



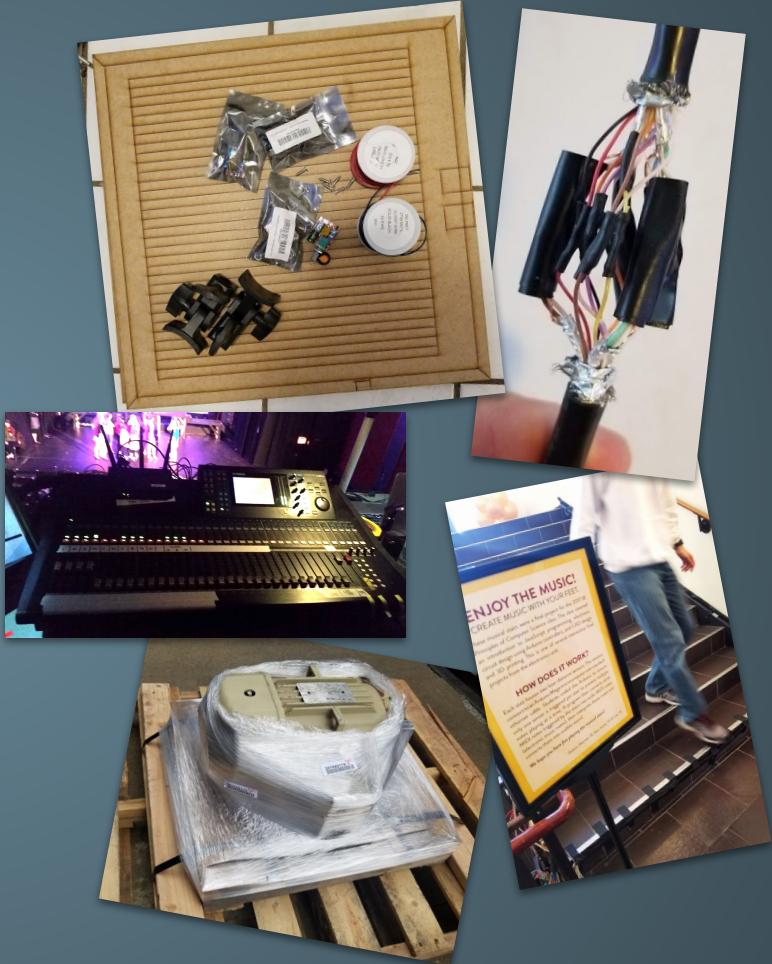
Zachary Sherman

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A few of my projects...

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Musical Stairs

This was my final project for my eleventh grade Principles of Computer Science class. While it was supposed to take only about a month and a half to complete, it ended up taking almost five! The story of its creation is detailed in my Personal Essay.

Each stair houses two laser distance sensors. The sensors connect to an Arduino Mega microcomputer over standard ethernet cable. Students coded the Arduino to ensure only one sensor is triggered per stair to prevent multiple notes playing at a time. A program then converts serial MIDI notes triggered by the stairs into audio MIDI notes (electronic music notes), then interprets those notes and converts them into audible sound.

We hope you have fun playing the musical stairs!

Zachary Sherman '19, Ilana Jacobs '19, Gabe '19

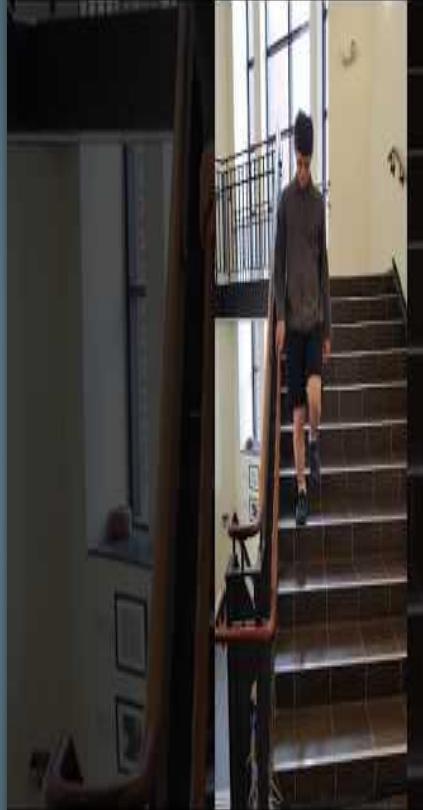
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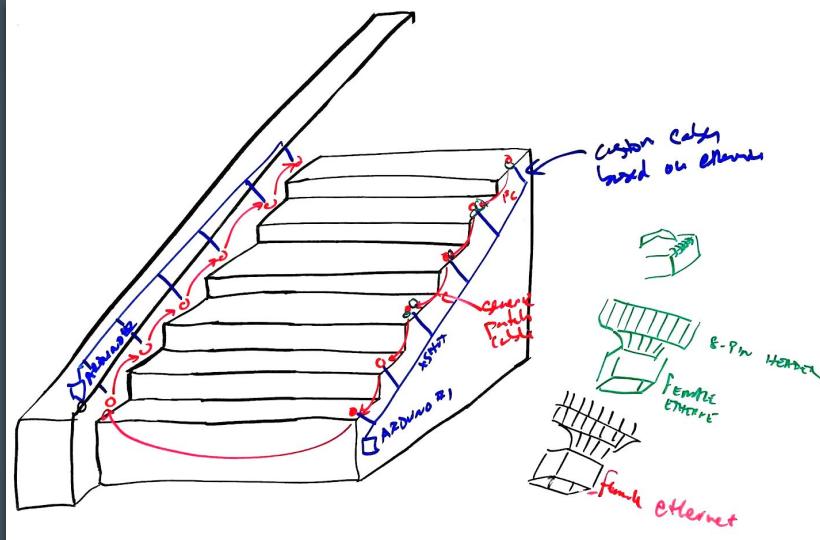
This project would not have been possible without the work of my partner, Ilana Jacobs, and my teacher, Seth Battis.

