Glue Stick Light Pipe Sculpture

Created by Dano Wall

https://learn.adafruit.com/glue-stick-archway

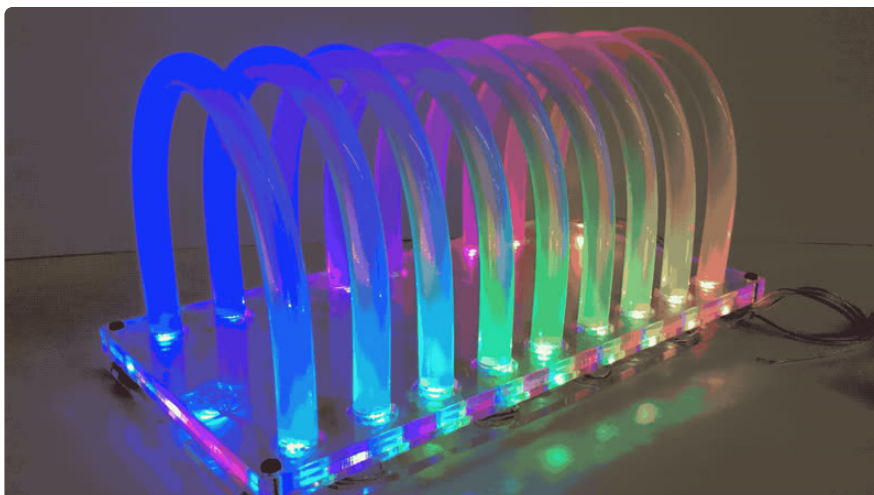Last updated on 2024-06-03 02:38:27 PM EDT

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Overview

For this project we will create a "fiber optic" rainbow archway using glue sticks and a NeoPixel LED dot strand. The NeoPixels hidden beneath the glue sticks guide the light in a curved path away from the LEDs. Because each glue stick connects two different NeoPixels, they are able to mix colors in the center, allowing tons of different color combinations to be achieved.

You can make neat sculptures with light effects!

This guide demonstrates how to make, assemble, and code your own glue-stick-fiber-optic art piece, demonstrating how to control the speed, color, and interactive potential of the light display, as well as alternative glue stick arrangements.
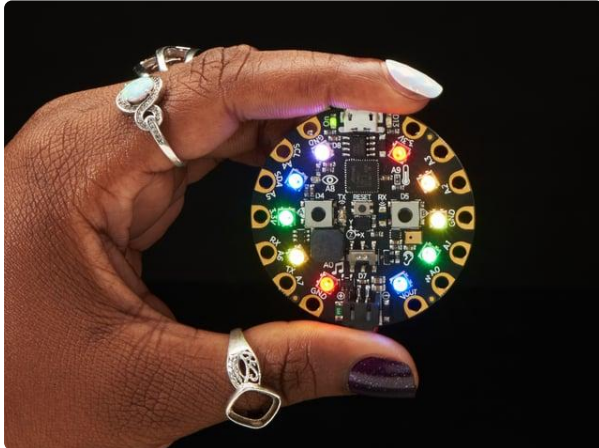

Fiber Optic...-ish

Fiber optic cables work by virtue of a unique property called "total internal reflection", allowing them to carry huge amounts of information in the form of light almost

losslessly. Glue sticks do not make good substitutes for fiber optic cable (https://adafru.it/Dlf) because they do not have total internal reflection, rather they act like light pipes, both scattering and reflecting light that enters them. This does, however, make them great light diffusers, which suits this project just fine.

