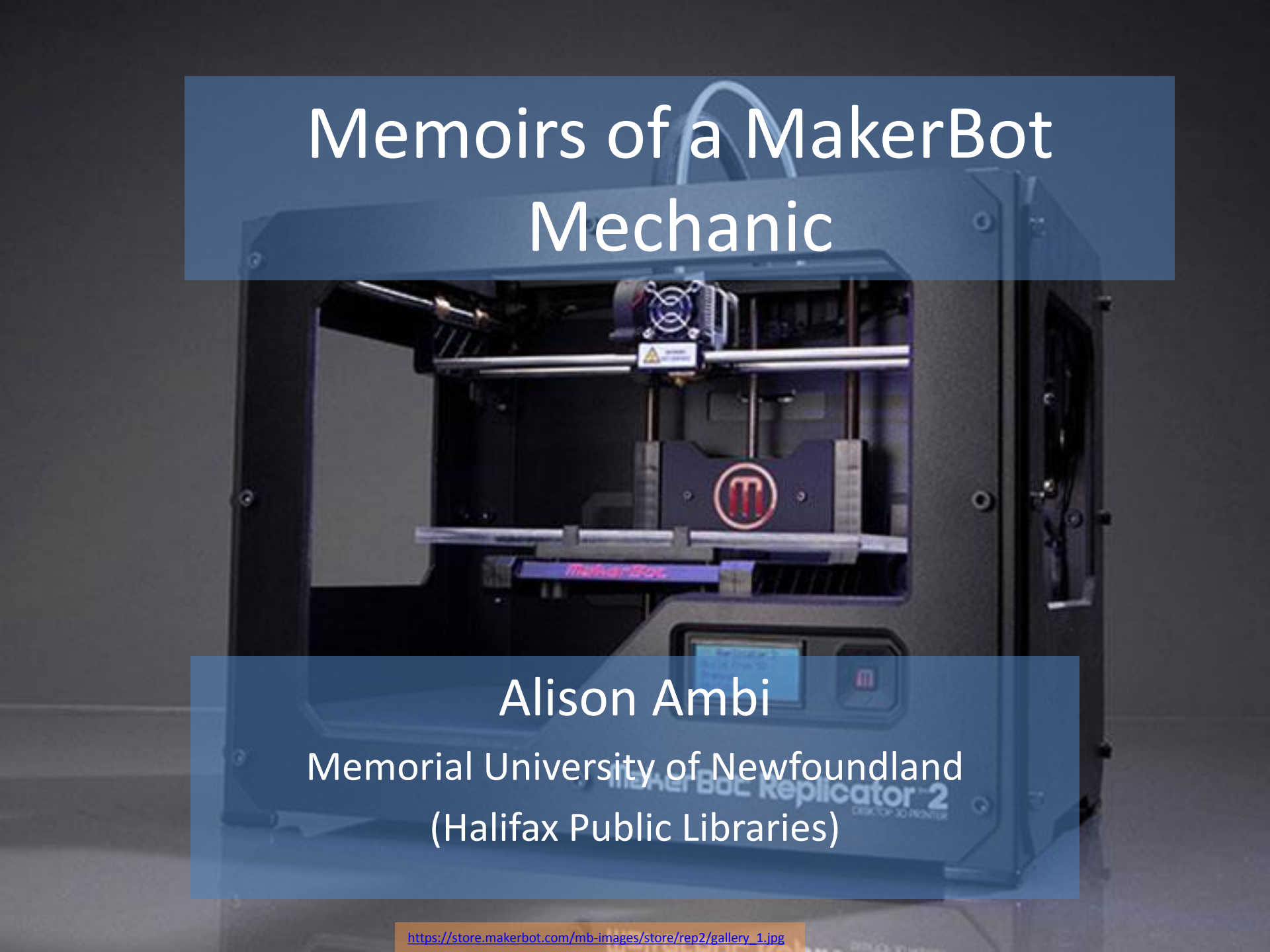
Memoirs of a MakerBot Mechanic



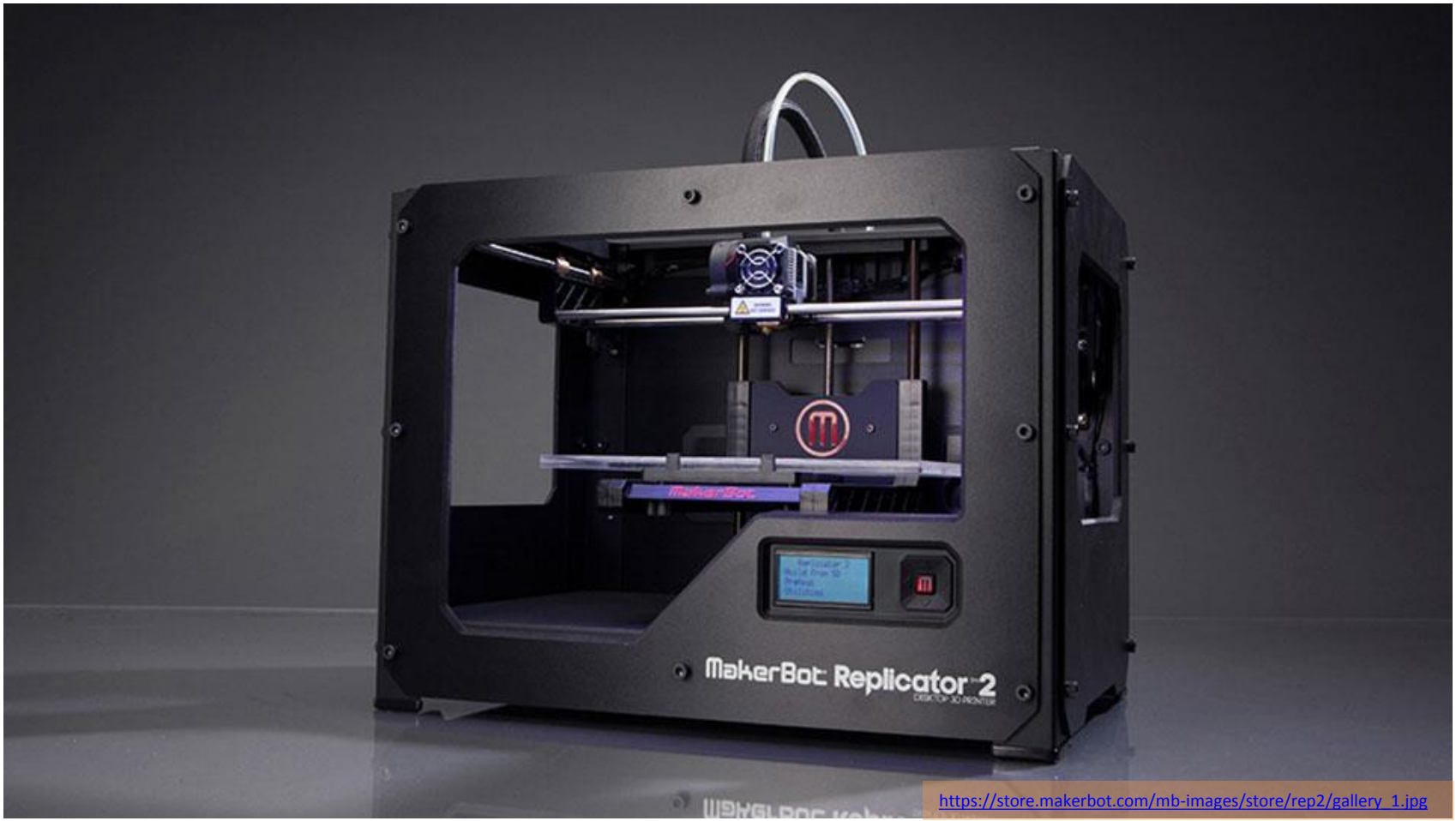
Alison Ambi

Memorial University of Newfoundland

(Halifax Public Libraries)

