

LASER-CUT HANDMADE BOOKS



design custom books using:

TinkerCAD

+

Woven and Interlocking
Book Structures

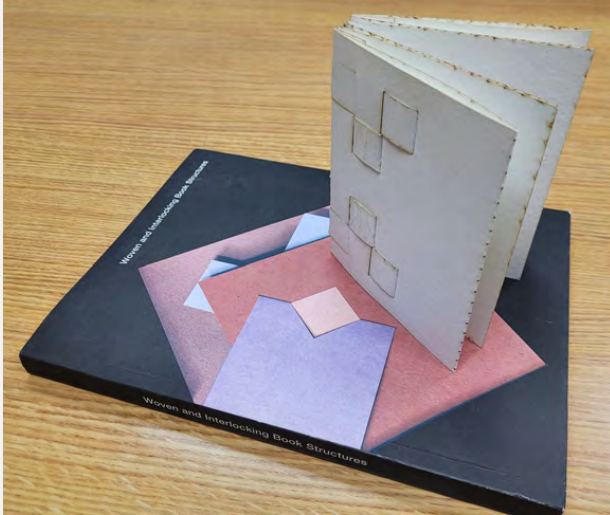
By Van Vliet & Steiner

+

TTU Makerspace's Glowforge Plus

+

watercolor & drawing paper



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

GSB, General Studies – Math/Engineering/Renewable Energy, TTU

MFA, Studio Art – Metals/Jewelry/Enameling, Kent State Univ

BFA, Studio Art – Metalsmithing/Jewelry Design, TTU

AA, Fine Arts, South Plains College Plains College

[linkedin.com/in/seanwscully](https://www.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



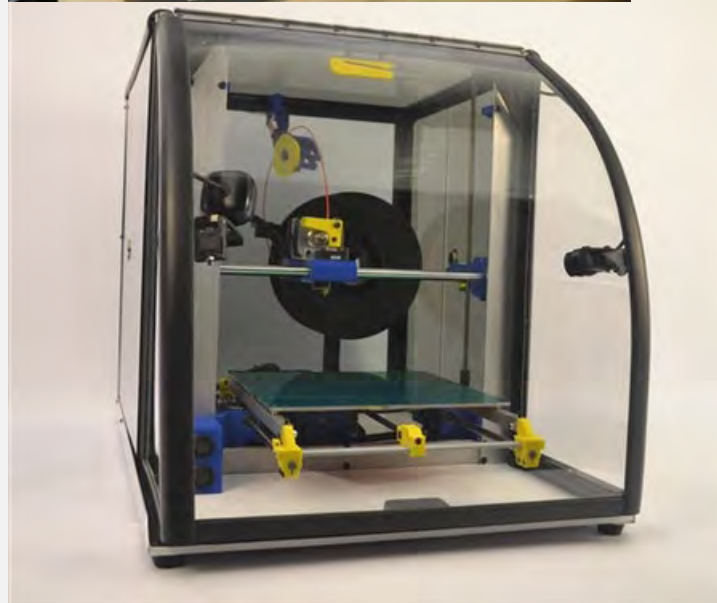
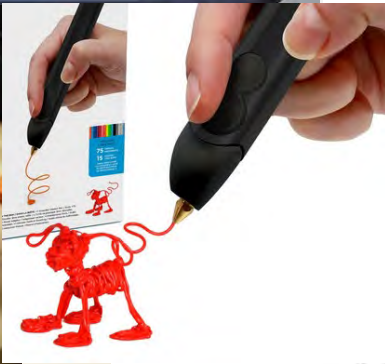
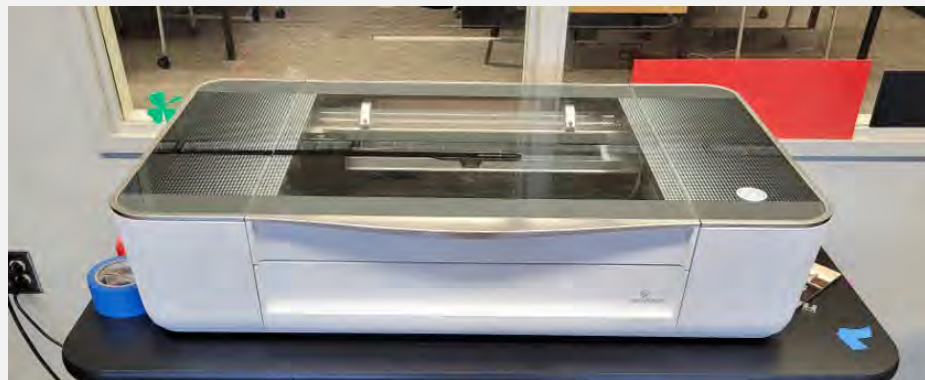
Emerging Technology Department

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

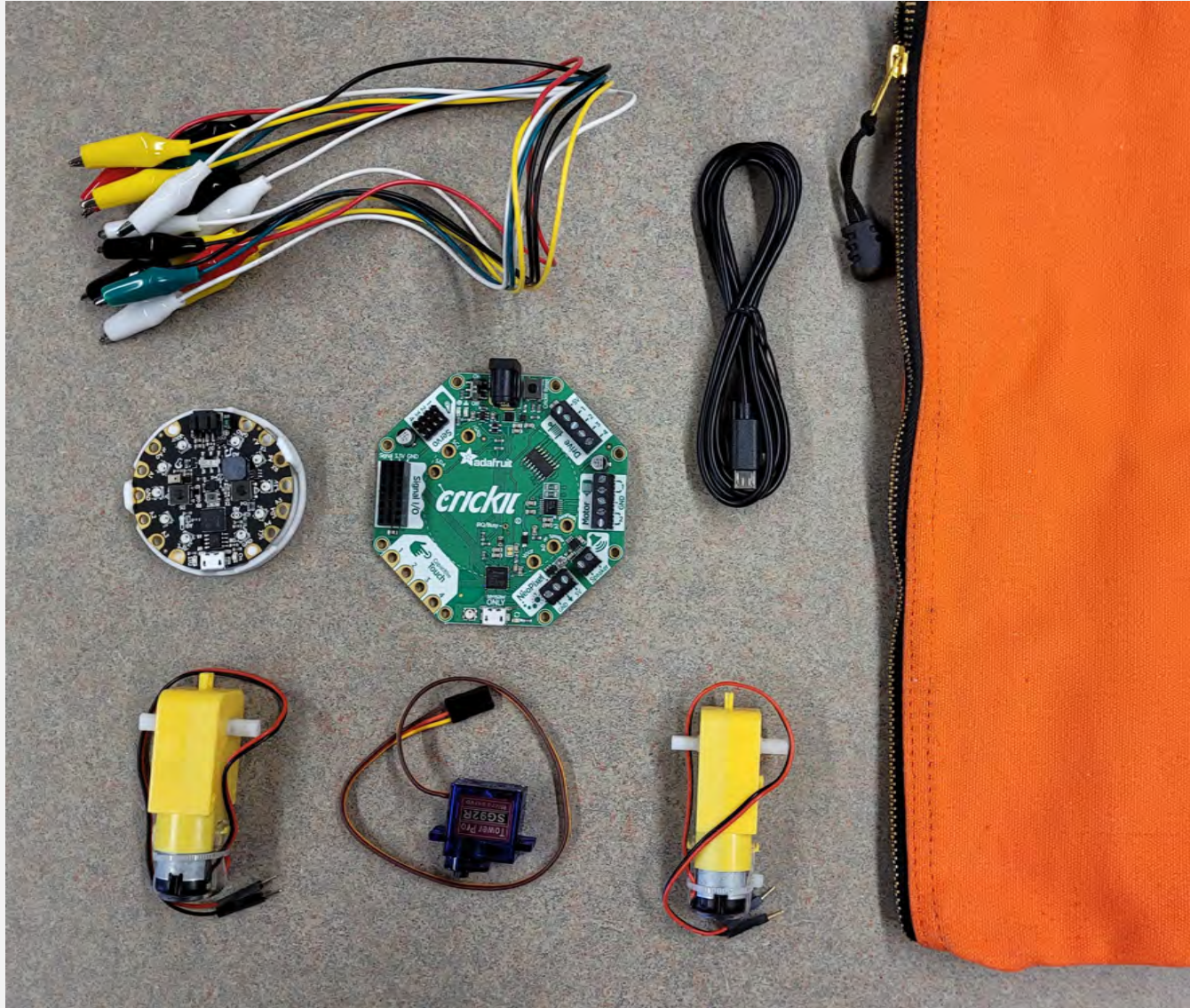
make@ttu.edu

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



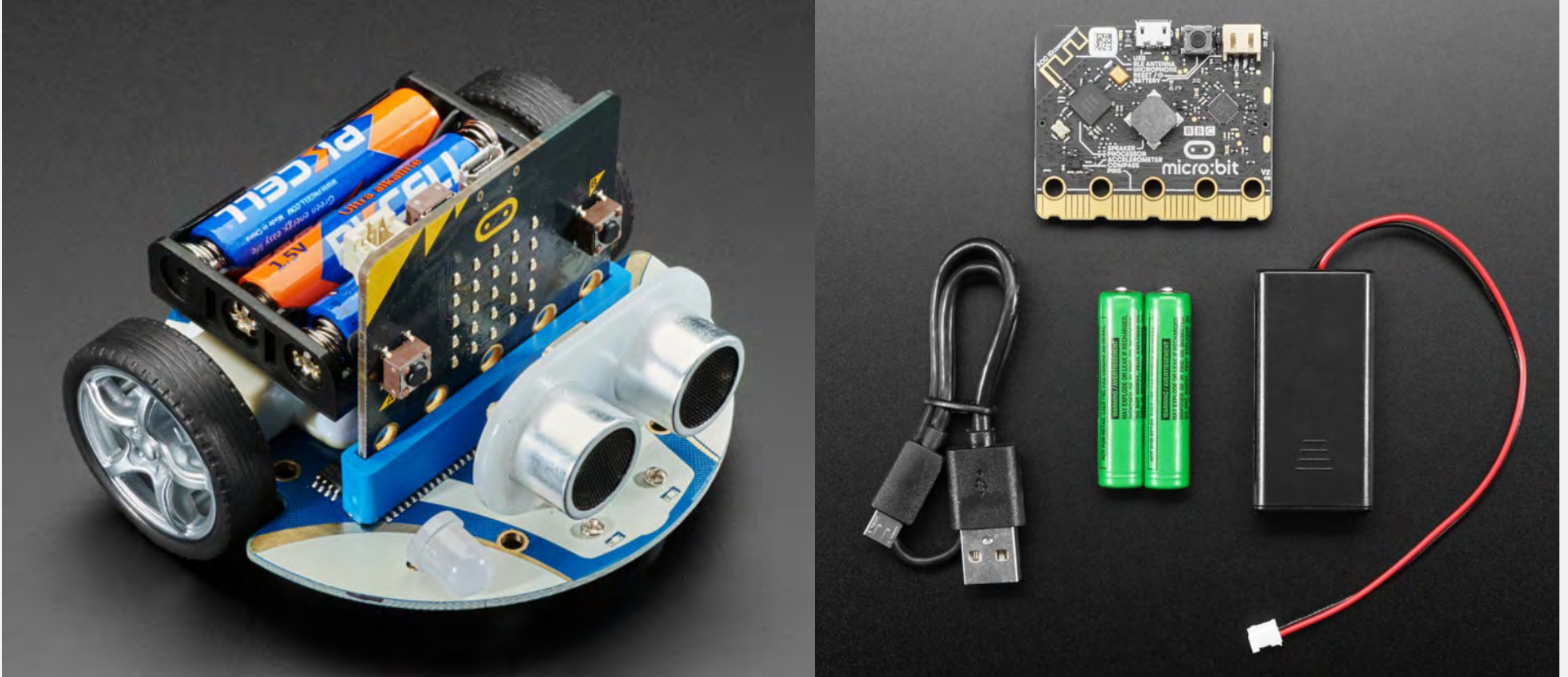


- Cricut Maker/Venture
- Glowforge Lasercutter
- Makyu Formbox
- Matter&Form 3D Scanner
- PolyPrinters 229 & 508
- Ultimaker 3, S7
- Sewing machines