Electronics

Circuit Playground Express
Circuit Playground Express is the next step towards a perfect introduction to electronics and programming. We've taken the original Circuit Playground Classic and...
https://www.adafruit.com/product/3333

USB cable - USB A to Micro-B
This here is your standard A to micro-B USB cable, for USB 1.1 or 2.0. Perfect for connecting a PC to your Metro, Feather, Raspberry Pi or other dev-board or...
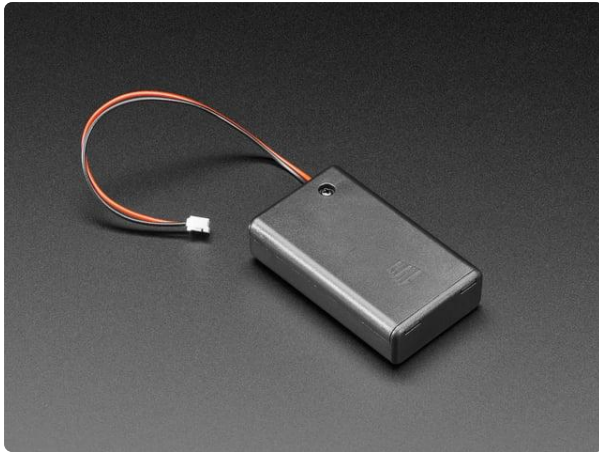https://www.adafruit.com/product/592

Adafruit NeoPixel LED Dots Strand - 20 LEDs at 2" Pitch
Attaching NeoPixel strips to your costume can be a struggle as the flexible PCBs can crack when bent too much. So how to add little dots of color? Use these stranded NeoPixel dots!...
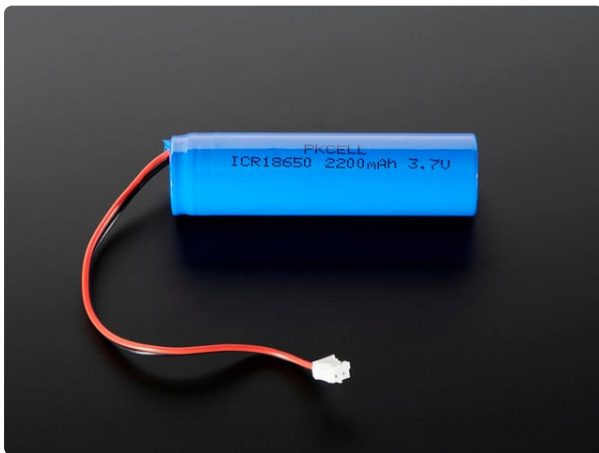https://www.adafruit.com/product/3630

3 x AAA Battery Holder with On/Off Switch and 2-Pin JST

This battery holder connects 3 AAA batteries together in series for powering all kinds of projects. We spec'd these out because the box is slim, and 3 AAA's add up to about...
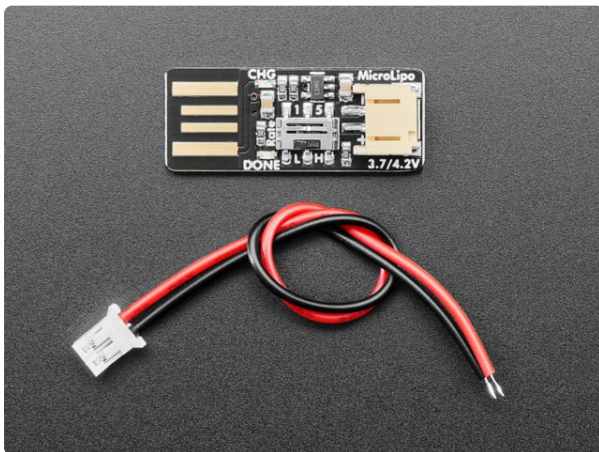
https://www.adafruit.com/product/727

Or, for a rechargeable version:

Lithium Ion Cylindrical Battery - 3.7v 2200mAh

Need a big battery for your project? This lithium-ion battery contains a 2200mAh and a protection circuit that provides over-voltage, under-voltage, and over-current protection. Yet,...

https://www.adafruit.com/product/1781

Adafruit Micro Lipo - USB LiIon/LiPoly charger

Oh so adorable, this is the tiniest little lipo charger, so handy you can keep it any project box! Its also easy to use. Simply plug in the gold plated contacts into any USB port and a...

