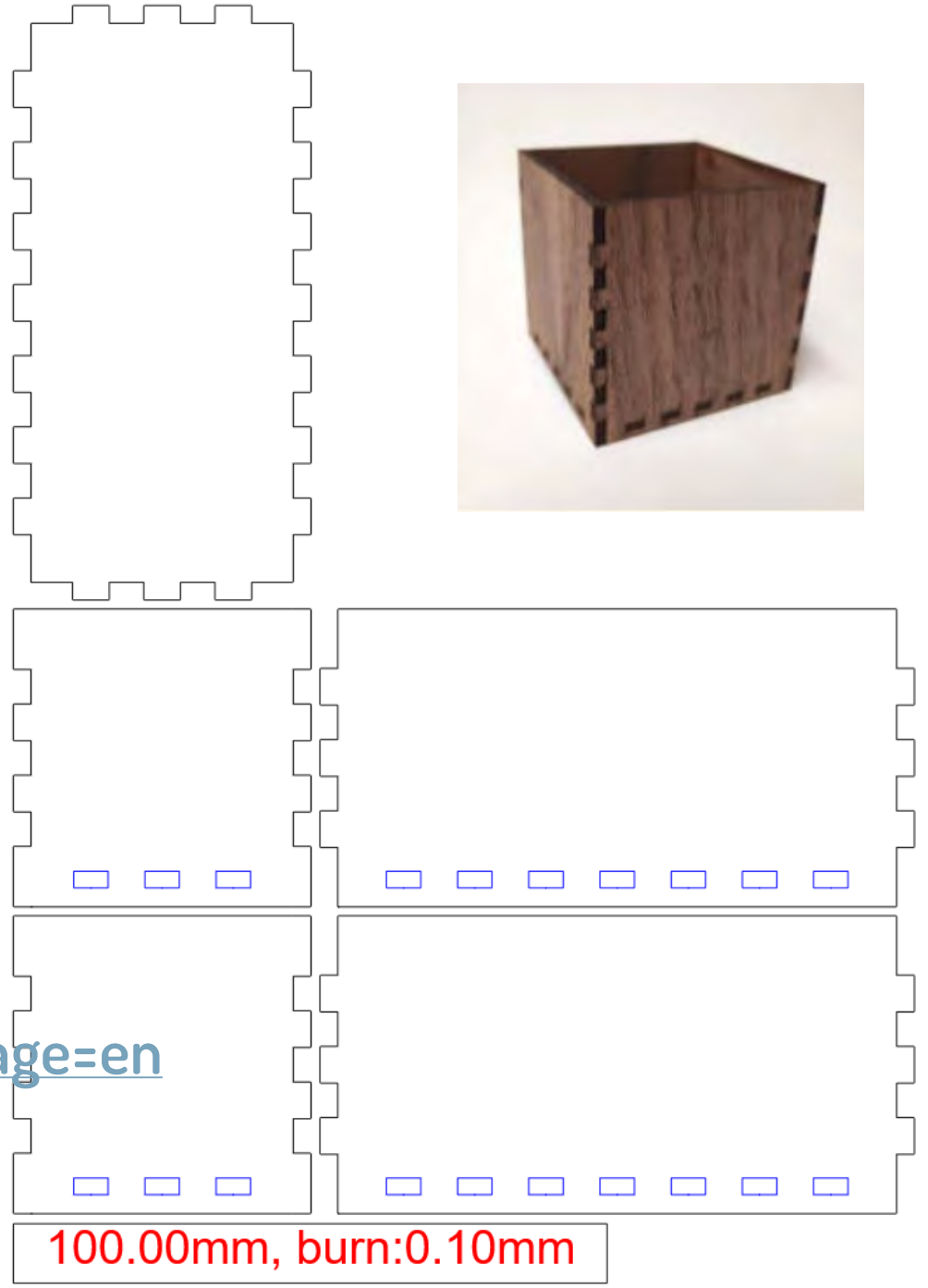


let's get started – TinkerCAD!!

- setup TinkerCAD account
- design your puzzle image (draw on paper first)
- build your design in TinkerCAD
  - *cut-outs, holes*
  - *text/design/logo (engraved design/image)*
- export your design (.SVG files)
  - *text/design/logo (engraved design/image)*
- email your design files to make@ttu.edu
  - *subject: "LaserCut Workshop"*

box generators!!

- Dimensions
  - *(simple, small, and fast today)*
  - *60mm x 60mm x 60mm*
  - *1/4” material (6mm)*
  - *No lid*
  - *(large enough that you don’t lose the design)*
- https://festi.info/boxes.py/
- https://boxes.hackerspace-bamberg.de/?language=en
  - let’s cut some boxes!



using Makerspace's *Glowforge Plus*

- arrange a $2.00/hr appointment time to work
- send us your files to ensure they work

- grab your materials

- have fun!