- 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

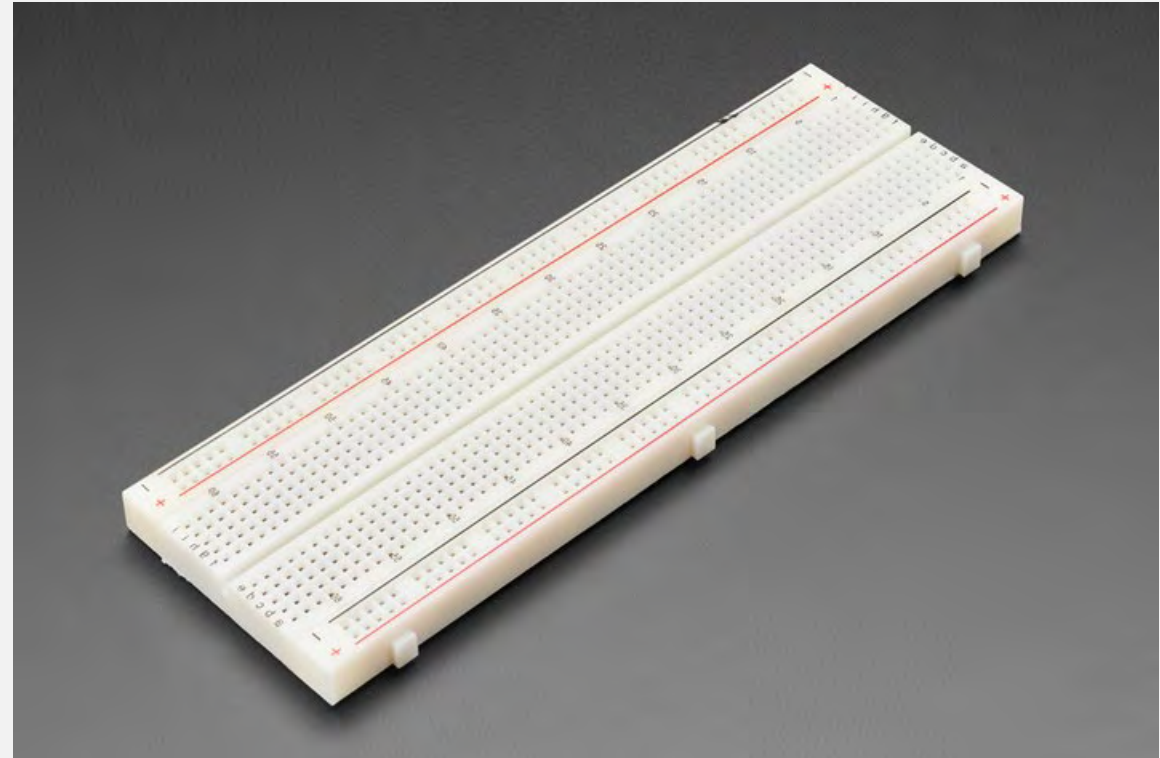
TTU Library's Makerspace *Pi-400* and *Pi-Zero W* Kits



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



TTU Library's Makerspace *Pi - Interface Kits*

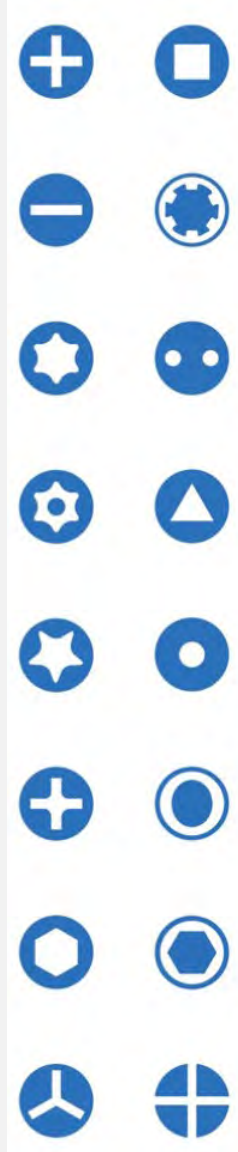


6 kits of each is available, one for every Pi-400

- 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

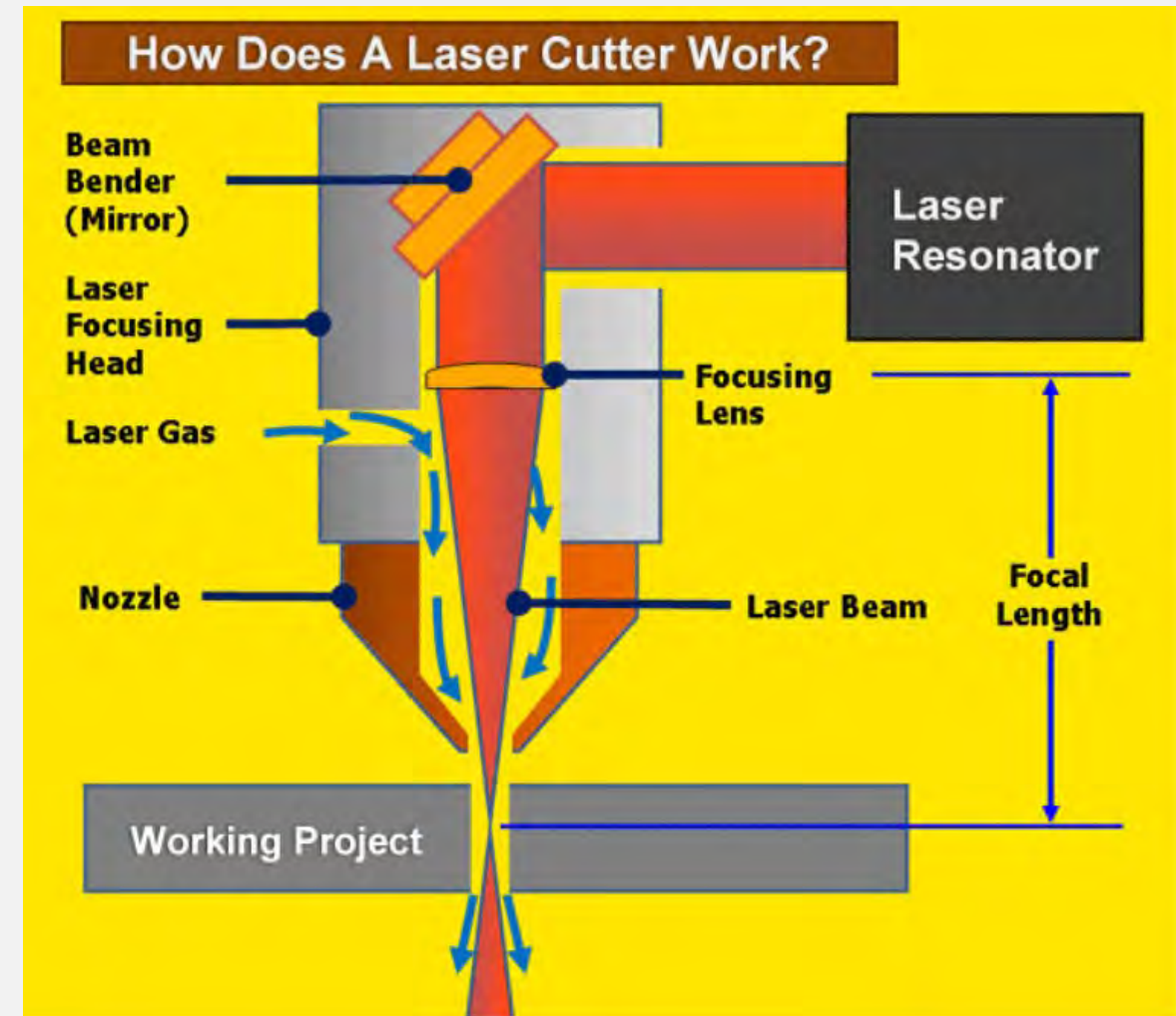


6 kits of each is available, one for every Pi-400

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

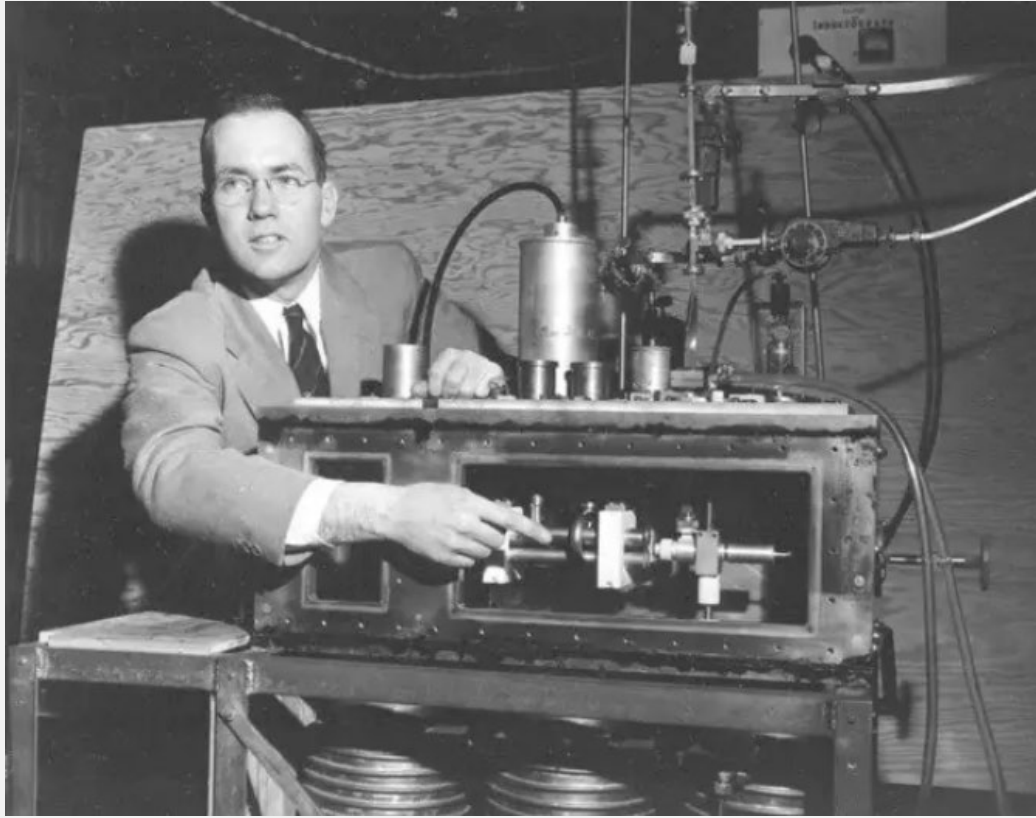
what is a lasercutter?