https://www.adafruit.com/product/1304

Other Materials

For this project you will need:

- Scrap corrugated cardboard
- Scissors and/or box cutter
- Hot glue sticks (https://adafru.it/DIg) (10 inches long x 0.44 inches wide is ideal)
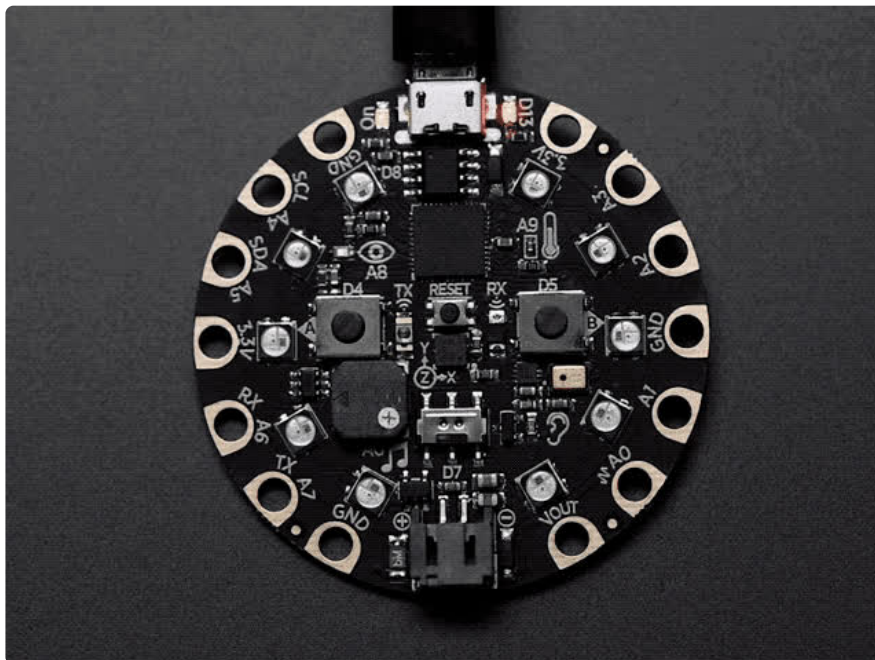
• Laser cutter + acrylic (optional)

MakeCode

Getting Familiar

The code for this project was created using **Microsoft MakeCode for Adafruit**, a web-based code editor. MakeCode provides a block editor, similar to Scratch or Code.org, and also a JavaScript editor for more advanced users.

If you'd like to learn more about MakeCode, this guide is a good place to start (https://adafru.it/BDk).

Click the button below to enter the portal to interact with the code for this project

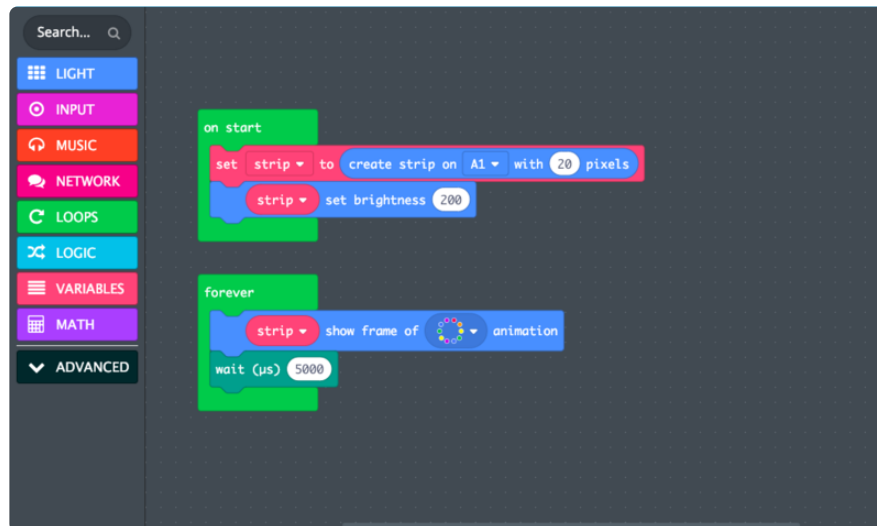**Load the project code in MakeCode**

https://adafru.it/DL3

How to Upload Code

To upload code, connect Circuit Playground Express to your computer using a micro USB cable and press the small reset button in the center of the board. All the LEDs will flash **red briefly, then turn green.** Your computer should now show removable drive called **CPLAYBOOT.**