https://store.makerbot.com/mb-images/store/rep2/gallery_1.jpg

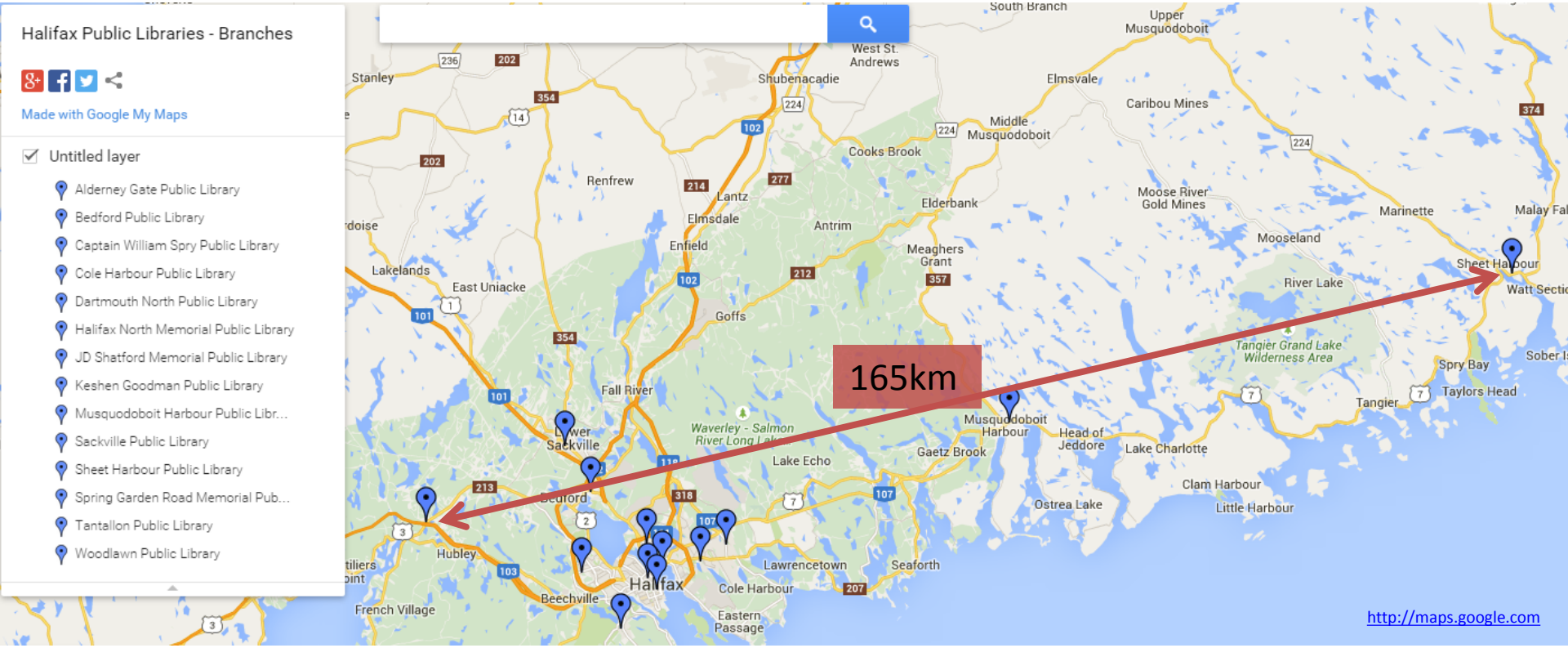
MakerBot Replicator 2



https://store.makerbot.com/mb-images/store/rep2/gallery_1.jpg

Received in Summer 2013 from Nova Scotia Community Access Program

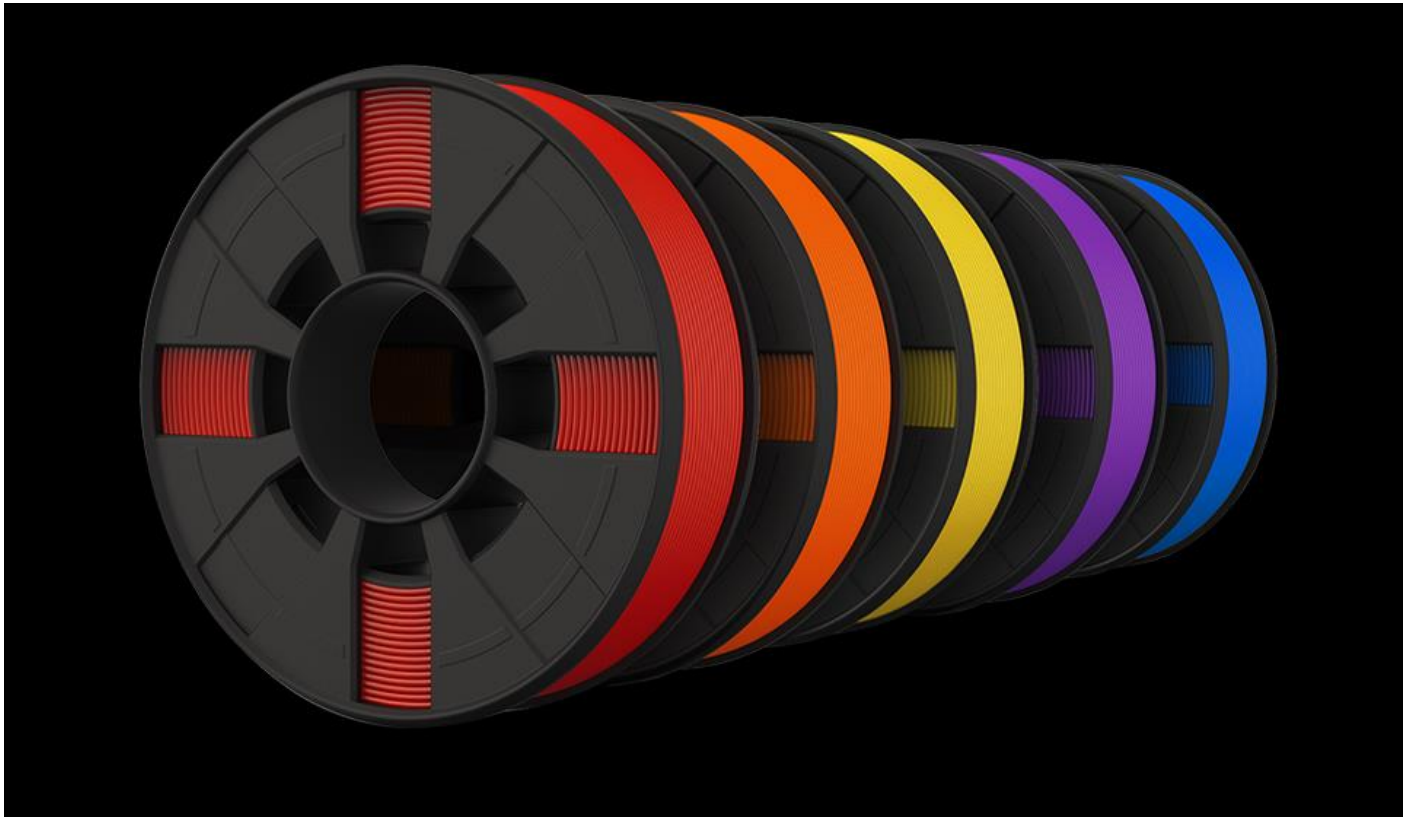
3D Printing Tour of 14 Branches
Fall/Winter 2013-2014