- 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



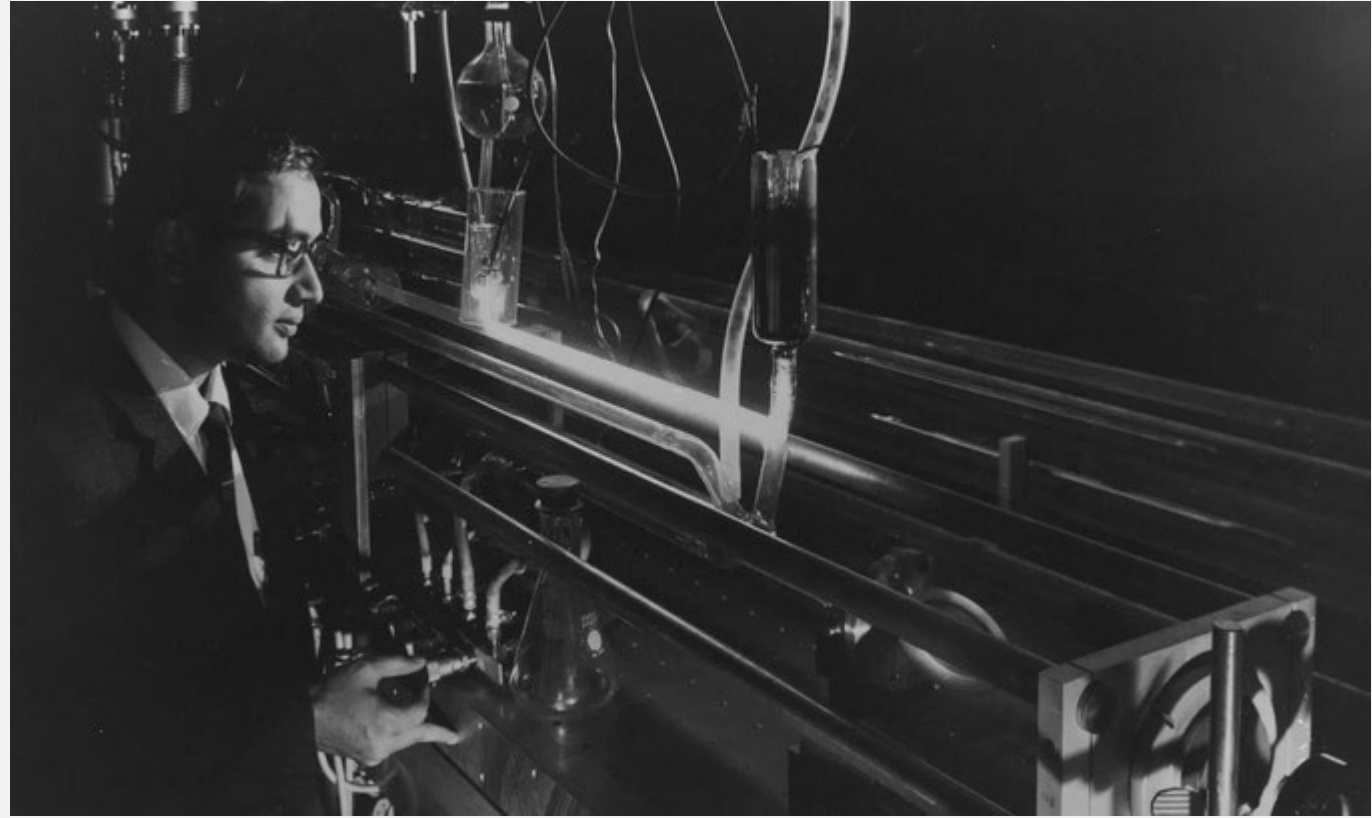
lasercutting history

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



Charles Townes

MASER - Microwaves Amplification by Stimulated Emission of Radiation



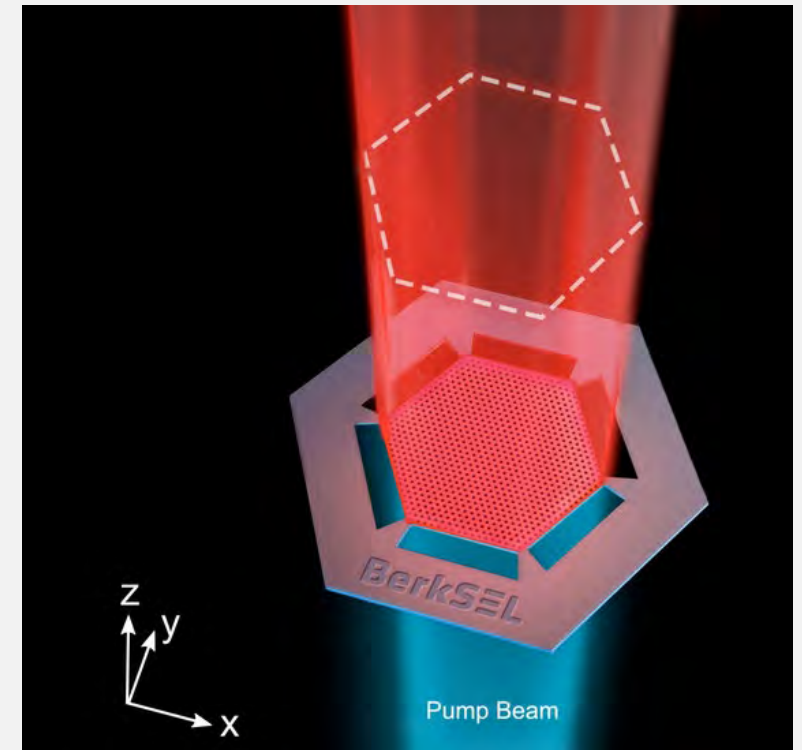
Kumar Patel

LASER - Light Amplification by Stimulated Emission of Radiation



laser cutting 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?

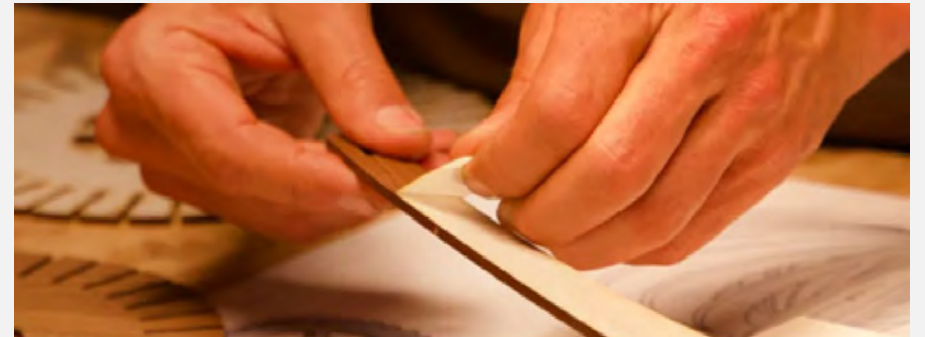
- paper
- wood
 - plywood
 - veneer
 - draftboard
- acrylic
- leather
- fabric
- metal
- stone (shale)





where to find materials for the Glowforge Plus?

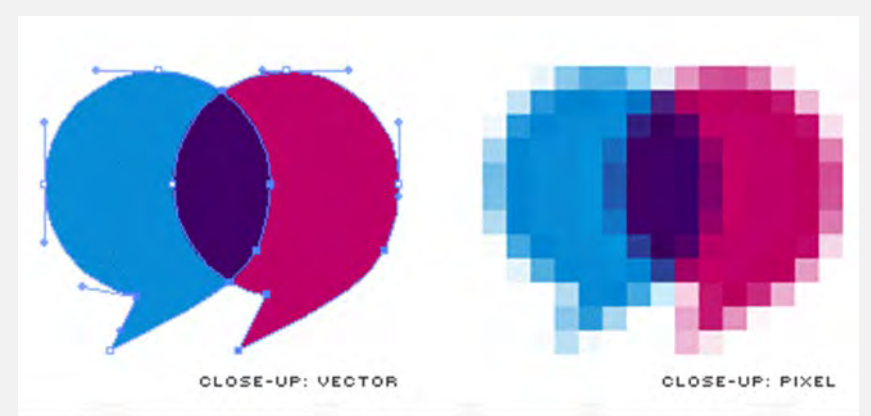
- Glowforge Website - recommended
 - <https://shop.glowforge.com/>
- local hobby shops
 - Michaels/HobbyLobby
 - Walmart/DollarTree/DollarStore
 - Joann's Fabrics
- local consumer/prosumer wood suppliers
 - Acacia Hardwoods – recommended (<https://www.acaciahardwoods.net/>)
 - Lowes/Home Depot
- online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





file types

- why is a JPG not an SVG?