Click the **Download** button to download the **.uf2 file** to your computer, and **drag 'n drop that .UF2 file onto the CPLAYBOOT** drive in your computer's file explorer or finder.

The drive will automatically eject itself (your computer may give you a "failed to eject drive correctly" error, you can ignore this). The code is now on your Circuit Playground Express and ready to run!

What's Happening?

First, in the `on_start` loop we tell Circuit Playground Express that a NeoPixel strand with 20 pixels is going to be connected at pin **A1**. Then we tell it how bright we want our lights to be (as bright as possible).

Then in the `forever` loop, we tell the strip to show one frame of the "rainbow" animation at a time, with a 5 millisecond delay between each frame.

If you'd like to play with this code, click "**Edit**" and a new window will open in which you can create your own version.

MakeCode is fun to work with and easy to customize, allowing you to get some great results with just a little trial-and-error.

Changing the NeoPixel Animation

If you'd like to change or add anything to your light show, you will find the **NEOPIXEL** section becomes available after you click on the **LIGHT** section.

Click on the **LIGHT** block at the top of the list. The code in this block deals with the Circuit Playground's onboard lights. When you click this tab, a new block called **NEOPIXEL** appears. This is the block you want. The options in this block deal with any light strips extraneous to the NeoPixels already onboard the CPX and provide many fun options for animating your NeoPixel strip.

To reveal the NEOPIXEL section in MakeCode, first click on LIGHT

Troubleshooting

Problem: My NeoPixels won't light up!

Solution: Make sure that your Circuit Playground Express is connected to a power source (anywhere between 3V-5V is safe). If you're using a AAAx3 battery pack, check that the switch on the battery pack is set to "ON".

Problem: My Circuit Playground Express doesn't show up as **CPLAYBOOT**

Solutions:

- Be sure you have a Circuit Playground Express. The Classic will not work with MakeCode.
- Some USB cables are "charge-only" and won't pass data. Try using a different USB cable and try using a different USB port on your computer.

- With the Circuit Playground plugged into your computer with a micro USB cable, **click the small reset button** in the center of the board. The lights should all turn green. If they don't, try double-clicking the reset button.

If things still aren't working, head over to the Intro to Circuit Playground Express (https://adafru.it/adafruit-cpx) guide for more suggestions.
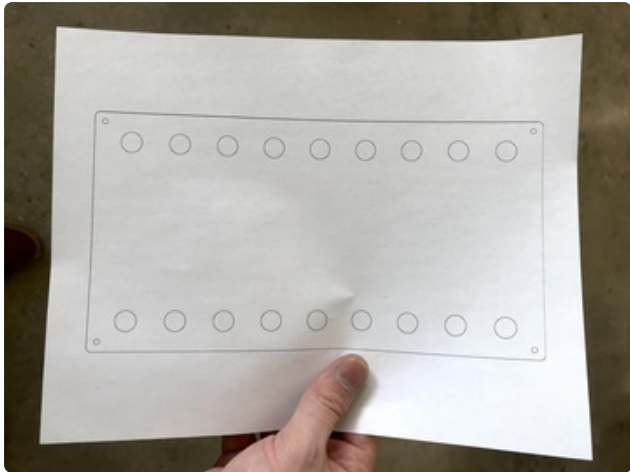
Assembly & Circuit

There are two ways to create the platform for your glow stick archway: cutting it out of cardboard, or using a laser cutter to create an acrylic piece that will hold the ends of the glue sticks firmly in place.