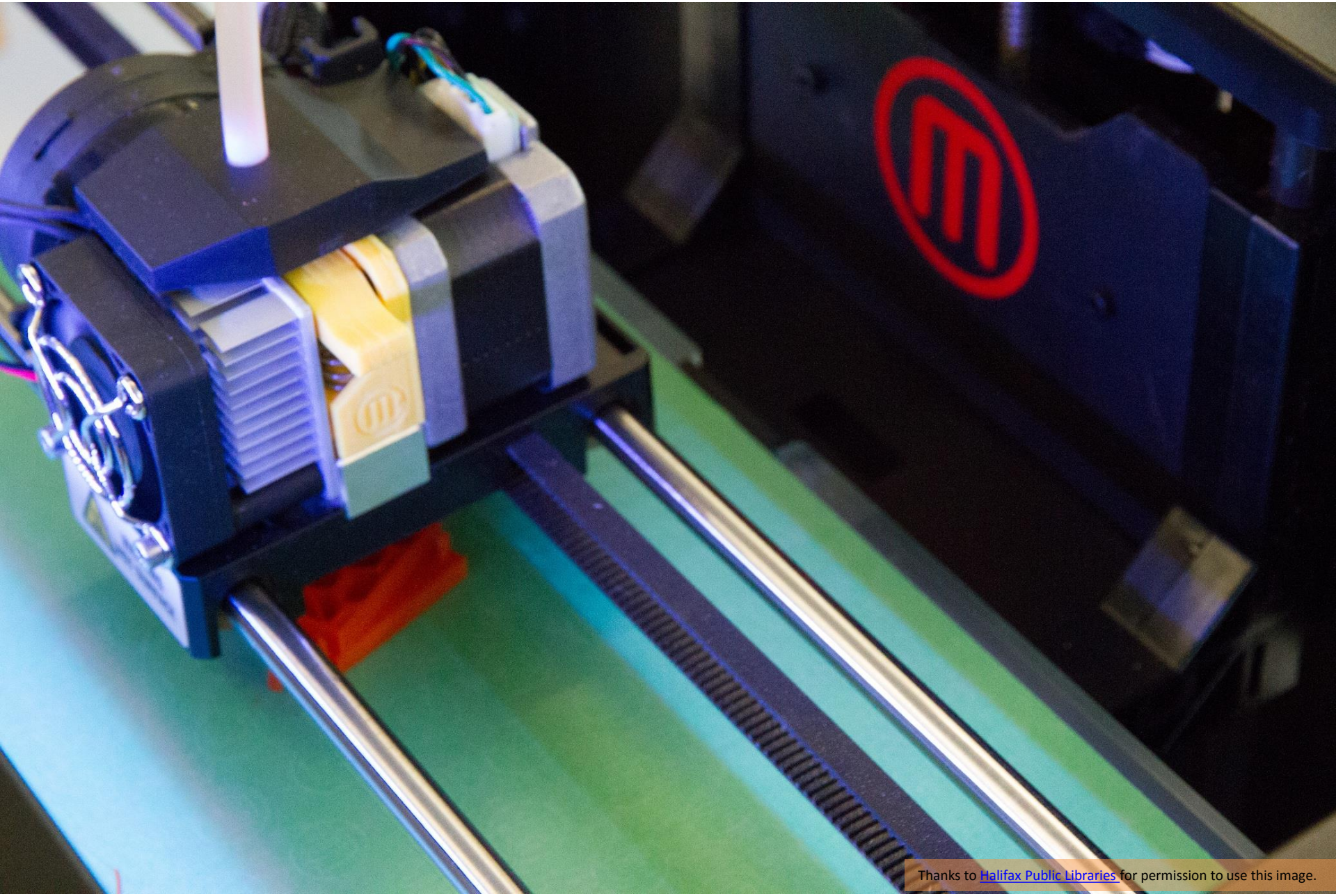
Phase One – Demo Tour

- 1 public demo/week from November - February
- Visited all branches at least once
- Set up printer in the public space and printed things for 3 hours
- Demonstrated Thingiverse, TinkerCAD, Sketchup, 123Catch, answered many questions
- Served as staff training - branch apprentices

Filament



http://store.makerbot.com/filament



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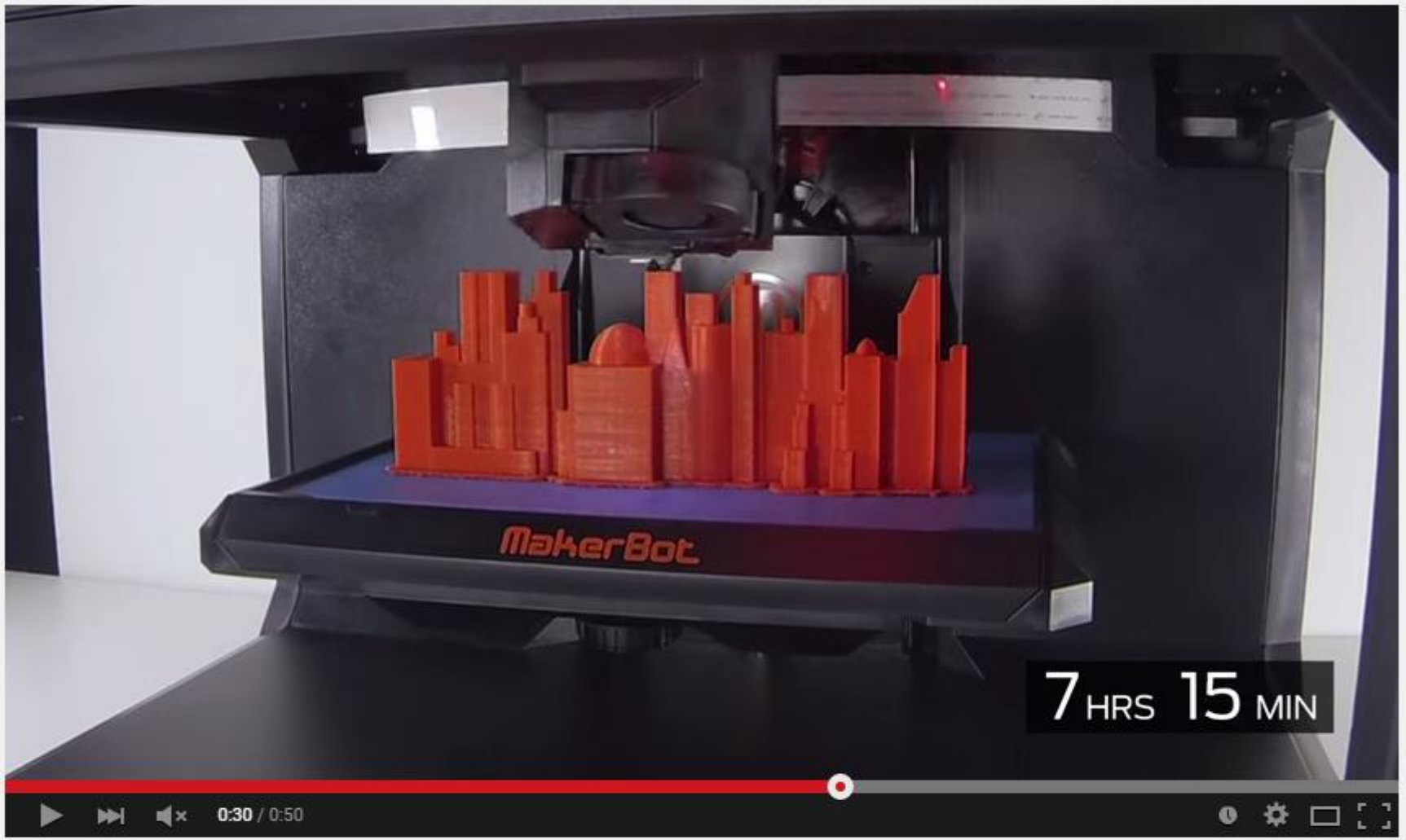


MakerBot Time-Lapse | NYC Skyline Time lapse

MakerBot

Subscribe 25,832

2,058

https://youtu.be/Ifgqvv1z3m8

3D Printing

Printers & Materials

3D printers build physical objects one slice at a time. Printers typically sold to consumers use plastic filament. Engineers, medical professionals and other scientists are using more expensive printers that print with other materials including metals, concrete, plastics and even living cells. Two common types of plastic filament are:

- PLA (Polylactic Acid): A renewable bioplastic made from corn. FDA-approved as food safe and BPA-free. No toxic fumes emitted during printing.
- ABS (Acrylonitrile butadiene styrene): Lego plastic. Does emit fumes during printing. More durable and gives a better quality print.

Examples of consumer market printers:

- Makerbot: www.makerbot.com - Replicator
- Cubify: http://cubify.com - Cube
- Afinia: http://www.afinia.com – H-Series

Things to Print

1. Download a Thing: (Easiest)

Thingiverse: www.thingiverse.com – A website where people share their designs for free. Thousands to choose from!

2. Design your Own Thing: (More skill required)

3D Design Software 101: www.makerbot.com/support/guides/design/

Examples of Free 3D Design Software:

- Tinkercad: https://tinkercad.com/
- 123D Design: www.123dapp.com/design
- Sketchup: www.sketchup.com

3. Scan Things: (Expensive equipment or lots of skill required)

As with printers, the really good 3D scanners are still very expensive, but the inexpensive scanners are rapidly improving. A lot of manipulation is still required to "fix" a scan before printing.