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Please click anywhere on this video to watch it.

Musical Stairs - Process Photos



One of the first sketches, drawn when routing the five wires per sensor.



Computer and Arduino mounted on the side of the stairs convert raw sensor data into MIDI notes.



Speakers mounted above the stairs play the notes.

It took 12 revisions before the 3D printed sensor cradle design held a sensor against each stair properly.



Smart Mirror

After seeing a video about smart mirrors over the summer, I knew I had to build one. A week later, I had all the parts and began building and assembling it. I hadn't done much woodworking before beginning this project, so I learned as I went along. Hand chiseling the rabbet inside the frame's edge took a long time!

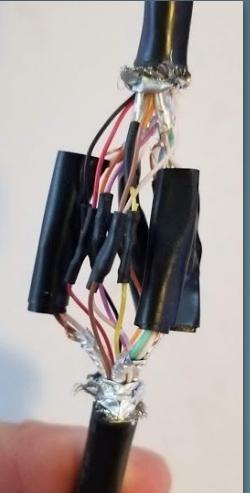
The mirror runs software called MagicMirror².
It is available for free here: <https://magicmirror.builders/>



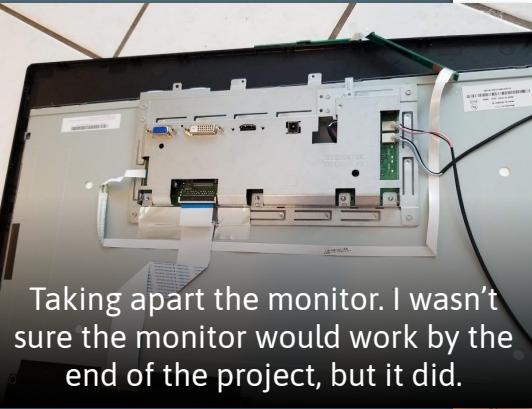
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Smart Mirror - Process Photos

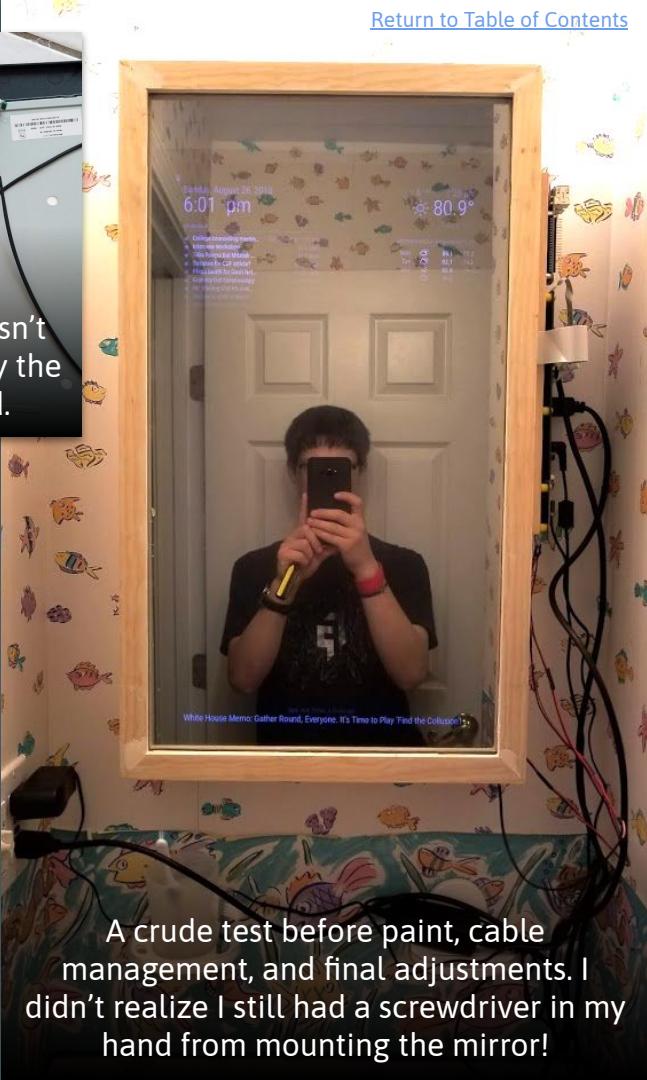
A closer look at the electronics, a Raspberry Pi 3B and the monitor display controller, removed from the monitor's housing.