Below are instructions for a cardboard version, which requires only some cardboard, paper, glue, and a good hobby knife.

Template for the base (PDF)

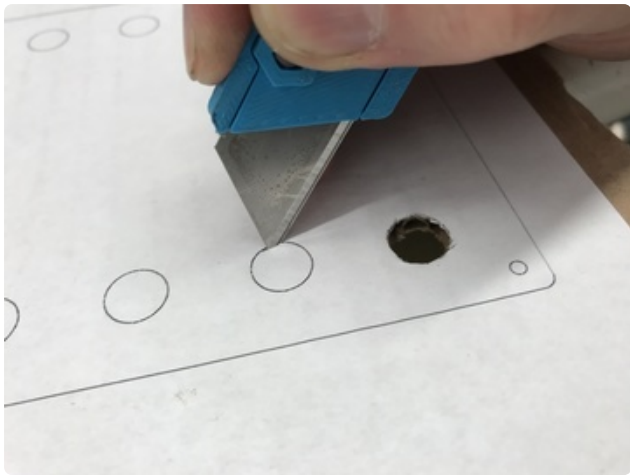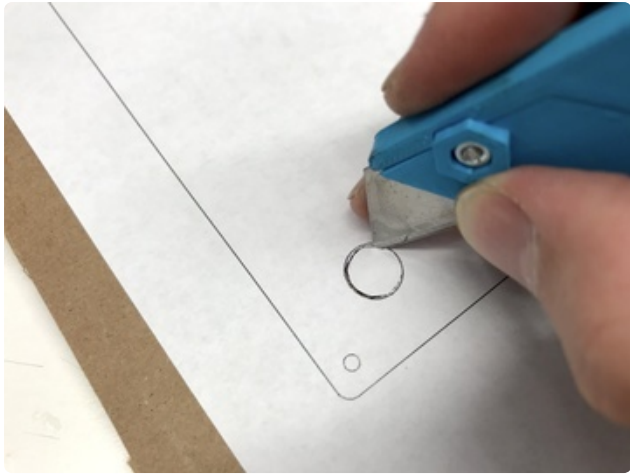https://adafru.it/DKy

Print Template

Download the PDF of the glue stick matrix template by clicking the green button above. Print out the template.

Glue the template to a piece of cardboard.

Press the cardboard+paper under something heavy. Wait 10-15 minutes for glue to dry.

Cut Holes

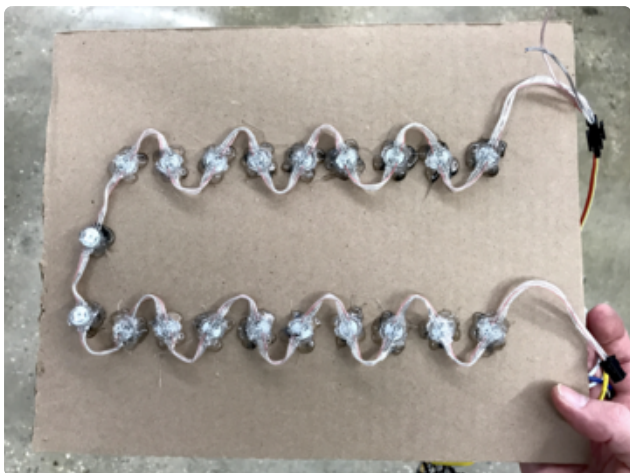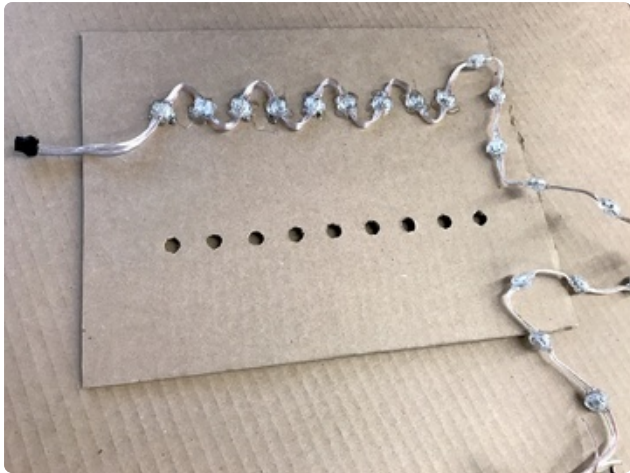Use a hobby knife to cut out the small holes in the cardboard.