Vectors

Pixels

Bitmap/Raster/Pixels vs. Vector Graphics

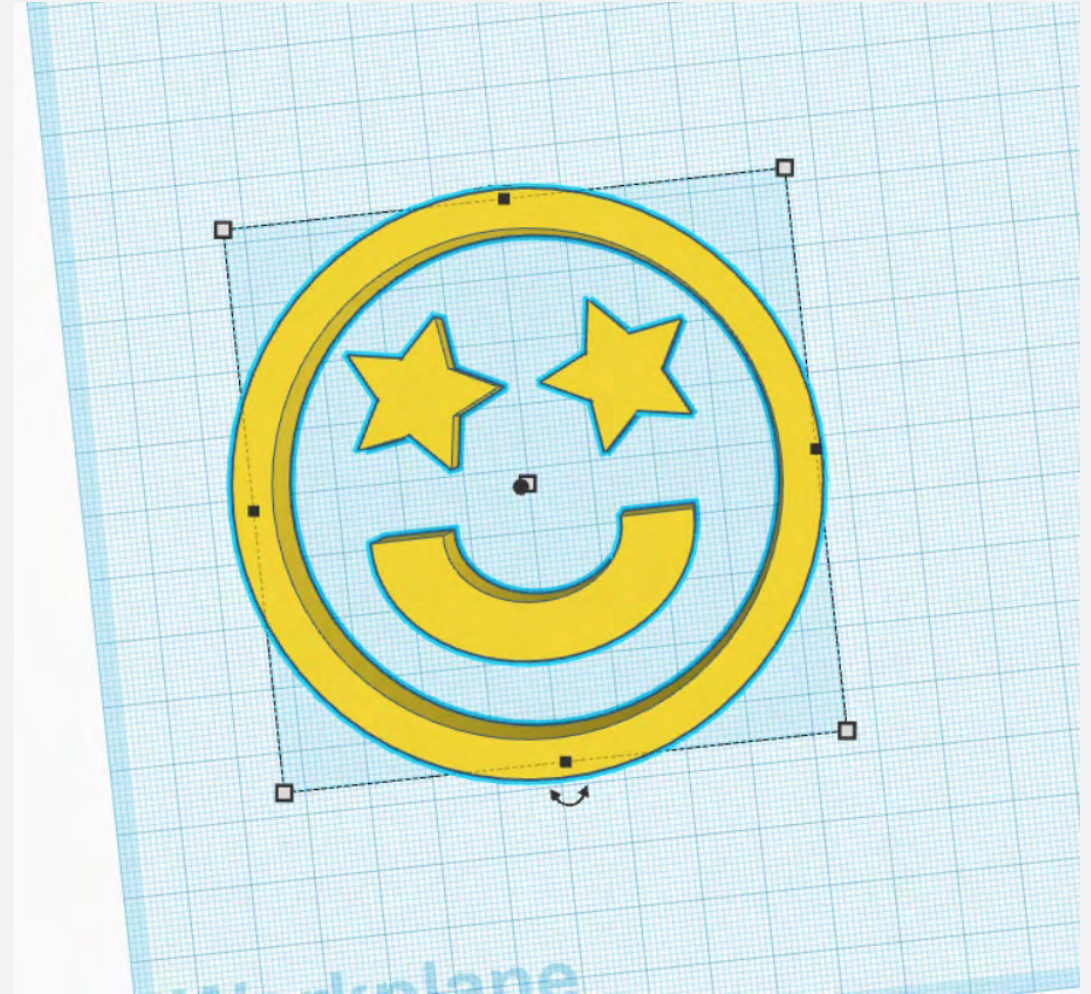
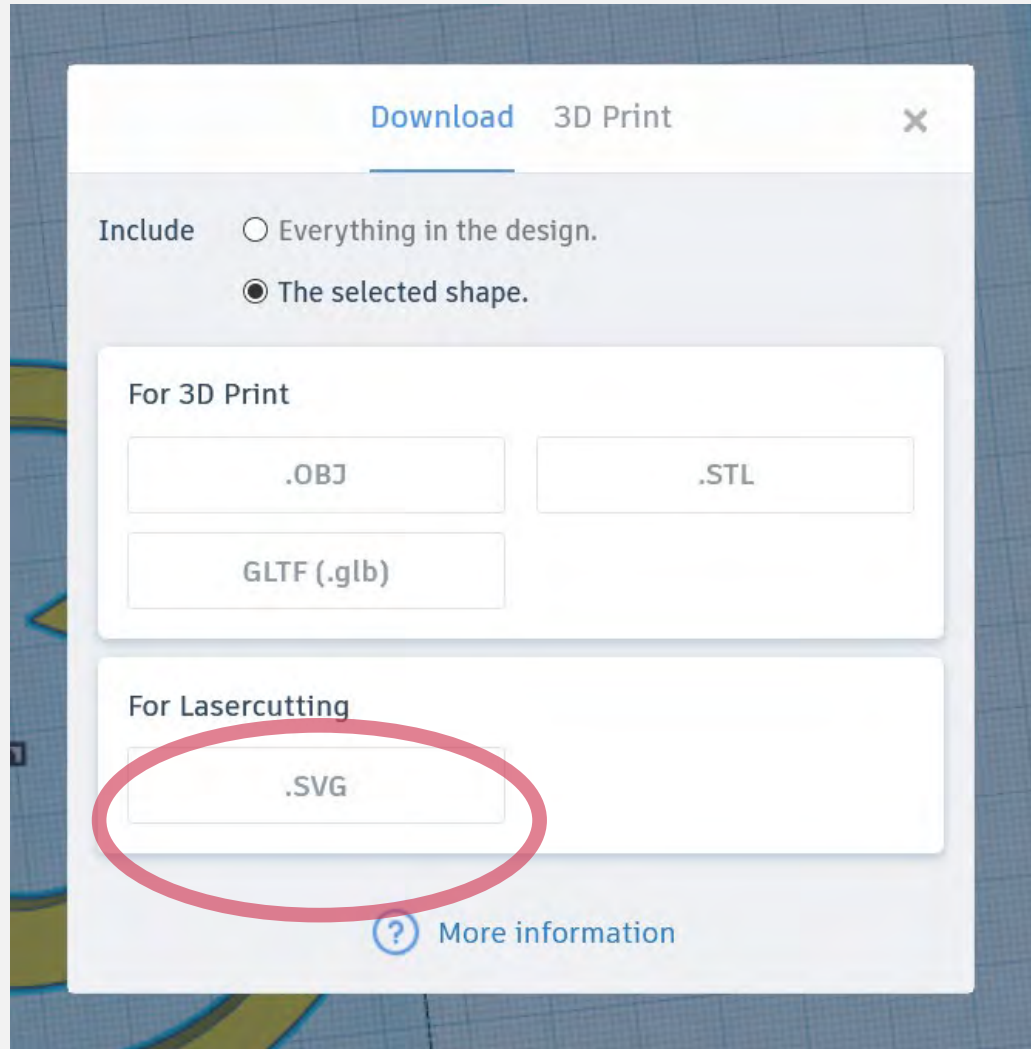
- Bitmap (JPG, GIF, PNG):
 - made of dots/pixels that distort when the image is scaled
- Vector (SVG, AI, PDF):
 - calculation of points connected with lines that will not lose clarity when scaled up or down (math path)

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)

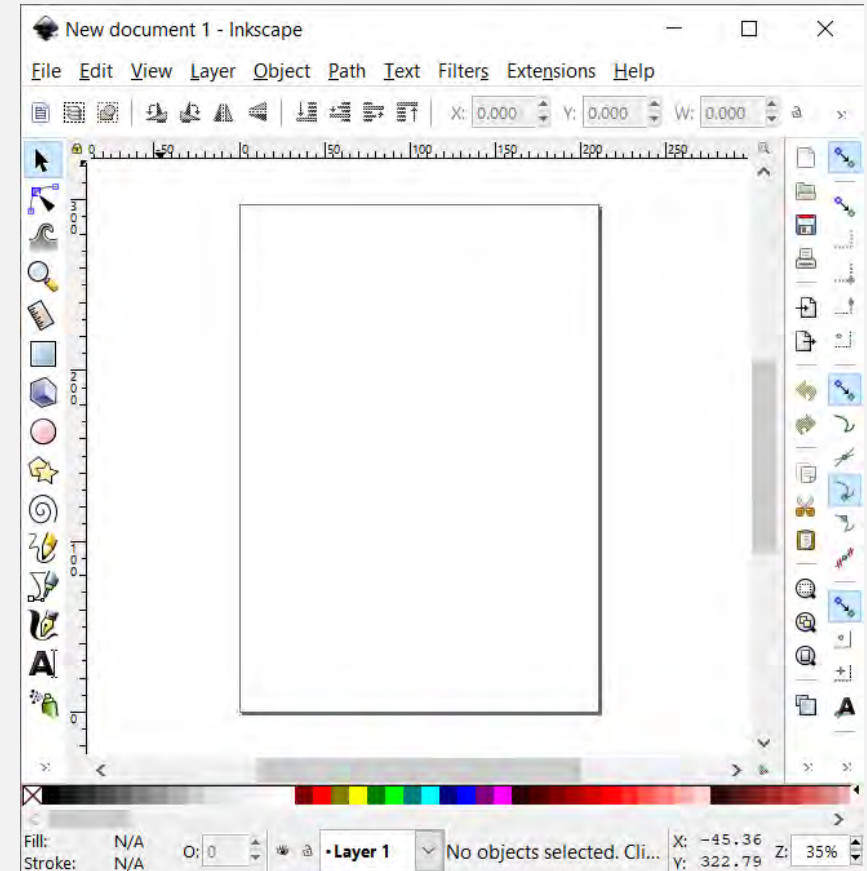
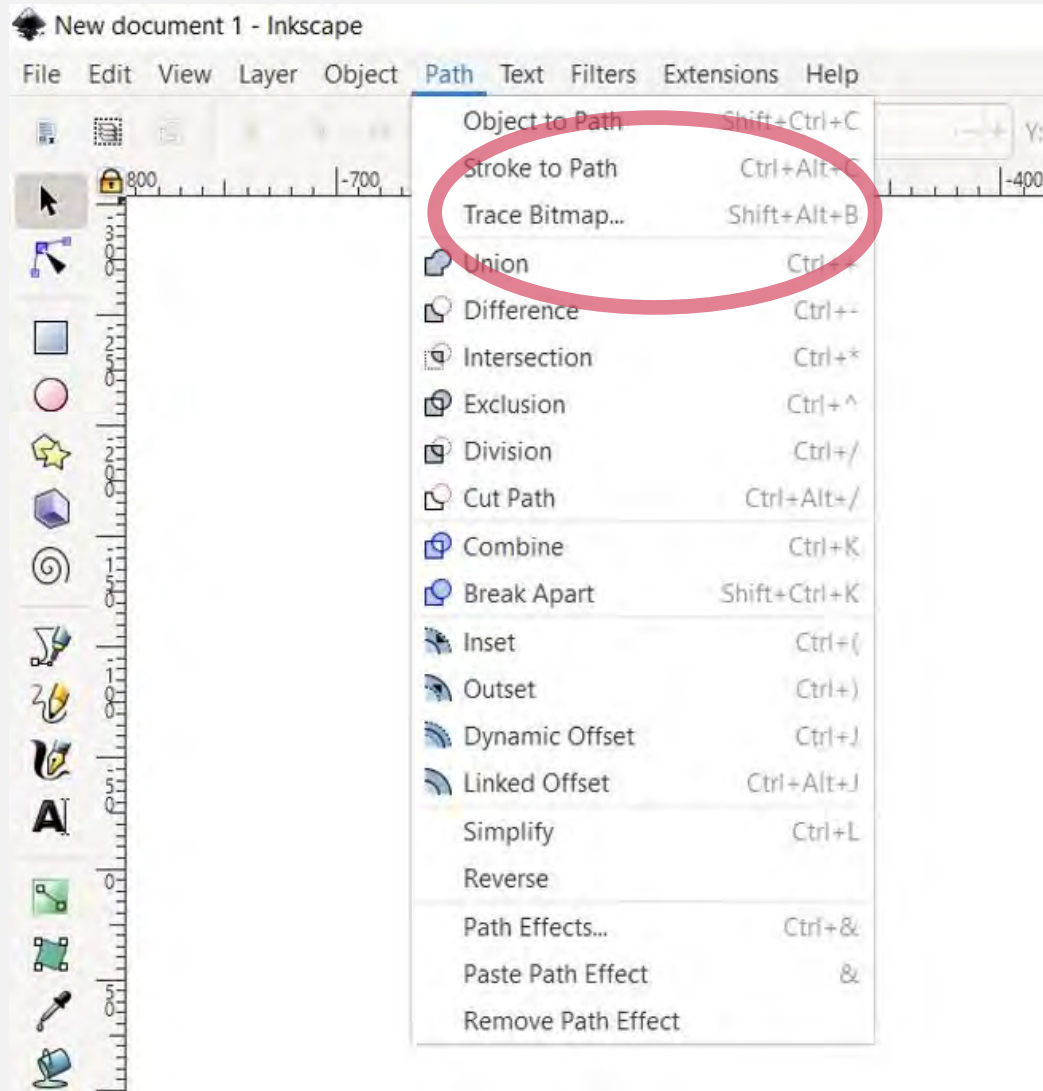