Examples of 3D Scanning Technology:

- Makerbot Digitizer: http://store.makerbot.com/digitizer.html (launched October 2013)
- NextEngine 3D Laser Scanner: www.nextengine.com (Dal Libraries has one of these)
- Hacked Xbox Kinect: www.open-electronics.org/kinect-for-3d-scans
- Free iPad App: 123D Catch: www.123dapp.com/catch

Print Requests

- Dalhousie Libraries: http://libraries.dal.ca/locations_services/services/3d_printing.html
- Shapeways: www.shapeways.com

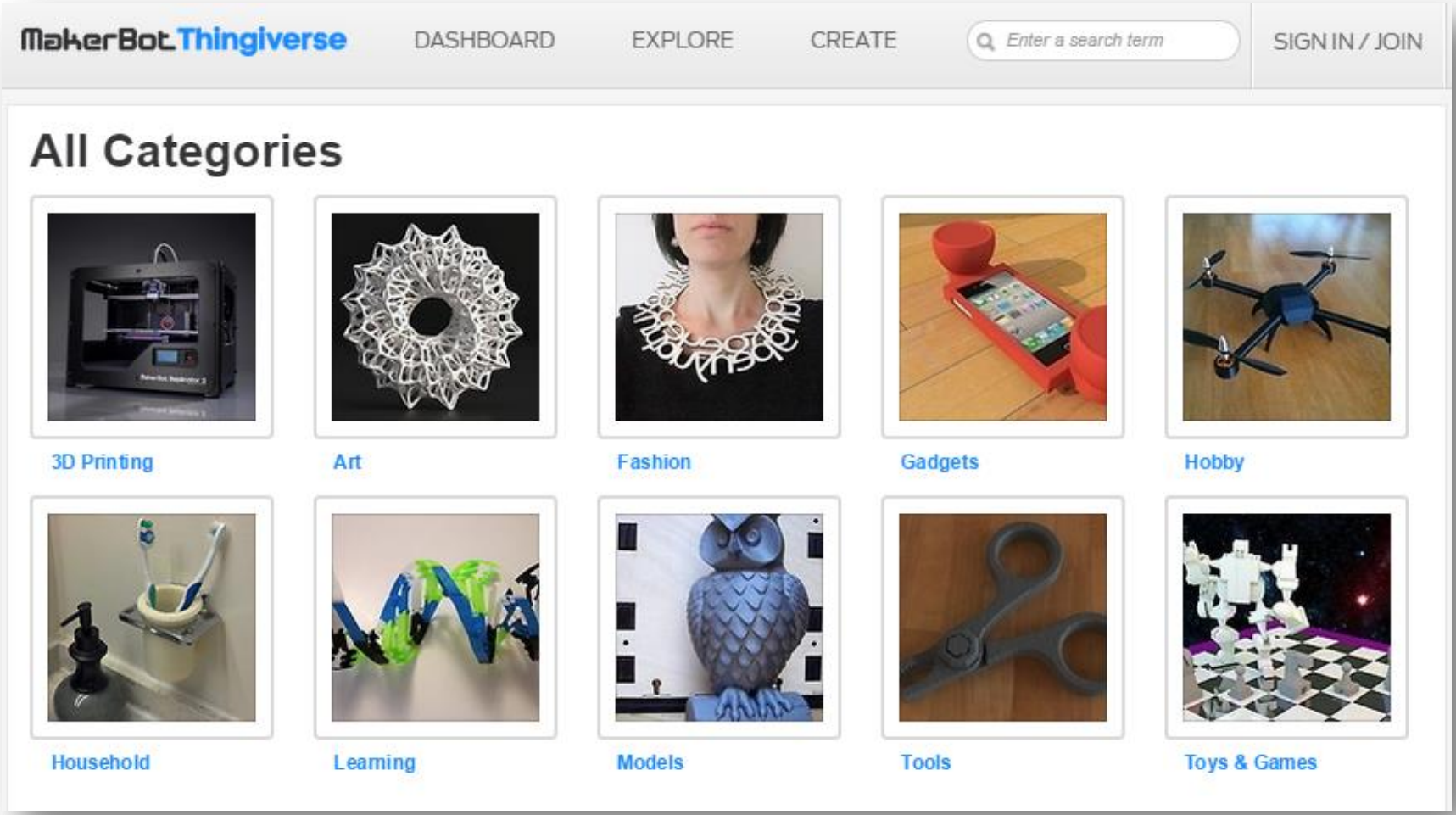
What to print?

Files in .stl format can be:

- Downloaded – Very easy
- Designed - Easier than you think! Several free CAD software options.
- Created from scans/photographs – More difficult and/or expensive, although technology is advancing quickly.