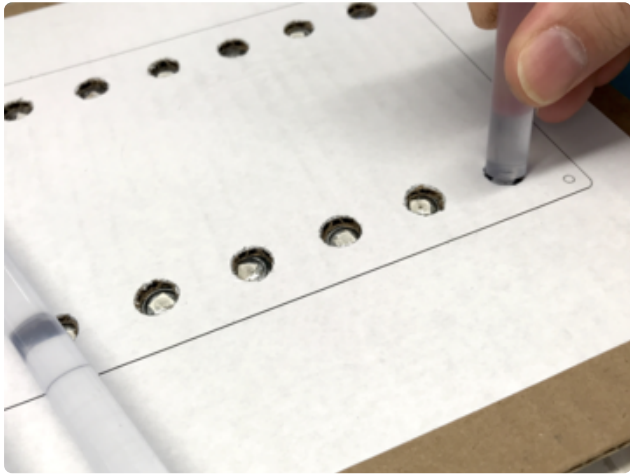Stay slightly inside the lines to ensure the gluesticks fit tightly in the holes.

Glue NeoPixel Dots

Glue the NeoPixel Dots one by one to the underside of each hole.

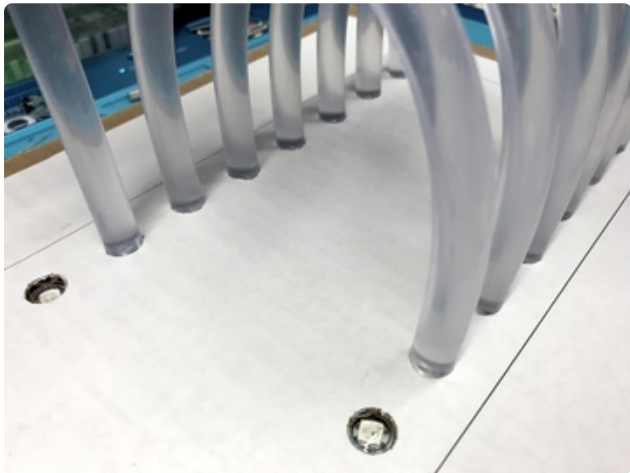Be careful and work slowly! Hot glue is dangerous and will burn your fingertips if you're not careful.
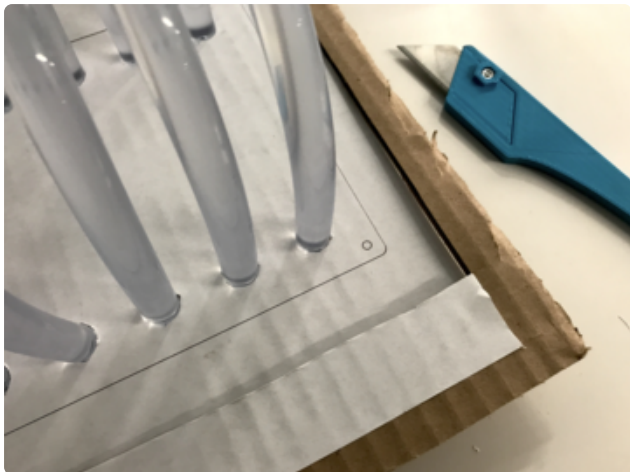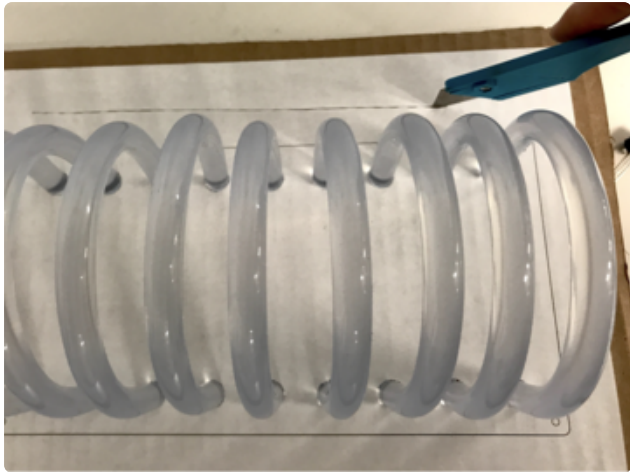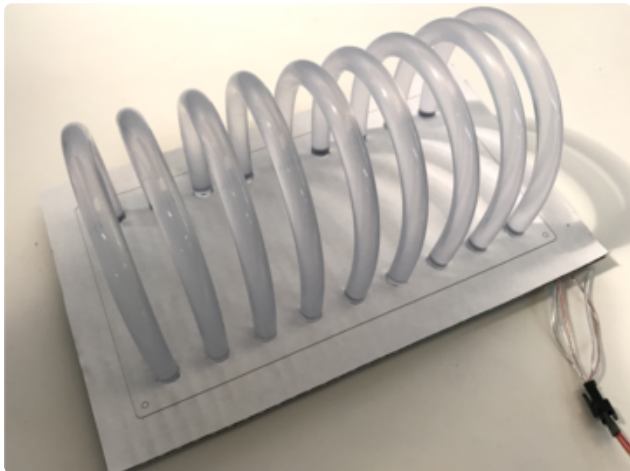
Add Glue Sticks