software – freeware: Inkscape



- 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

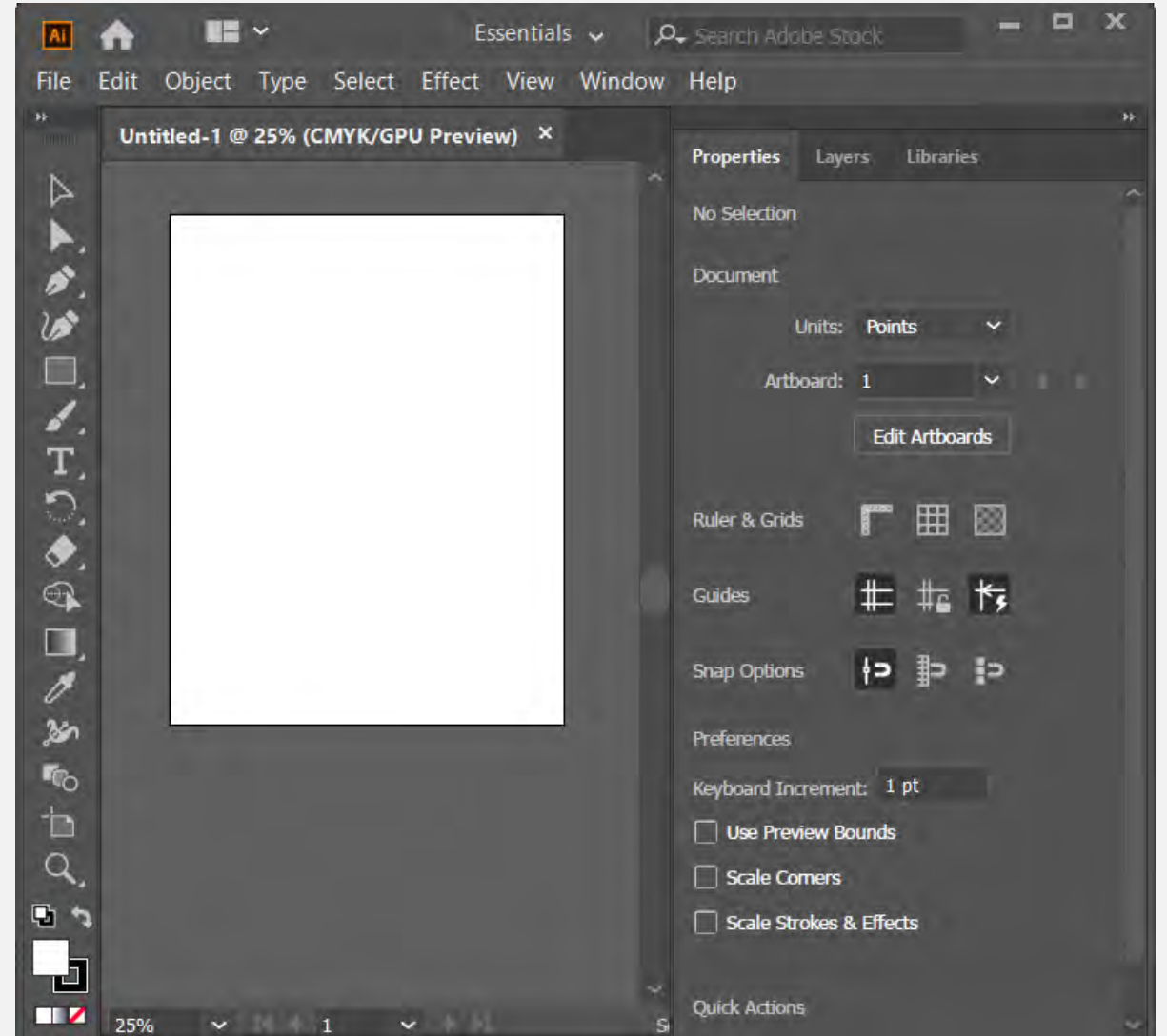
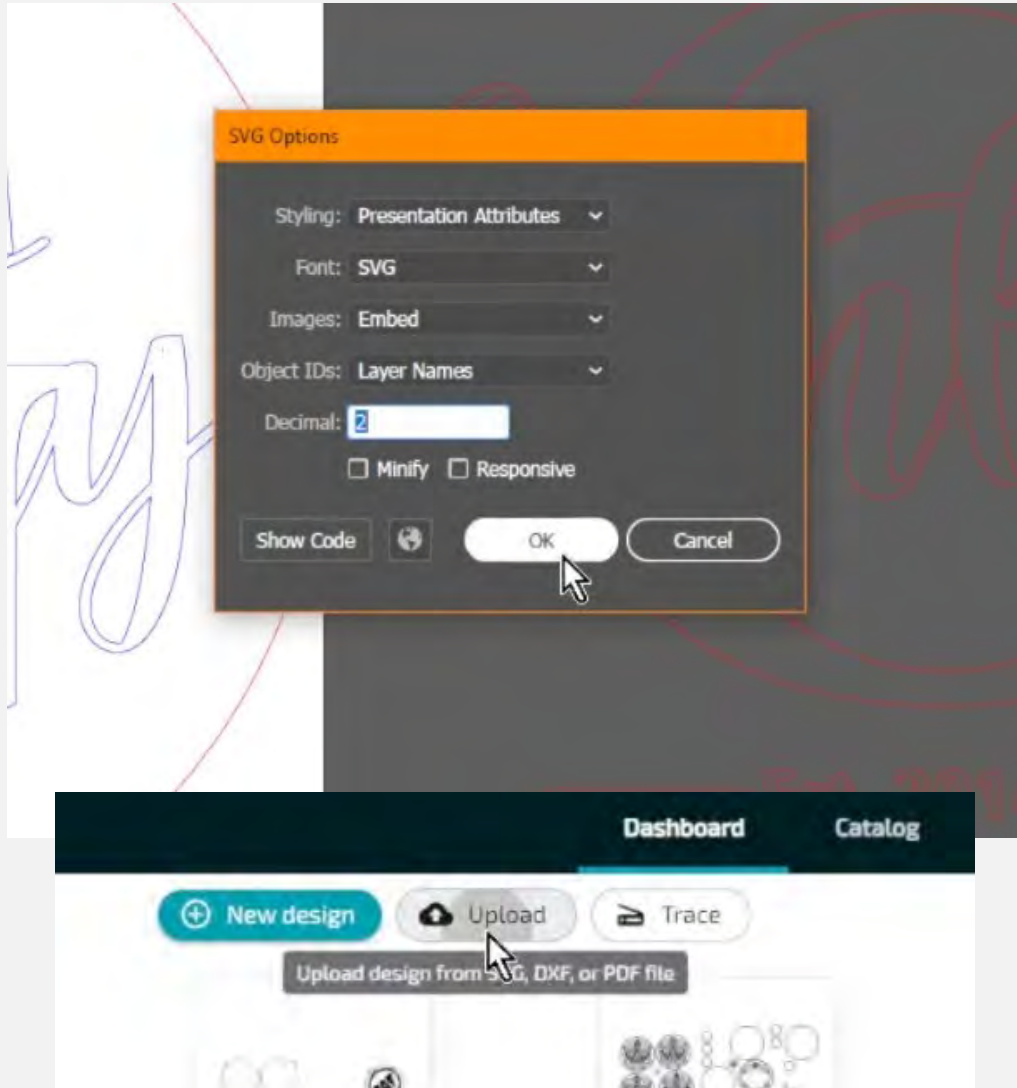


software – Adobe Illustrator

- 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





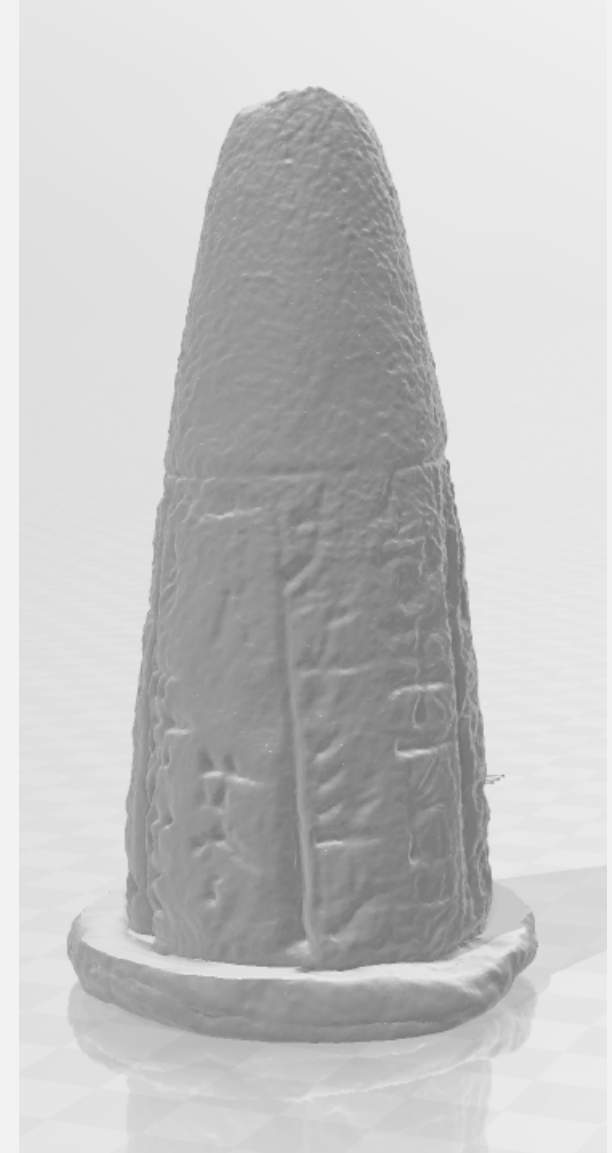
book background

- what is a book
 - *tool for information*
 - recording
 - preserving
 - disseminating
 - *ancient*
 - *print*
 - *modern*
- with lasers!!



Book background - history, ancient

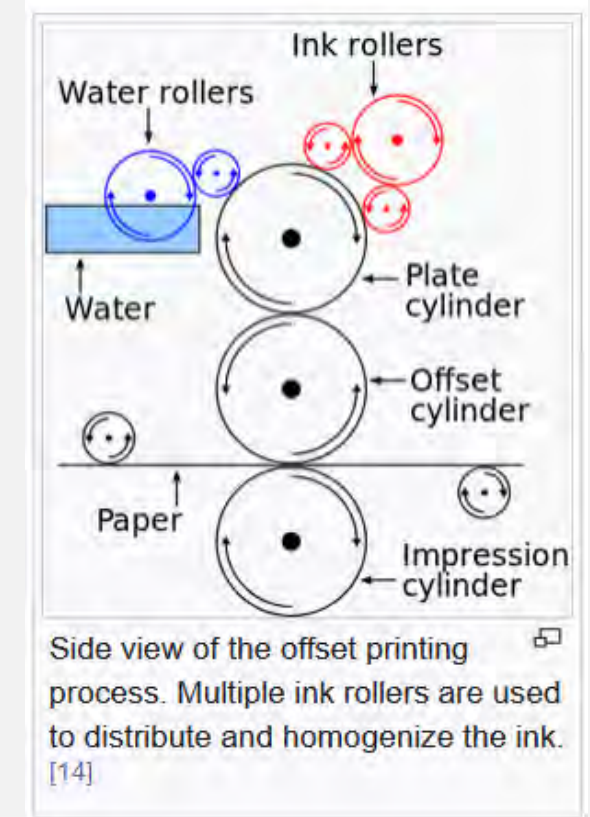
- ancient books
 - *cuneiform, pictographs*
 - *clay tablets or stone seals*
- codex books
 - *Maya, Aztec, Romans*
 - *Bound skins, papyrus*
- medieval manuscripts
 - *illuminated, ornate*