Download Things

www.thingiverse.com

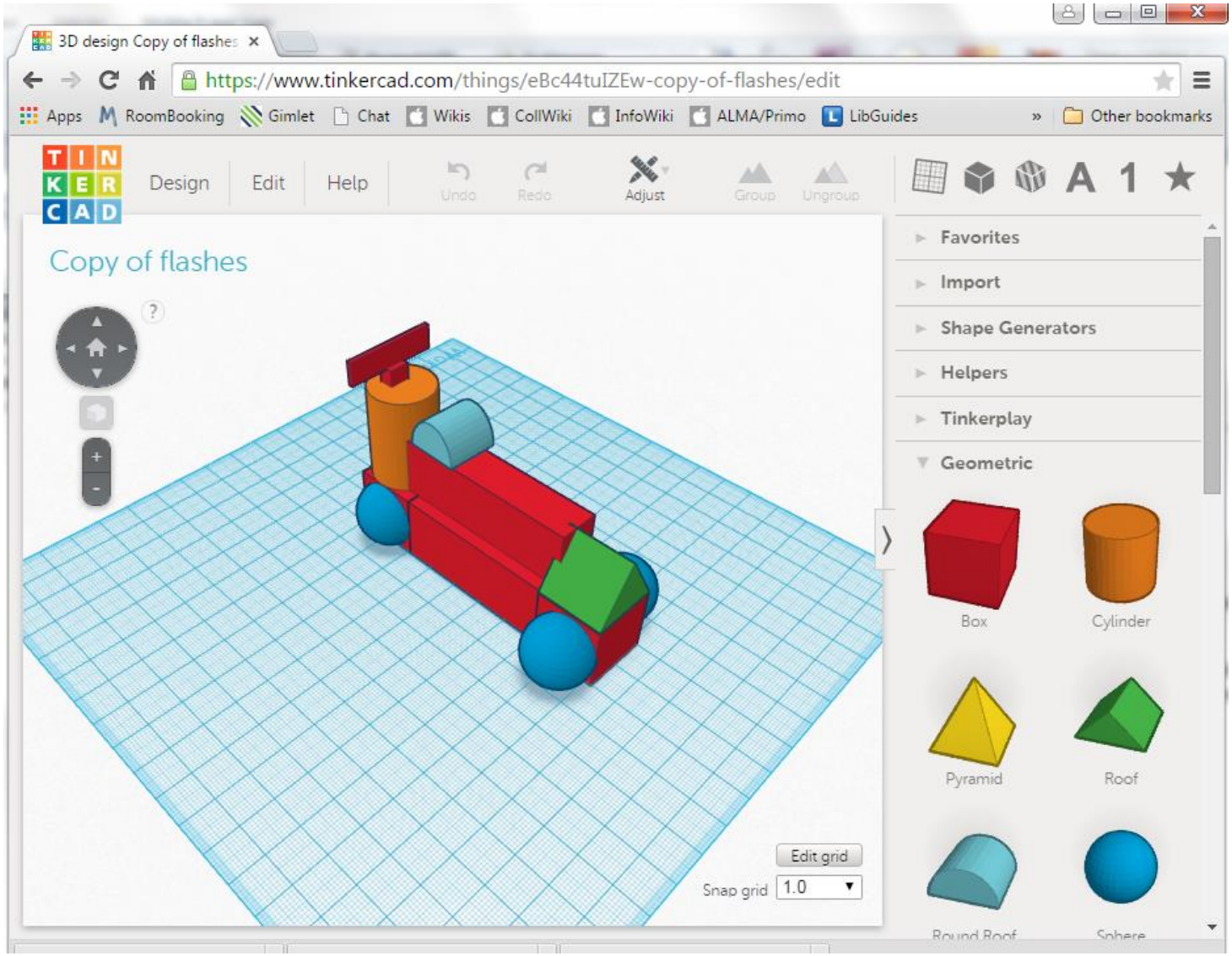


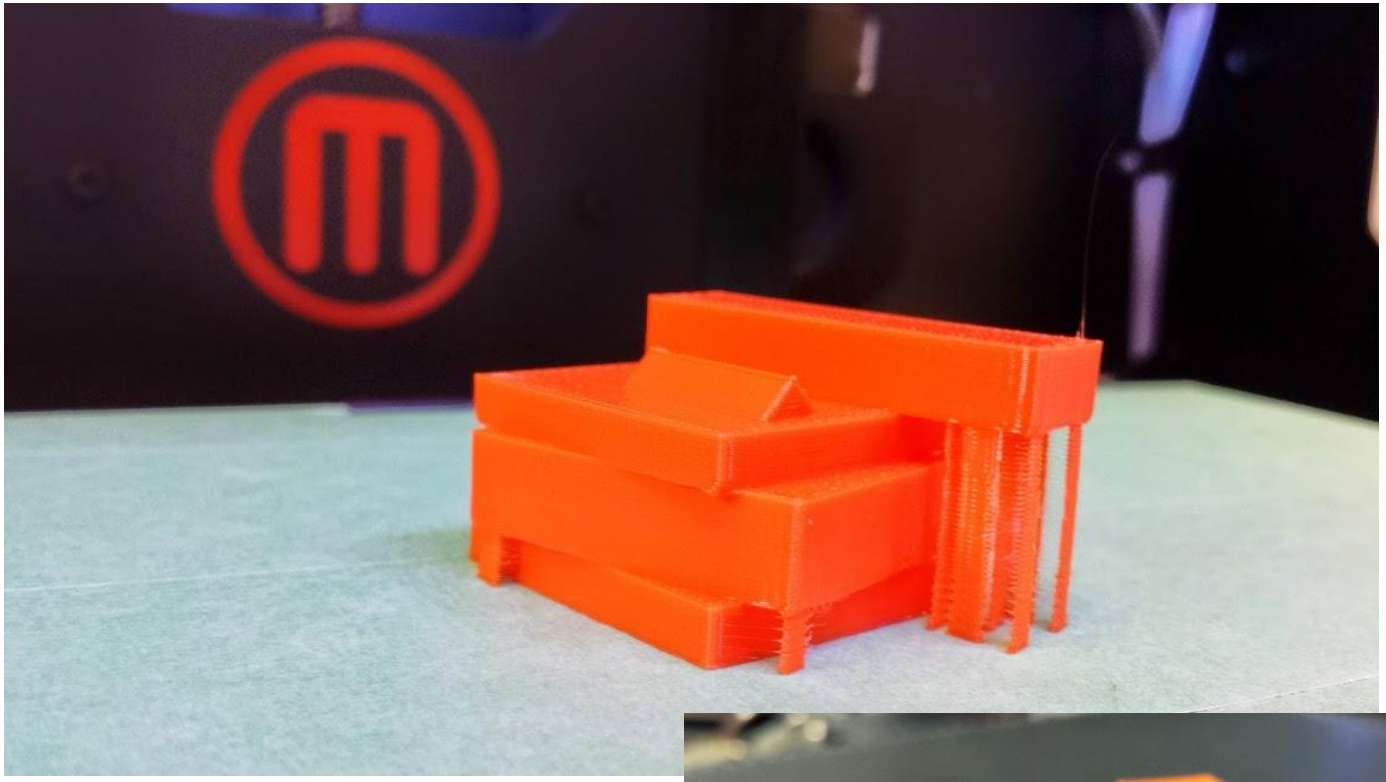

1.0
1.25

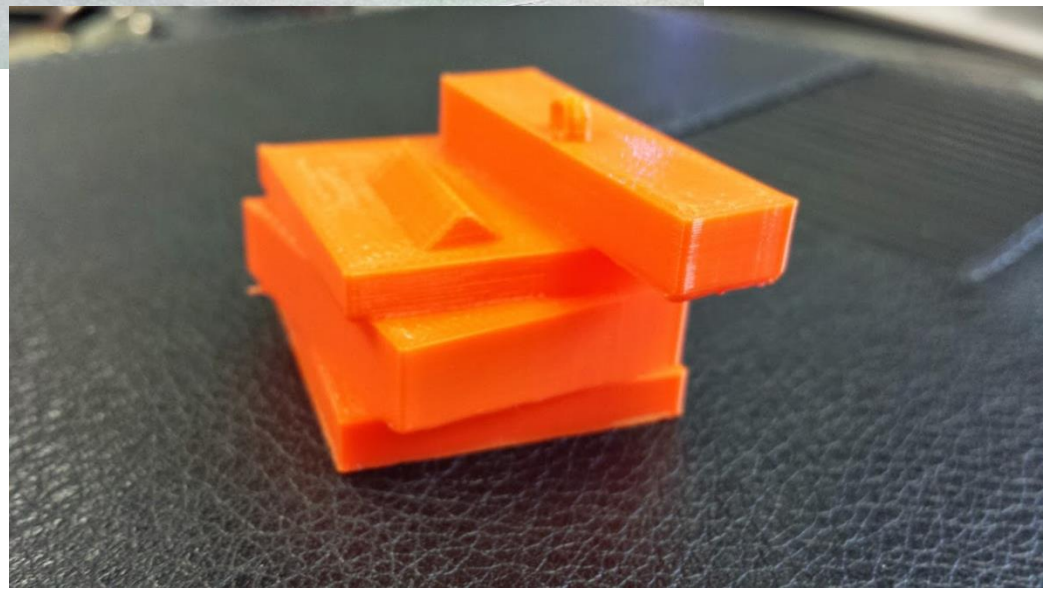
Thanks to Halifax Public Libraries for permission to use this image.

Design Things

www.tinkercad.com







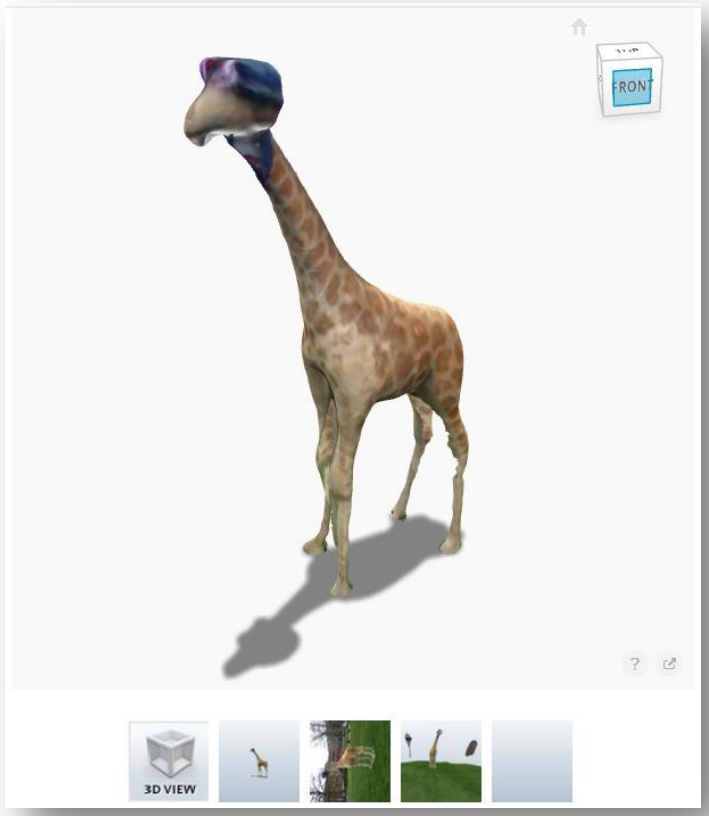
Scan Things

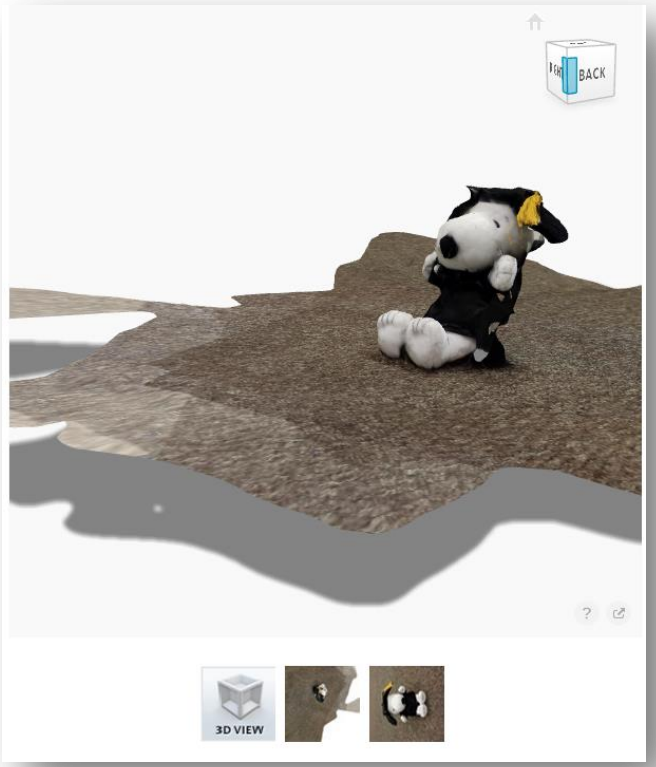
https://store.makerbot.com/digitizer.html

http://cubify.com/products/sense/

3D Modeling from Photographs

http://www.123dapp.com/catch





It's not science fiction anymore

People observe a 3D printer at work at the Woodlawn Public Library in Dartmouth on Dec. 7. (Colin Chisholm)

http://thechronicleherald.ca/community/dartmouth/1174364-it-s-not-science-fiction-anymore

Thanks to Halifax Public Libraries for permission to use this image.

http://www.halifaxpubliclibraries.ca/assets/files/annual_report/2013-14_Annual_Report_-_HPL-a.pdf

Public Reactions

- Appealed to all ages
- Amazement, curiosity, excitement, disbelief

“That’s amazing” “It boggles my mind” “Its really cool” “It is great that they are taking this around to the branches not just in the city” “I thought they would be more expensive”

- Will we need special glasses?
- High schoolers skipped classes (oh dear)
- People travelled to distant branches
- Can it print a gun?
- Discussions of broader social/environmental implications
- One person lit a piece of filament!