Raw pieces of wood, sized to fit around the monitor and two-way glass. I don't have a router, so I had to hand-chisel the rabbet for the mirror to fit in.



I hand-soldered this HDMI cable so it would be small enough to fit without extra cable length.



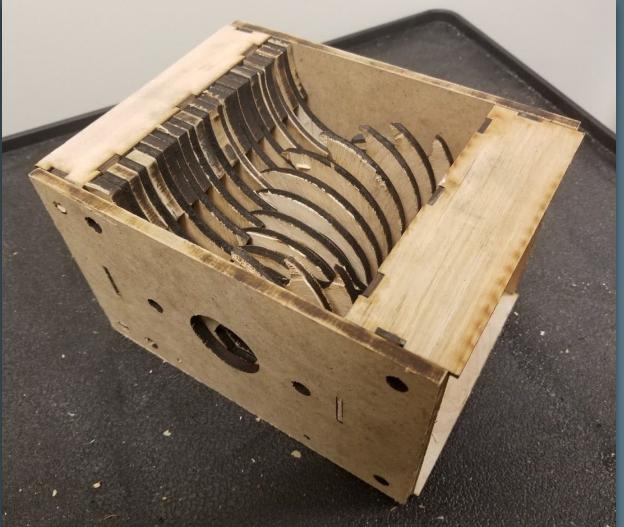
Plastic Shredder

At Gann, there is too much plastic waste: We recycle over 40 single-use water bottles per day and dump our failed 3D prints and support material in a box, waiting for a future use. To fix this problem, we decided to build a fleet of plastic recycling machines, starting with a shredder. This year, we are hoping to build an injection molding machine for use with our CNC router and an extrusion machine for making new 3D printer filament out of old 3D prints. The shredder will be completed within the next few weeks. This project would not have been possible without the work of my partner, Micah Margolis, and my teacher, Seth Battis.



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Shredder - Process Photos/Video

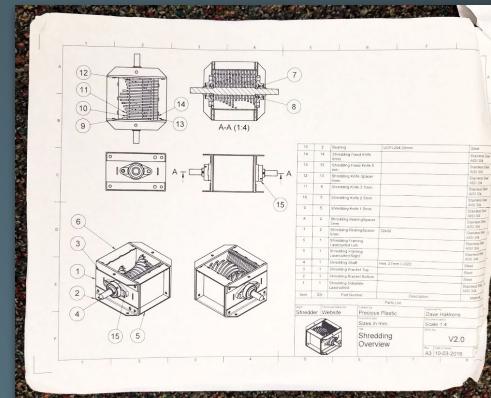


A laser-cut wooden prototype of the shredder design built before purchasing...

Check out a short video clip of the shredder in action.



...\$500 of laser-cut stainless steel for the real shredder!



Plans from
preciousplastic-usa.com
for how to build
the shredder assembly.



The 200lb motor on the day it arrived.
I had never received a delivery on a pallet before!

New and Improved Tech

In tenth grade, my friend Alex Bulanov and I started a YouTube channel and website together called New and Improved. We produced one video, two articles, and a forty-minute live show each week. While due to time constraints we could no longer continue producing videos in eleventh grade, our videos are still available at www.newandimprovedyt.tk and our articles at: www.newandimproved.tk. One of our videos received over 5,000 views!



One of my favorite tech review videos from our channel, featuring the Google Home. Alex and I had a lot of fun making videos for the channel!

LED Lighting Panels for Video Production

After my softbox studio lights fell and broke during an outdoor photo shoot, I needed a better solution. LEDs, which run instantly at full brightness, are smaller, and use less power, sounded perfect. Building these panels took a lot of planning, design, and woodworking, but I'm glad to have them! In this photo, one LED panel is being used to light a green screen for a photo booth.

A sample photo taken at my photo booth.



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LED Panels - Process Photos

All the parts for the panels, including the laser-cut back panel which acted as a template for where to glue the LED strips and power delivery modules.



My first time using a chisel. I used it to cut recesses for the power delivery modules into one of the side pieces.



Complete!
The panels are
really bright but
perfect for video.



Gluing together the last frame. At this point, my plan was to use white acrylic diffusers, but they were too opaque, so I later switched to roughed-up clear acrylic.

Chanoch LaNa'ar Video

At the end of last year, my Jewish Studies teacher approached me about making a video describing in depth our Chanoch LaNa'ar program. Focusing on soul traits, the goal of the program is to encourage students to think introspectively. I created the video over about two months, doing everything from composition to filmography to editing. It was shown in an all-faculty meeting and is now shown each year to incoming ninth graders in their Jewish Studies classes.

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The main set for the video. The arch seen in the video is behind the chair to the right of this photo.



Sound Reinforcement for Theater Productions

Since I was 12, I have mixed sound for over 20 theater productions both in school and for local children's theater groups, paid and as a volunteer. I love working with children and helping them sound their best on stage! Here are a few photos from different venues at which I have worked on sound.



This photo was taken the first time I ever worked on sound!