3D scan of cuneiform Foundation Nail
TTU Special Collections, 2000 BCE

book background – history, print

- printing press – Gutenberg 1440
 - *Offset type*
 - https://en.wikipedia.org/wiki/Offset_printing
 - “*Age of Mechanical Reproduction,*”
Walter Benjamin
 - https://en.wikipedia.org/wiki/The_Work_of_Art_in_the_Age_of_Mechanical_Reproduction
- Industrial Revolution (1760–1840)
 - *papermaking*
 - *printing technology*
 - *bookbinding innovation*



Book background – digital revolution

- offset printing
 - *serial printing (periodicals)*
 - *'pulp' fiction, 'airport novel'*
- digital printing
 - *Xerox, replication*
 - *desktop publishing, decentralized production at home*
- cyberbook – audio, interactive
 - <https://www.youtube.com/watch?v=kWQSUfxdFDM>
- ebooks



First xerographic image of a handwritten note
1938



book background - digital revolution + internet

- hybrid publishing
 - *print-on-demand*
- open access
 - *free & unrestricted access licenses* - <http://www.openaccess.org/>
 - *online archive* - <https://archive.org/>
 - *Project Gutenberg* - <https://www.gutenberg.org/>
- future of books
 - *blurred medium boundaries*
 - *interactive ebooks*
 - *augmented reality storytelling*
 - *digital archives*
 - *knowledge sharing*

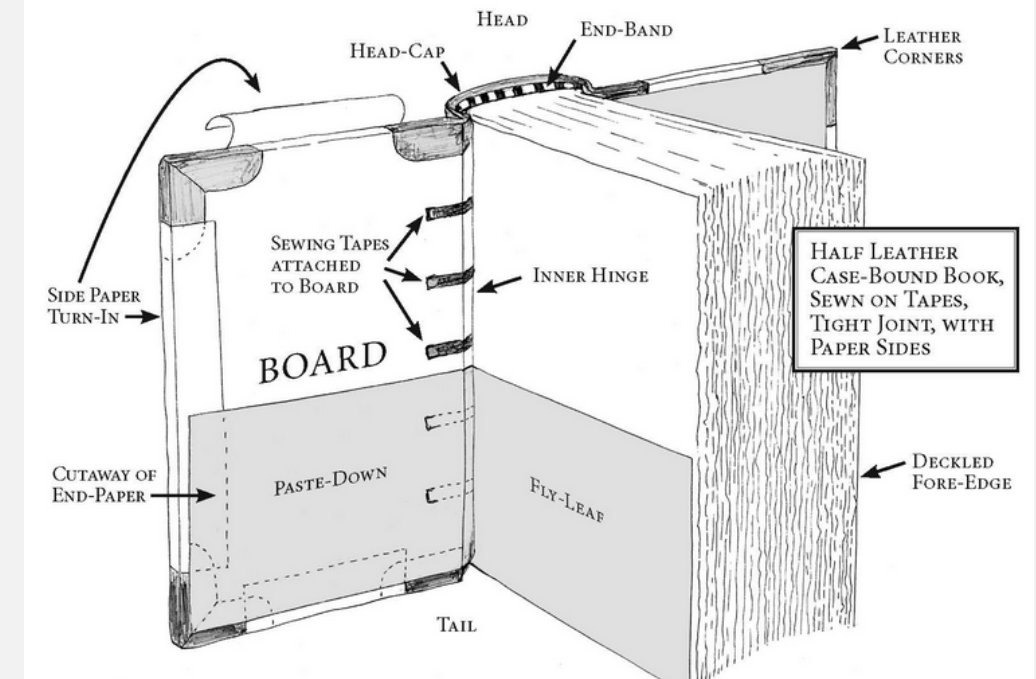
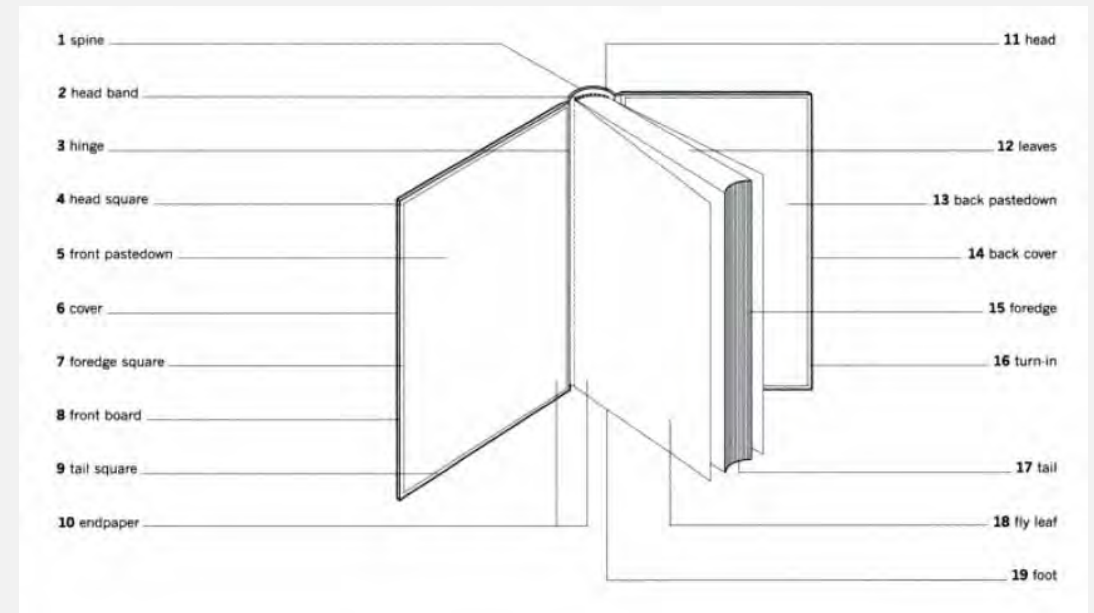


Book background - theory

- Marshall McLuhan – Understanding Media/Gutenberg Galaxy
 - *impact on perception – linear logic, assembly line*
 - <https://www.youtube.com/watch?v=HeDnPP6ntic>
 - *cultural impact – ‘literary’, repositories, libraries*
 - <https://www.youtube.com/watch?v=0pcoC2l7Tol>
- Idea Channel – PBS
 - *Hot/Cold Media – McLuhan*
 - <https://www.youtube.com/watch?v=BNcy24WD4yk>
 - *But Wait: Do We Really CONSUME Media?*
 - <https://www.youtube.com/watch?v=fRsQ0-9409A>
 - *Are We All Cyborgs?*
 - <https://www.youtube.com/watch?v=Xs4d6AiVPQ>
 - *But Wait: How DOES The Media Tell You What To Think?*
 - <https://www.youtube.com/watch?v=F7SzwMJ3MZQ>

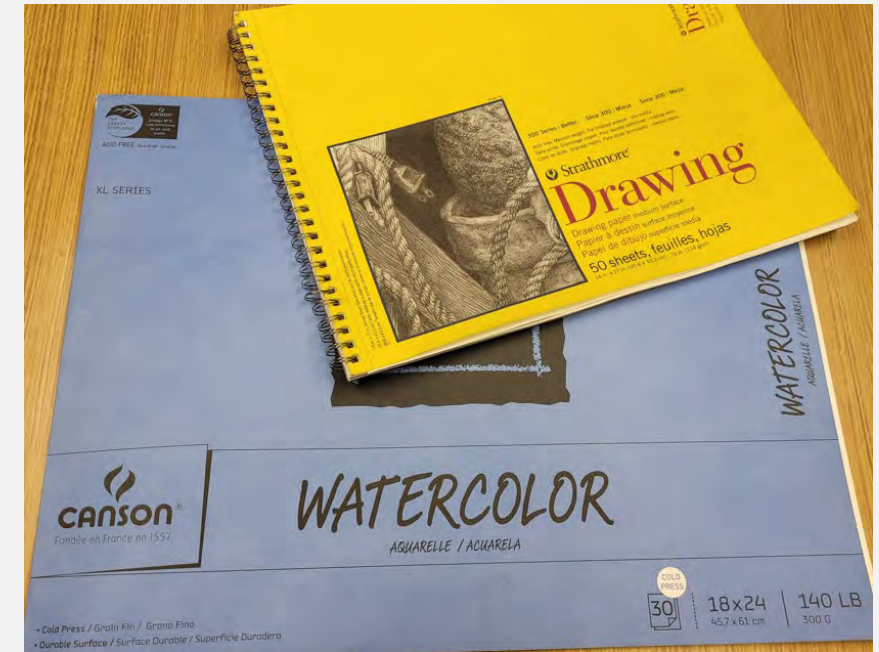
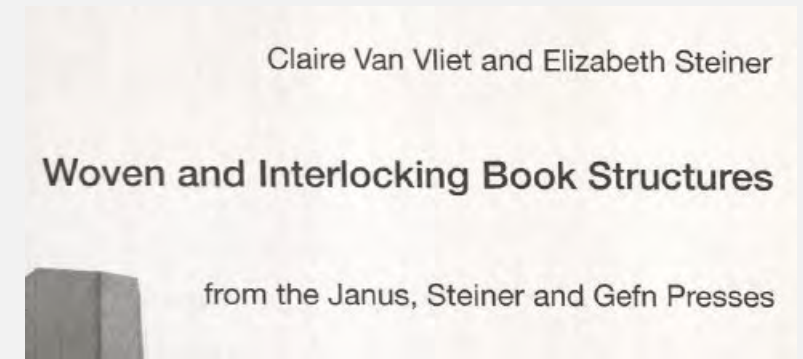
Book background - anatomy

- components
 - *cover*
 - *spine*
 - *pages*
 - *binding*
- structure
- functionality



let's get started – instructions!!

- review step-by-step instructions (pg 77-87)
- gather materials
 - *Canson XL Watercolor, 18x24", 140lb*
 - *Strathmore Drawing, 14x17", 70lb*
- find dimensions & number of each component
 - *top cover*
 - *bottom cover*
 - *leaf style A (2 copies)*
 - *leaf style B (2 copies)*
- placement & dimensions of cutouts
 - *cutouts – boxes/lines with thickness of 0.01"*
 - *folding seams – dotted lines as small series of boxes (alt.: experiment with scoring)*





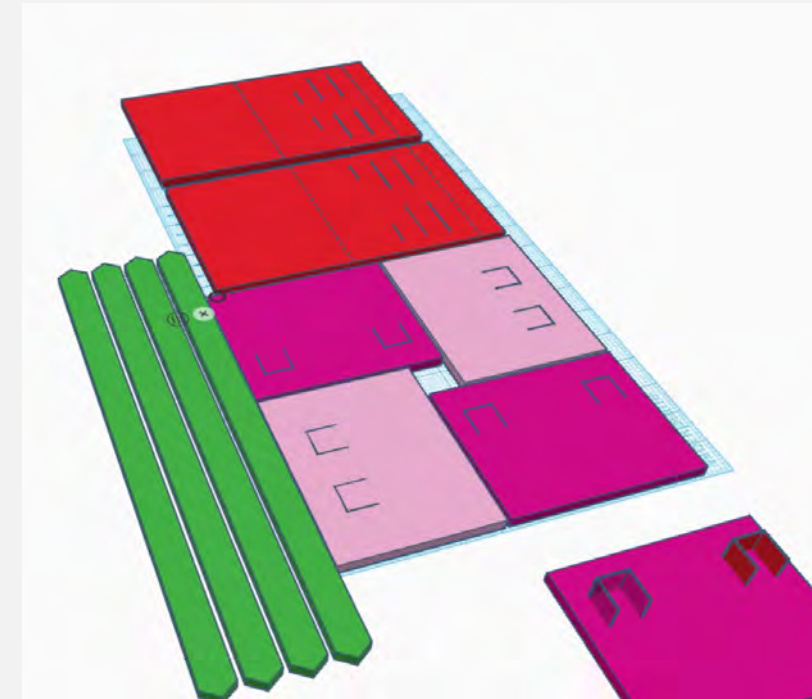
let's get started – TinkerCAD!!