Thanks to Halifax Public Libraries for permission to use this image.


Thanks to Halifax Public Libraries for permission to use this image.

Public Reactions

- Kids (and adults) wanted to take a thing home
- Kids wanted to make/design their own things
- Can you make me one of these?

“I dropped by the Tantallon library with my 7 year old last month to see a demo of the 3D printer. I just wanted to say I was thrilled that the library is taking a leading role in teaching 3D printing and that the library is changing with the needs of the population. I followed the presenter's recommendation to use TinkerCAD to model a broken part from my son's sewing machine, and printed it at Dal for $1. Thanks again, and keep up the good work!”

Phase Two – DIY Branch Demos

- Group training sessions for branch IT Instructors
- Practical stuff – booking system, container for delivery, etc.
- Branches did their own demos:
  - Printer delivered to branch
  - Individual training for branch apprentice
  - On standby during their demos

Thanks to Halifax Public Libraries for permission to use this image.

Future Ideas

- Develop 3D Design instructional modules for children
- Staff training – Puppet show prop design competition

MakerBots do NOT enjoy

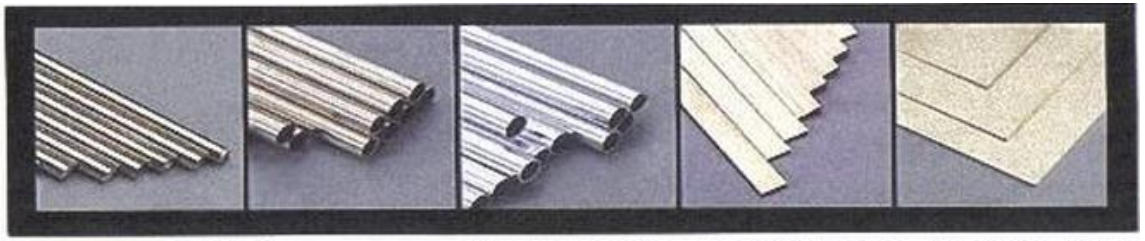
- Being transported
- Getting cold
- Being bumped while printing
- Printing in cool, breezy rooms

and they're generally a little persnickety, so things sometimes went wrong!

Librarian shopping in unexpected places

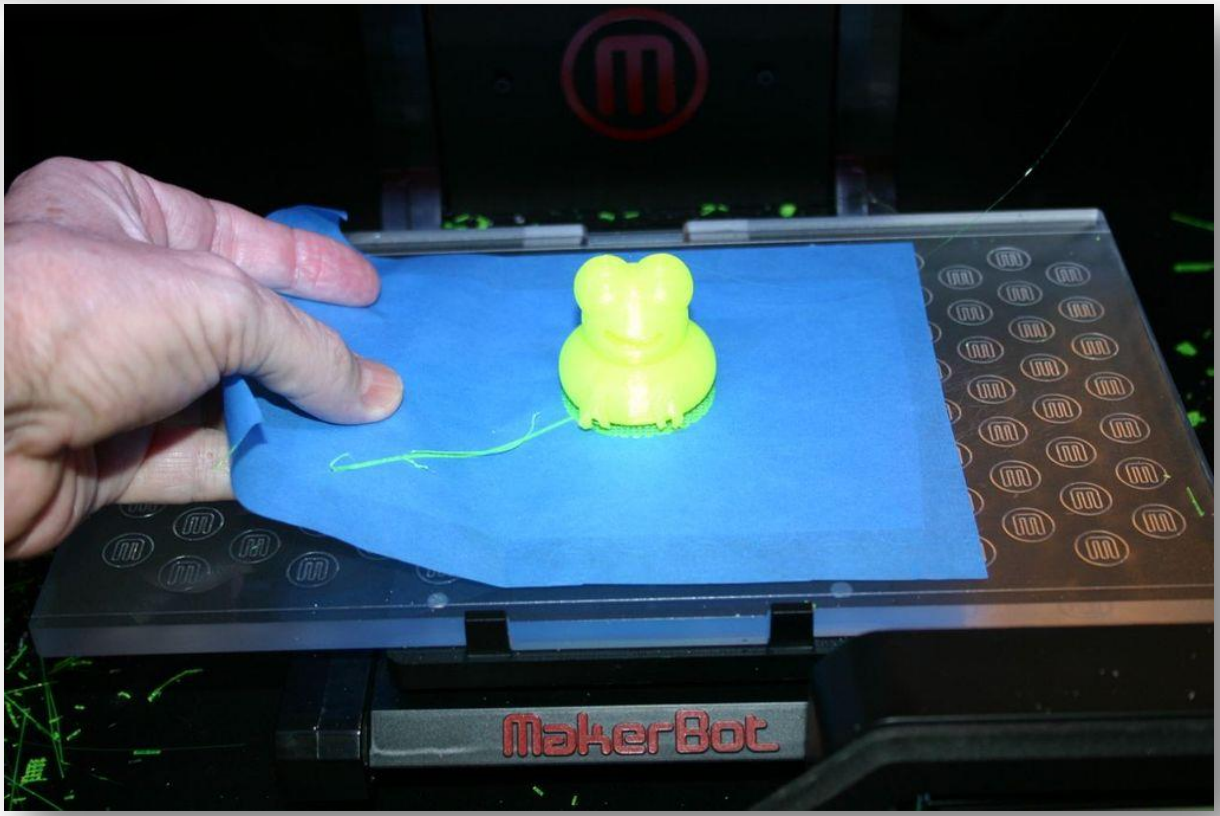
For extraordinary things

K&S®
PRECISION METALS



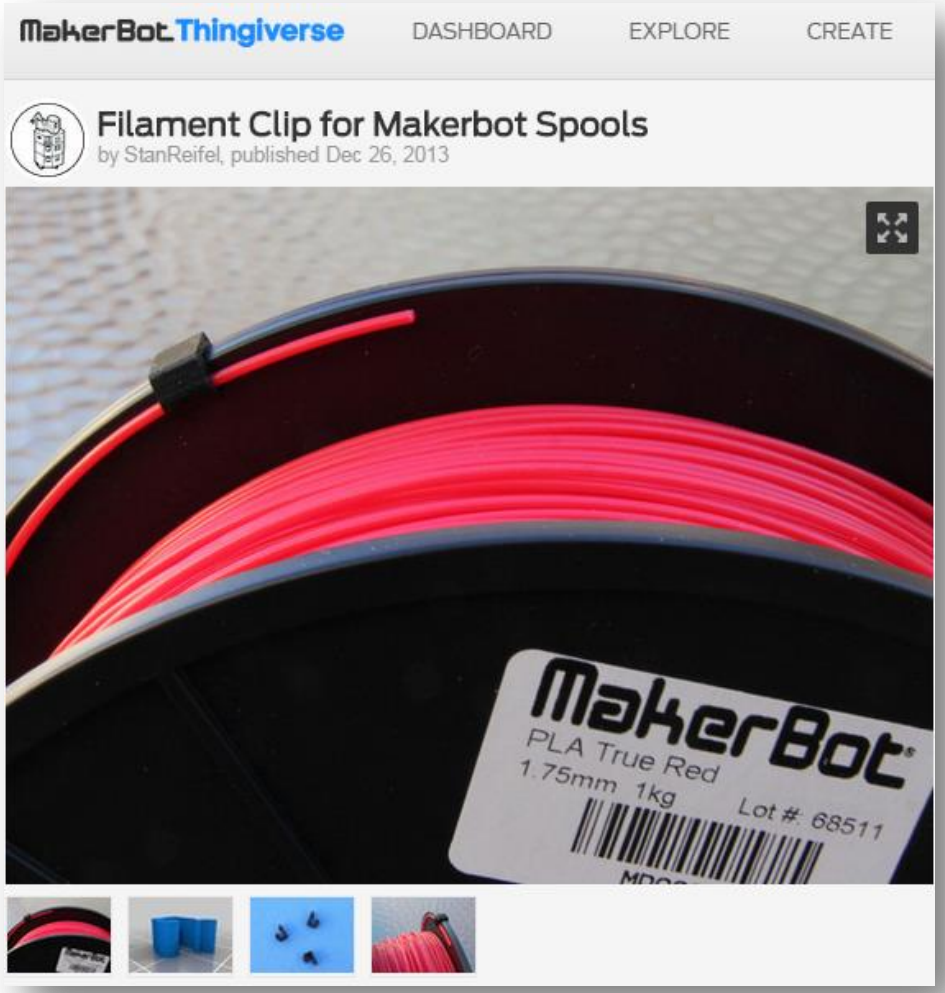
K&S
Brass, Copper and Aluminum Tubing, Strip Stock, Sheets, Rods and Tubing Benders and Cutters
Perfect for Hobby, Model Building and Model Railroading.