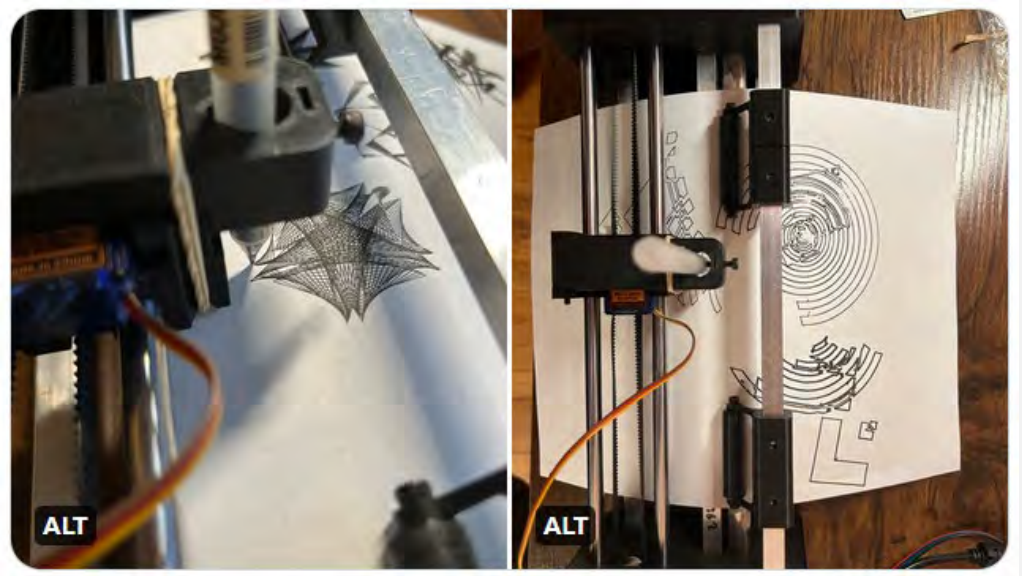
- brainstorm by exploring Glowforge's project guides
  - https://glowforge.com/discover/
  - https://community.glowforge.com/

- explore Glowforge's professional-grade materials
  - https://shop.glowforge.com/

moving forward

- The Staff and Student Assistants in the Makerspace are here to help!
- There are O'Reilly video and text tutorials available to help learn the more advanced software (TinkerCAD, Inkscape, etc.) through Library Databases:
  - *Search for "oreilly" @*
  - *http://texastech-ml.hosted.exlibrisgroup.com/V/?func=find-db-1*
- https://inkscape.org/learn/tutorials/
- Makerspace's Inkscape Workshop: https://guides.library.ttu.edu/inkscape
- trace bitmap image in Inkscape for Glowforge
  - *https://www.youtube.com/watch?v=UY6diL0l4cY*
- Glowforge and lasercut
  - *https://www.youtube.com/watch?v=dP50np_2igk*

lasercutting – *onward*



- explore
  - *“flexible hinges”*
  - *“plottertwitter”*
  - *Op Art*
  - *“generative design”*

- as springboards to the next level consider
  - *line quality*
  - *composition*
  - *other design elements*

- make mistakes, learning is messy

lasercutting - *inspiration*

hobby electronic projects

- https://learn.adafruit.com/search?q=lasercut

make boxes, looms, and cases!

- https://www.instructables.com/The-Ultimate-Guide-to-Laser-cut-Box-Generators/
- https://festi.info/boxes.py/
- https://boxes.hackerspace-bamberg.de/?language=en
- https://www.makercase.com/
- https://makeabox.io/
- https://talk.vanhack.ca/t/laser-cut-inkle-loom-project/5503

other project generators – even puzzles

- https://makerdesignlab.com/tutorials-tips/online-file-generators-for-laser-cutting/
- https://www.instructables.com/howto/lasercut/

projects galore

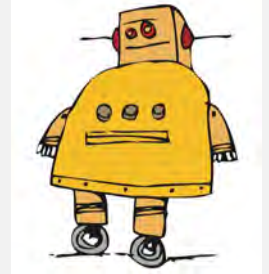
project-sharing websites (some require membership)

- https://learn.adafruit.com/
- https://www.hackster.io/
- https://www.instructables.com/
- https://hackaday.io/
- https://make.co/

Support/Forums/Discord

- Glowforge (create a free log-in first - https://glowforge.com/create-account)
  - *https://community.glowforge.com/*
- Adafruit
  - *http://adafru.it/discord*




thank you!

please share your projects and progress!

"Laser-cut Boxes" with Instructor Sean Scully
review this workshop here:
https://ttu.libwizard.com/f/workshop-eval-24-25_emerging_tech

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Workshops - https://guides.library.ttu.edu/make