- setup TinkerCAD account
- design your papercuts from book templates

https://www.tinkercad.com/things/fngYRrXspd2-gioia-wovenbookstripsa-d/edit?returnTo=%2Fdashboard%2Fdesigns%2F3d%3Fpage%3D2&sharecode=vILc6oj9V7EAAQXs0B6yLKaLj00Lgbvs7dPv9GeS1_I

- 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"*



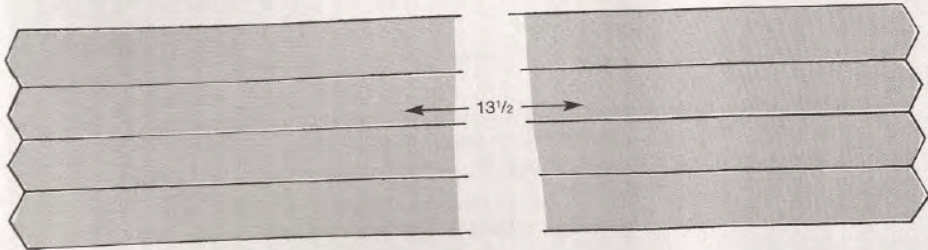
design in TinkerCAD & laser your components!

Materials

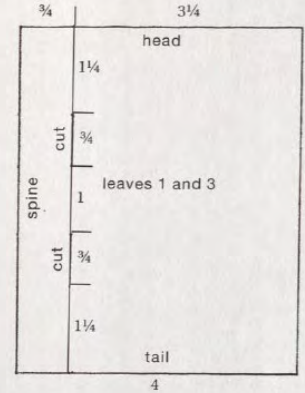
- 4 leaves 4" x 5" grain long cover stock or light card
 - 2 covers 5" x 8 3/4" grain short cover stock
 - 4 weaving strips 3/4" x 13 1/2" grain short thin strong paper such as Elephant Hide or Tyvek
- Note – Both sides of the strips will show

Weaving Strips

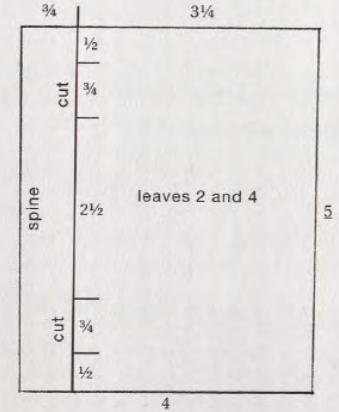
Cut the ends to a slight point and use spatula for easier threading through the slits in the leaves



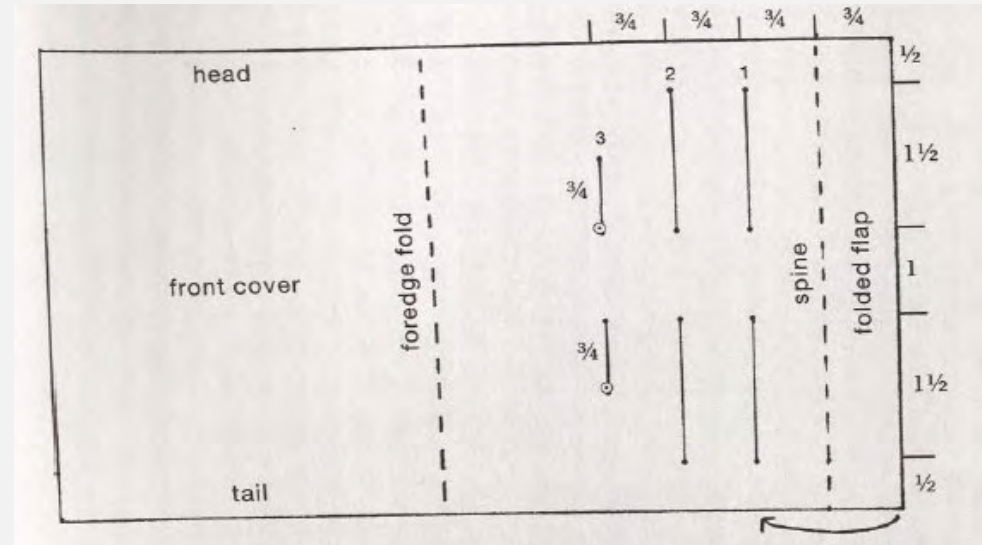
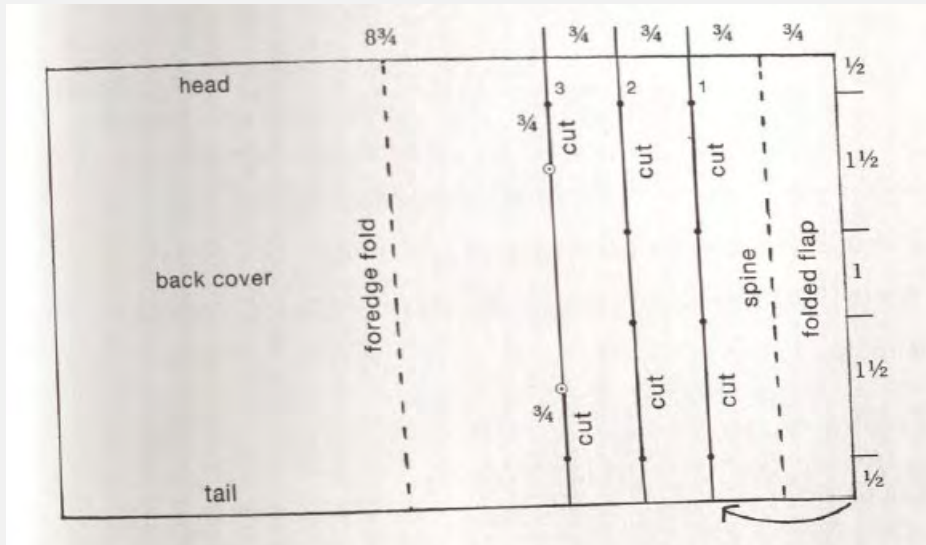
Leaves



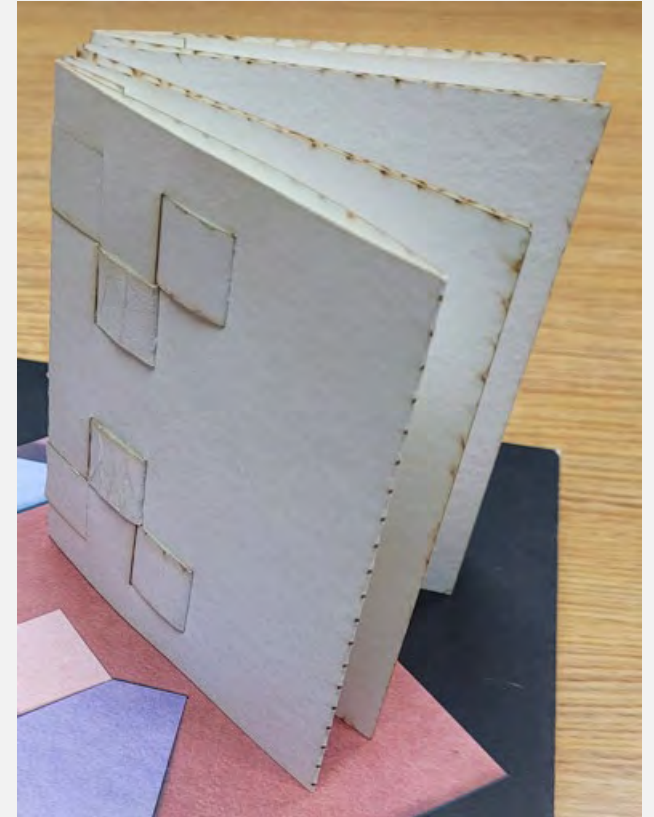
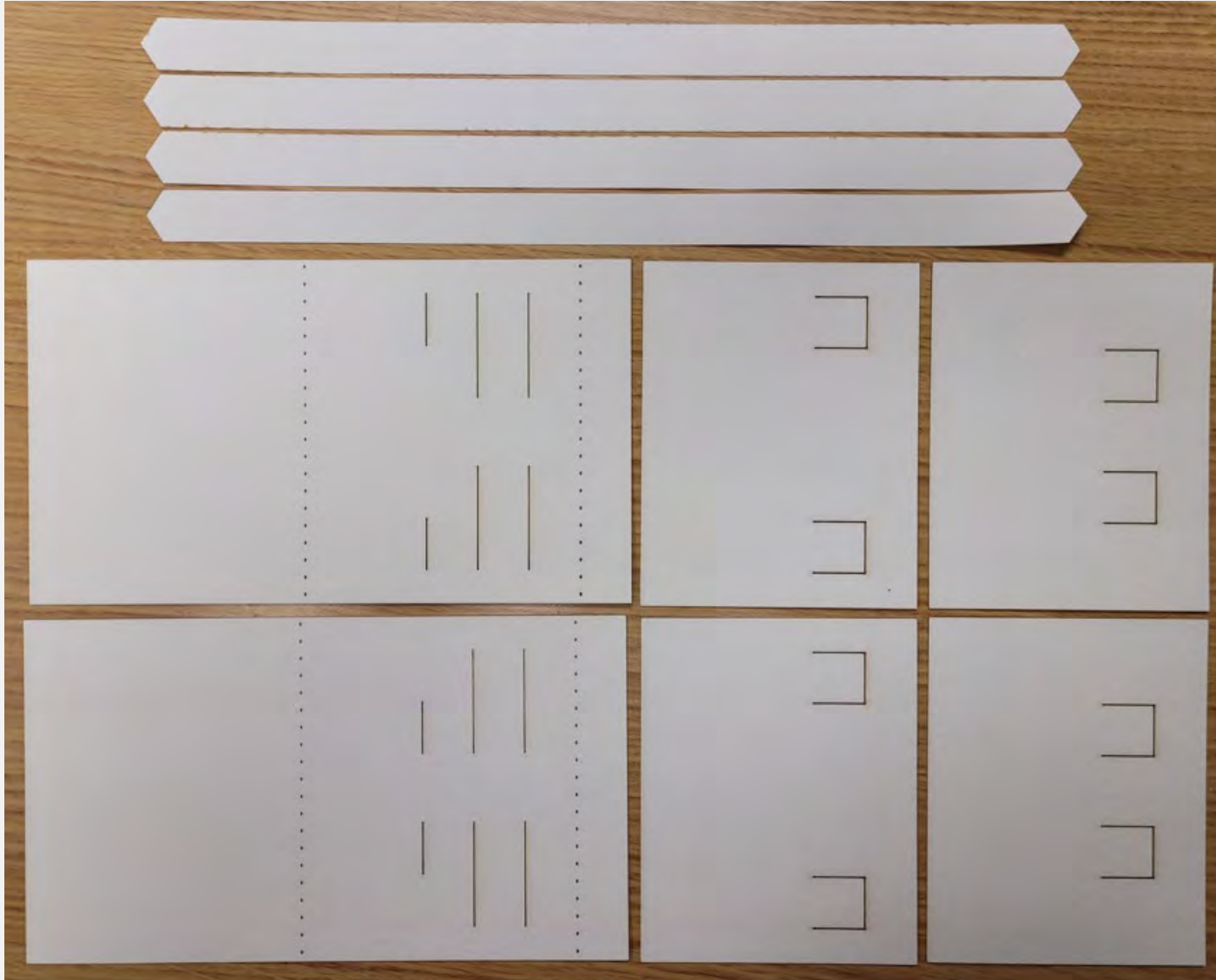
Leaves 1 and 3 Draw a line 3/4" parallel to, and in from the spine edge of leaf 1
On the line mark down 1 1/4" from head then a further 3/4"
Repeat the same measurements from the tail up
Prepare leaf 3 by pricking through these marks with a fine awl
Between the marks cut two 3/4" slits in both leaves