It’s stuck!



http://www.instructables.com/id/Easy-PLA-Removal-of-3D-Prints/

Don’t get your filament in a twist!



http://www.thingiverse.com/thing:213307

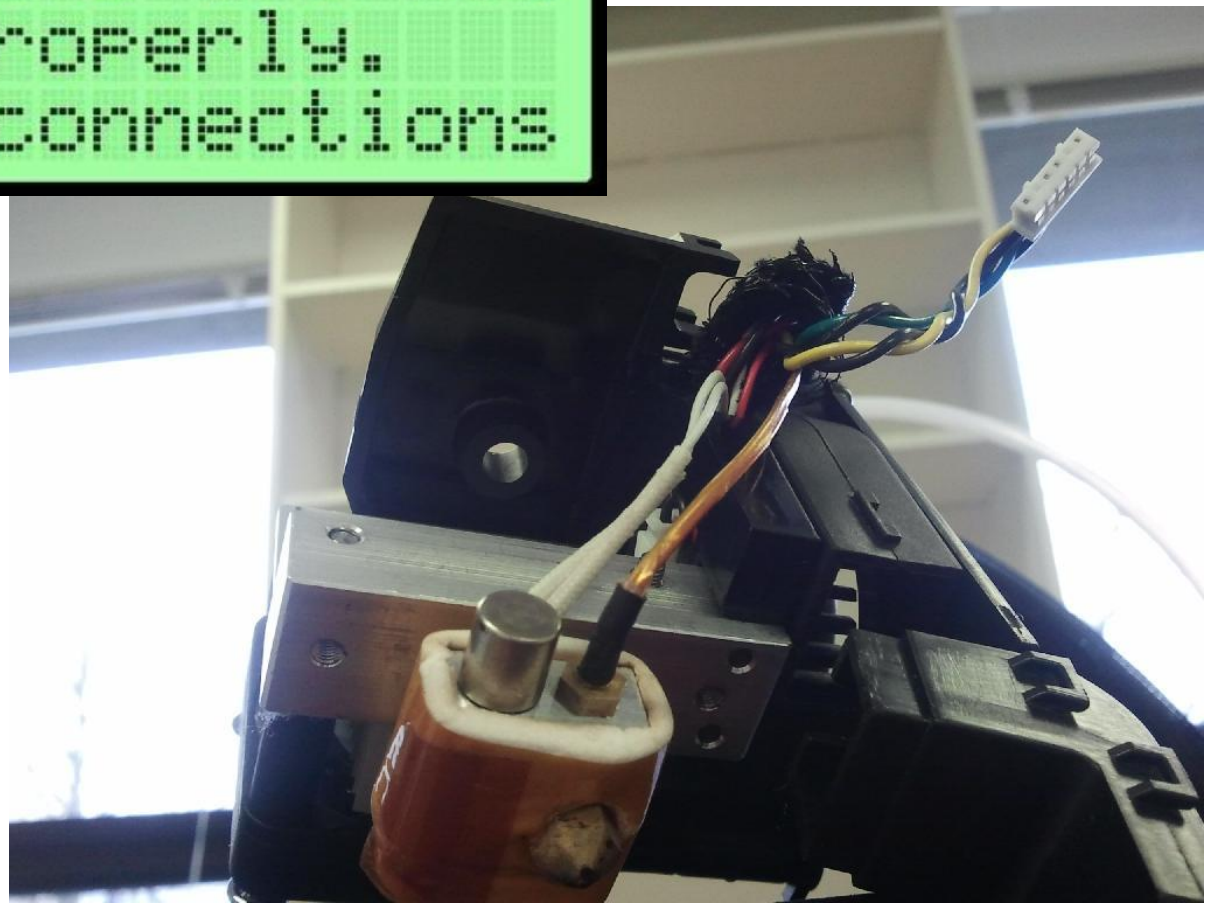
Drive block upgrade

https://www.youtube.com/watch?v=ZdOS5NP5eaE

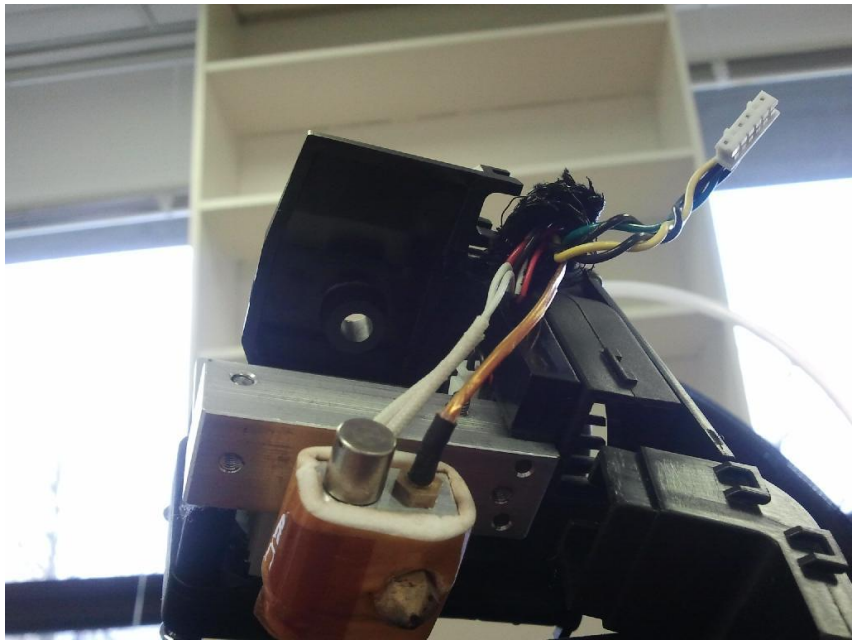
Thermocouple Failure

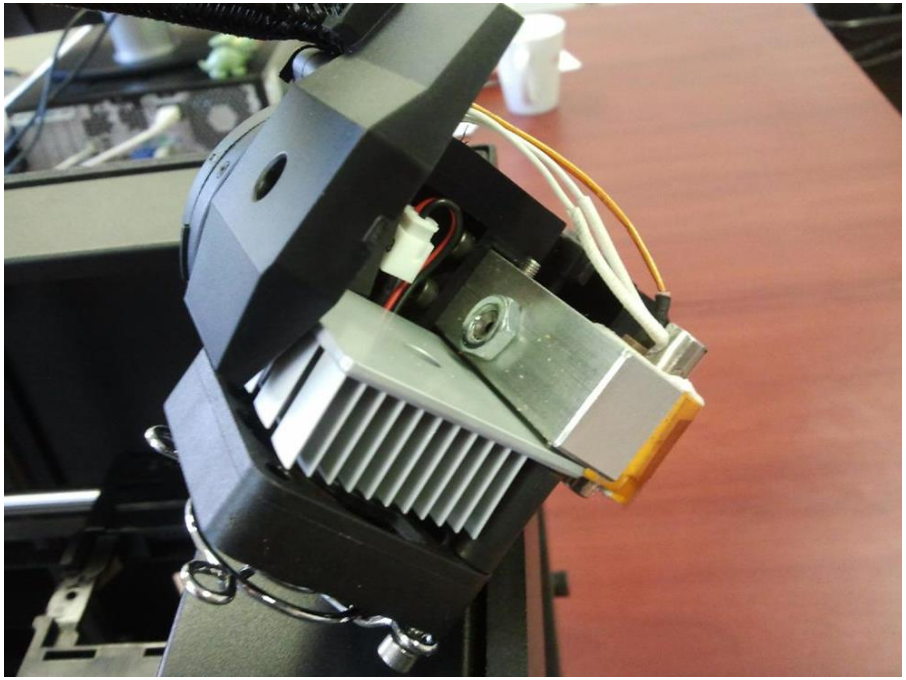
Heating Failure #2
My extruders are not heating properly.
Check my connections

SMOKE!!



Extruder Blockages





Lessons learned

1. Brace yourself for enormous public enthusiasm and media requests.

2. 3D printers are cantankerous beasts.

