

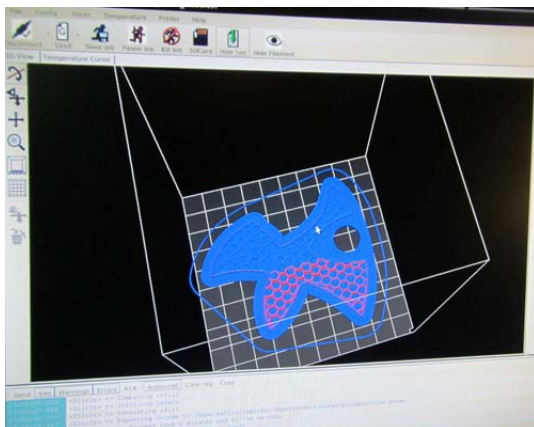
Adventure in 3D Printland

After researching numerous articles on 3D printing, attending webinars, and watching videos, I decided that I needed to see the process for myself in tangible action. 3D printing brings the virtual world right back to the realm of sights, smells and physical stuff.

Lacking a makerspace at either of my local library systems, I found my neighborhood [Create:Space](#). The 3D printer is just one of many tools offered by this community workshop—some as low-tech as sewing machines and soldering irons. Although there is an abundance of tools, materials, and evidence of projects-in-progress, the place was mostly dust- and odor-free. Walk-ins are welcome and no prior knowledge is required.



This MakerBot is a model from 3 years ago. The “build envelope,” or maximum size of the object to be printed, is a 4.5-inch cube.



The software tracks the entire process. Here, a fill-in layer is laid down in a honeycomb pattern, which speeds up the printing and reduces the overall density of the object.

This little box (roughly 15”w x 15”d x 24”h) is the machine that transformed my selected digital design file into a 3-dimensional object. It’s from [MakerBot Industries](#), a pioneer company with the goal of bringing desktop 3D printing into the home at an affordable price. Printers are sold as do-it-yourself kits.

Until recently, the MakerBot company operated on an open-source hardware model, sharing its hardware designs with the community of makers. Enthusiasts (aka geeks) could build their own machines, using existing replicators to print the parts they need. Driven by the irrepressible urge to improve, many users are designing variations on the 3d printer. Makerspaces are the perfect petri dish for incubating and proliferating ideas and inventions. Even on a quiet Wednesday afternoon, the Create:Space was suffused with the camaraderie of explorers and the fervor of discovery.

I didn’t feel ambitious enough to design my own thing, being a rank beginner at [Trimble SketchUp](#) (formerly Google), the free 3D design software that brought computer-assisted design to the masses. After looking at a few hundred objects on MakerBot’s [Thingiverse](#), I chose something relatively “simple” and useful: the [M.C. Escher Fish cookie cutter](#), generously shared with the world by ARTCAD.

I didn’t really do anything in the whole process, other than to watch attentively. My Create:Space assistant downloaded the files (there are 2 parts) from Thingiverse, opened them in the MakerBot software program, fine-tuned the settings, and did some troubleshooting of the setup before proceeding with the print process. As I followed all this manipulation on the monitor, I realized that learning the software was one more step in the overall learning curve, but one

that I felt I could grasp.

The setup wasn't seamless; there was a problem with files. My helper was able to upload the damaged files to netfabb.com, a free file repair tool. In a few minutes, the files were repaired and ready for use. It seemed rather miraculous from my novice perspective.



A honeycomb layer is laid down.

Then MakerBot whirred into action. This machine uses ABS 1.75mm (1/16 in +) plastic wire, fed from a spool over the top of the machine and through the extruder head (the yellow part at left). The nozzle lays down the melted plastic in very thin, narrow ribbons, running back-and-forth-and-around the shape, building up one very thin layer of plastic at a pass. The solid layers are interspersed with honeycomb layers. These are laid down much faster, thus reducing the time, as well as the weight and density of the piece.

Piece of advice: bring something to do while you wait for the execution of this methodical process. Once setup and running, the piece pictured here took 1 hour and 6 minutes to complete, followed by 12 minutes of cooling time before it could be released from the build platform. Then the machine needed another 15 minutes to cool down before starting on the second piece of the project.



My very own M.C. Escher fish cookie cutter

Ta-da! The finished piece consists of the cookie cutter part and the part that embosses the design on the cookie. It was thrilling to hold it in my hand.

In the interests of full disclosure, I have two caveats:

1. The embossing part of the cutter is backwards; that is, I will need to cut the cookie, then turn it upside down to emboss it. A user noted this on the website and I assumed it had been corrected by the designer. Bad assumption.
2. Create:Space is a for-profit business. At \$.50/minute for use of the MakerBot, the total cost of this cookie cutter assembly came to \$40 +tax. All in the name of science!

I encourage everyone to go out and try this for yourselves. My biggest concern about this 3D printing revolution is that it is introducing so much more plastic into the environment, often to make arguably useless things.