Leaves 2 and 4 Draw a line 3/4" parallel to, and in from the spine edge of leaf 2
On line mark down 1/2" from head, then a further 3/4"
Repeat the same measurements from the tail up
Prepare leaf 4 by pricking through the marks with a fine awl
Between the marks cut two 3/4" slits in both leaves

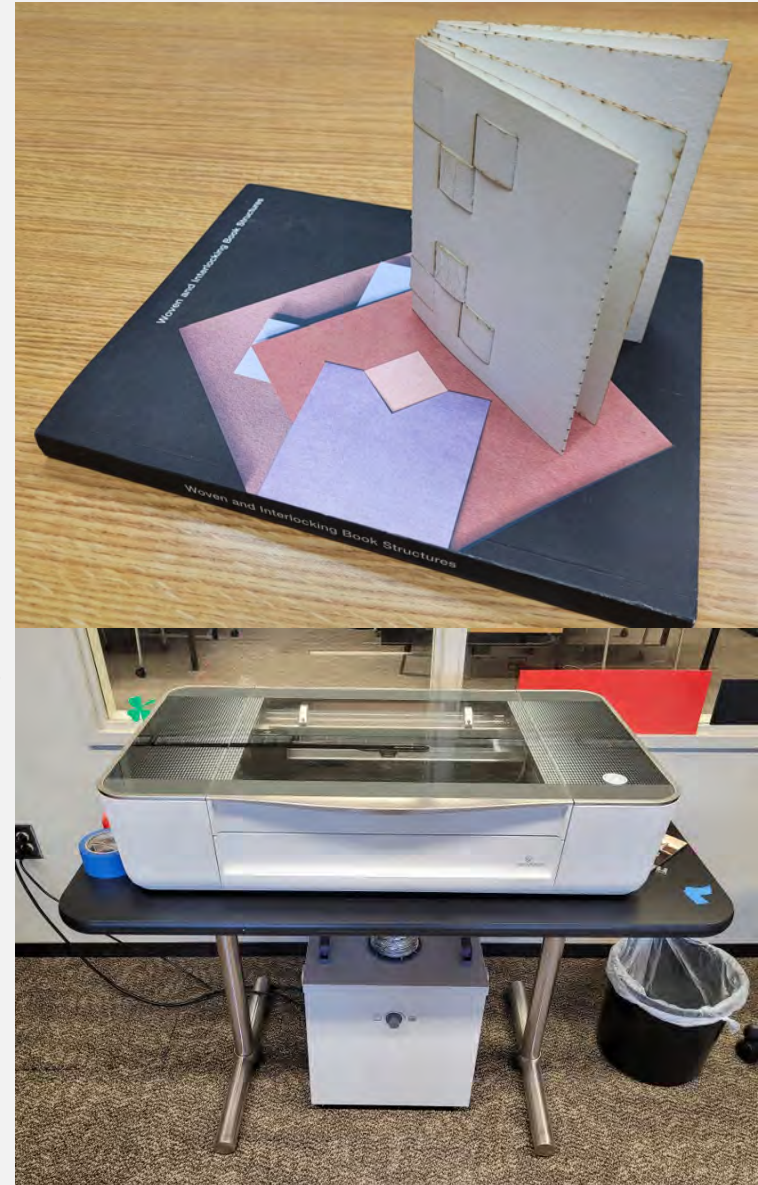


components assemble!



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/>

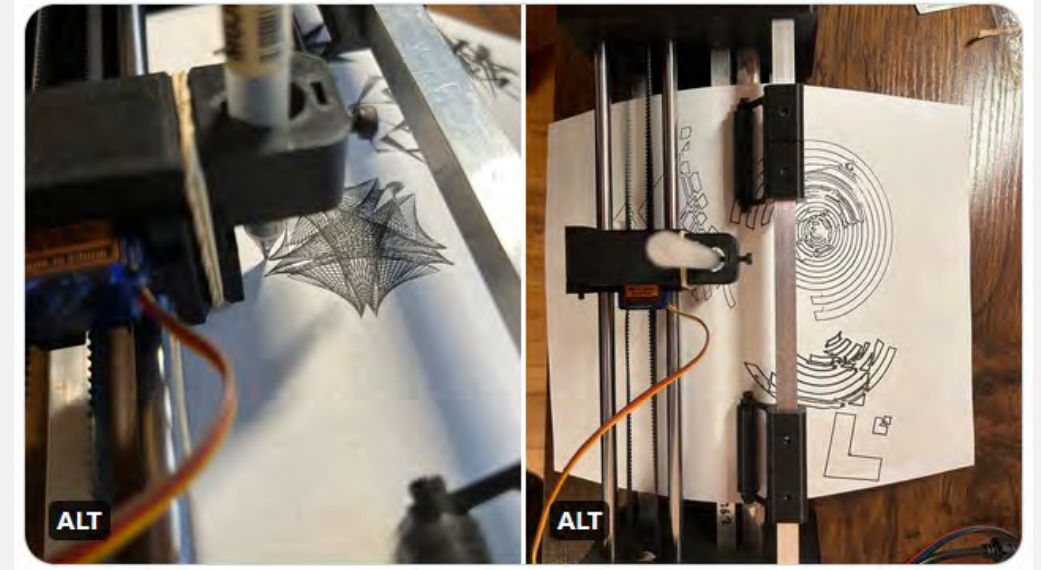


moving forward

- 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-mt.hosted.exlibrisgroup.com/V/?func=find-db-1>
- Open Access at TTU
 - <https://guides.library.ttu.edu/open-access>
- TTU Special Collection's: Art Books (Emily Grover - Assistant Librarian, SWC/SCL, emgrover@ttu.edu)
 - https://swco.ttu.edu/rare_books/Bookarts2.php
- Makerspace's Inkscape Workshop: <https://guides.library.ttu.edu/inkscape>

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 – *general inspiration*

trace bitmap image in Inkscape for Glowforge

- <https://www.youtube.com/watch?v=UY6diLQl4cY>

Glowforge and lasercut

- https://www.youtube.com/watch?v=dP5Qnp_2igk

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>

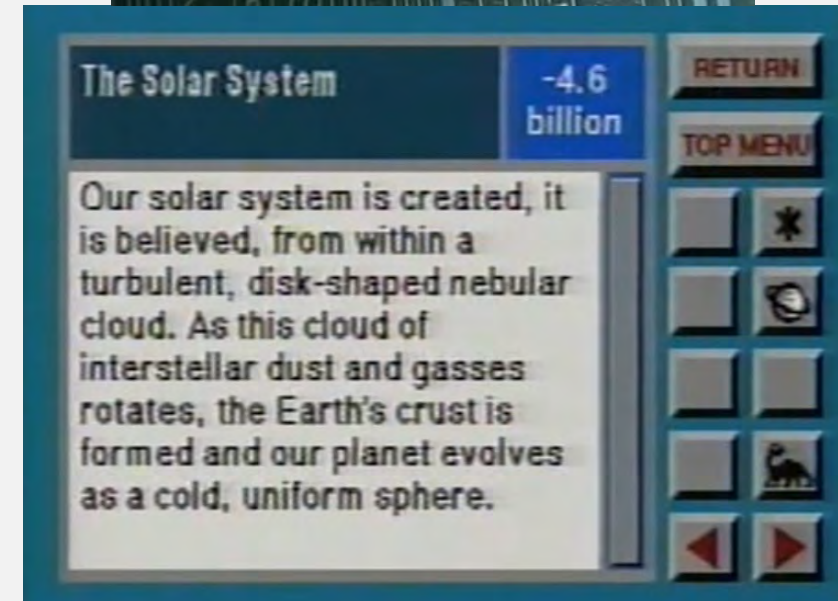
other project generators – even puzzles

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



book – *inspiration*

- Prisoners of Gravity – electronic interactive books of the 90s – “CyberBook”
 - Part 1 - <https://www.youtube.com/watch?v=kWQSUfxdFDM>
 - Part 2 - <https://www.youtube.com/watch?v=005lCwQMN5g>
 - Part 3 - <https://www.youtube.com/watch?v=Ubl78HD4tuA>
- Secret Life of Machines – word processor, etc.
 - *The Secret Life of the Word Processor – Remastered*
 - <https://www.youtube.com/watch?v=CNcP7KgWaXg>
 - *The Secret Life of the Office – Remastered*
 - <https://www.youtube.com/watch?v=S6RCKPY32Lg>
 - *The Secret Life of the Photocopier – Remastered*
 - <https://www.youtube.com/watch?v=FKV028gTu-g>
 - *The Secret Life of the Fax Machine – Remastered*
 - <https://www.youtube.com/watch?v=yuUyt9RG7pk>



book – *independent print shops/printmakers*

- art books – TTU: [TTU Libraries - artists books](https://www.depts.ttu.edu/art/programs/undergraduate/studio-art-bfa/printmaking/index.php)
- local presses
 - *TTU Printmaking, Art Building*
 - <https://www.depts.ttu.edu/art/programs/undergraduate/studio-art-bfa/printmaking/index.php>
 - *CASP Lubbock*
 - <https://casp-arts.org/print-studio/>
- regional
 - <https://www.flatbedpress.com/>
 - <https://printaustin.org/>
 - <https://printingmuseum.org/>
 - <http://www.briarpress.org/51541>
 - <https://www.printmattershouston.org/>
 - <https://houstonfineartpress.com/pages/about.html>
 - <https://www.printana.org/print-studiosworkshops.html>
 - <https://bio.site/zygotepress>
- medium-scale
 - <https://www.texaspress.com/printing-plants-01>



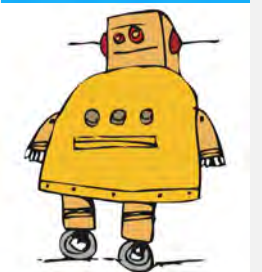
projects galore

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!

“Make Laser-cut Handmade Books” with Instructor Sean Scully
review this workshop here:

https://ttu.libwizard.com/f/workshop-eval-24-25_emerging_tech

Lead Administrator - sean.scully@ttu.edu

Assoc. Librarian - jake.syma@ttu.edu

Makerspace - make@ttu.edu

Director/Librarian - ryan.cassidy@ttu.edu

Workshop Guides- <https://guides.library.ttu.edu/make>