3. Embrace catastrophic malfunctions during public demos. They're learning opportunities in disguise.

Lessons learned

4. Things print slowly. Very s l o w l y.

5. People will want their very own things.

6. At least two printers are needed to offer a reliable print request service.

Lessons learned

7. The learning curve can be steep.

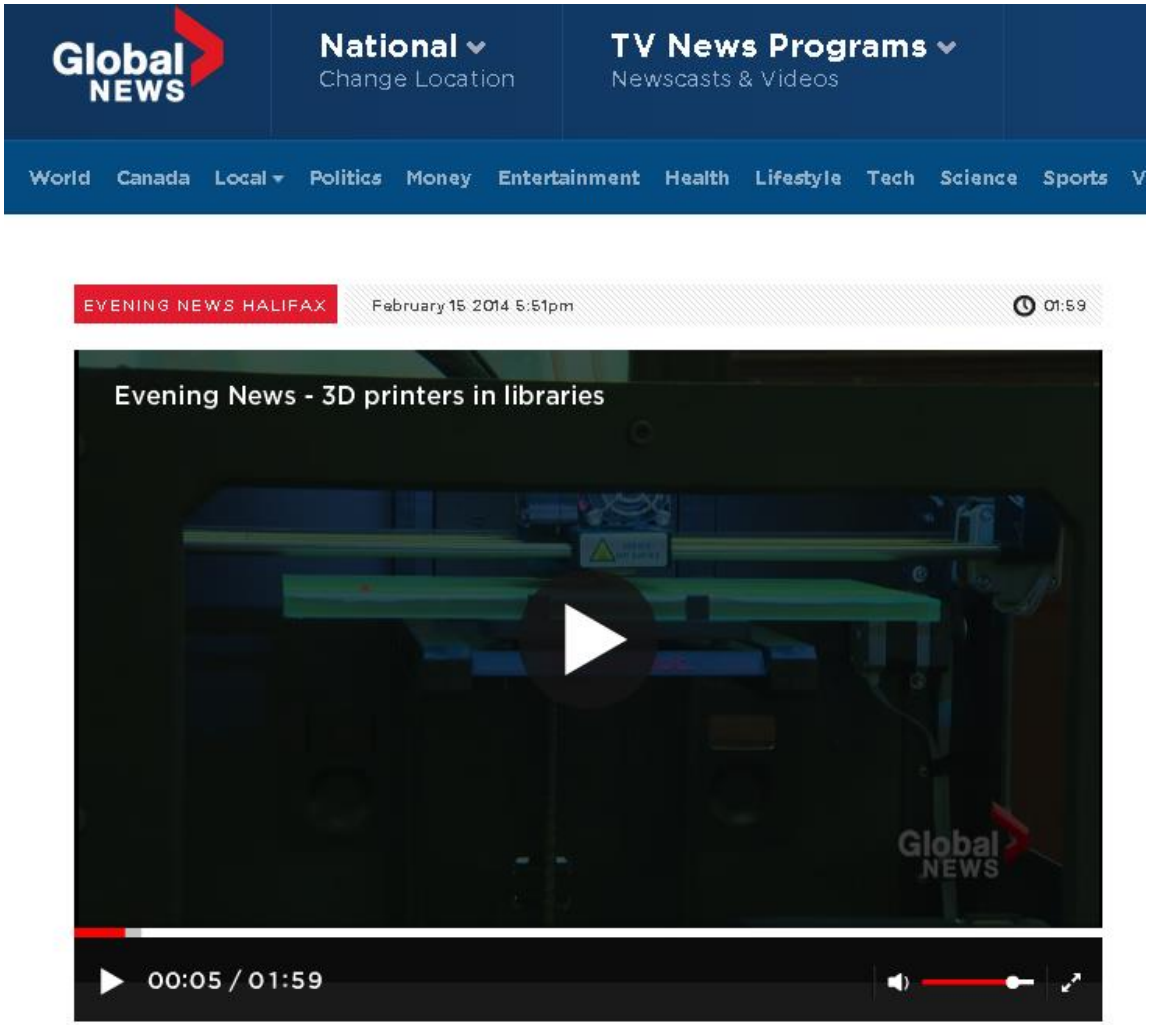
8. Google and YouTube are your friend.

9. Find a support network. (Province-wide mailing list in Nova Scotia, Dalhousie Libraries)

Not Taught in Library School!

- Why Public Libraries?
  - Universal public access to technologies for consuming, creating and transmitting knowledge
  - Skill development, focus on “STEM”
  - Natural fit for partnerships with community maker groups

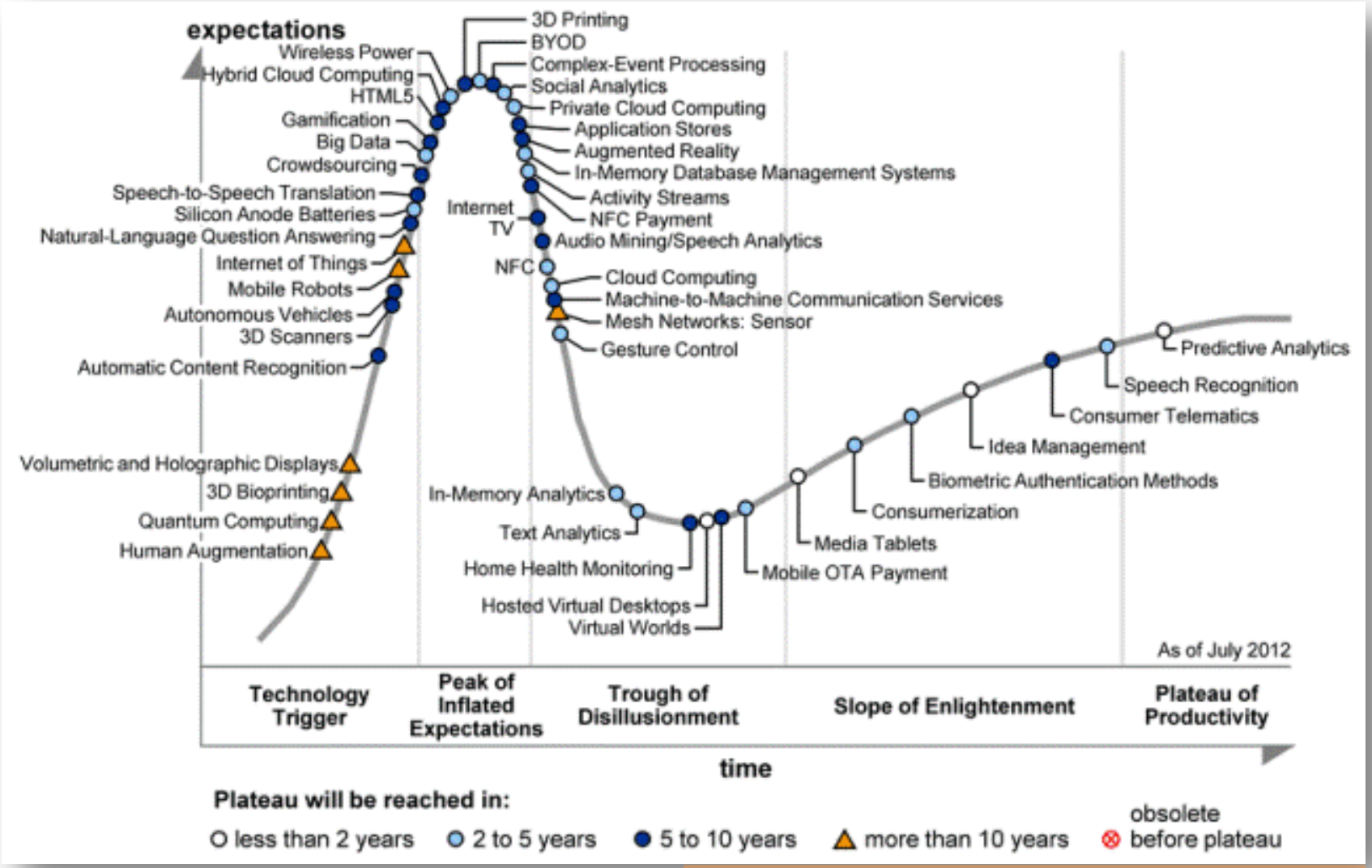
- Why Librarians?
  - Essential aptitude for 21st Century Librarians = adaptability and ability to learn new technologies.



3D printers in libraries

http://globalnews.ca/video/1152449/3d-printers-in-libraries

Hype Cycle of Emerging Technologies



http://joemurphylibraryfuture.com/gartner-2012-hype-cycle-for-emerging-technologies/

We're Happy to Share our Knowledge

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