Once the hot glue has cooled, grab 8 pristine glue sticks and insert the ends of the glue sticks into the top of the holes, pressed them tightly up against the NeoPixel dots.
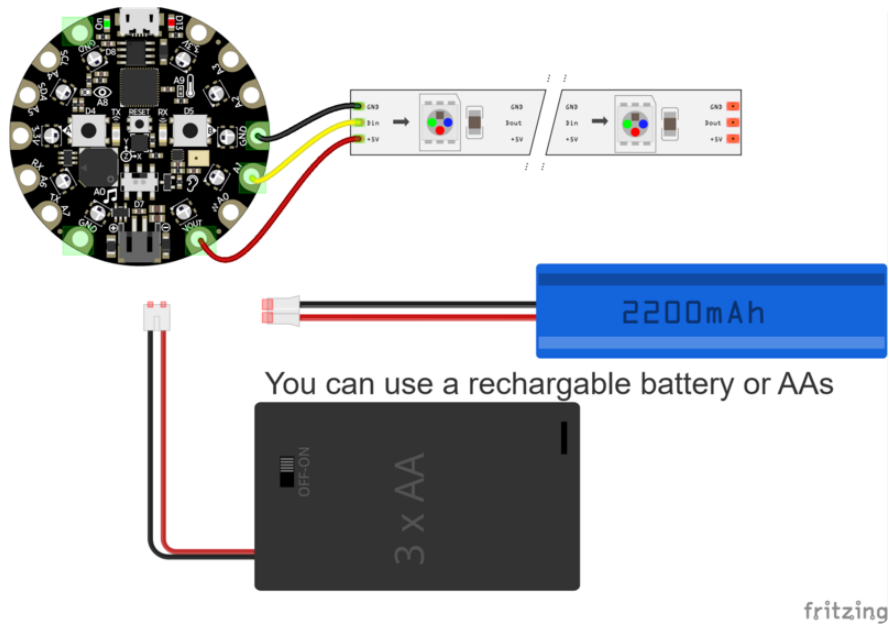
Clean It Up

If desirable, cut around the outside edge to give the rainbow platform a clean and finished appearance.
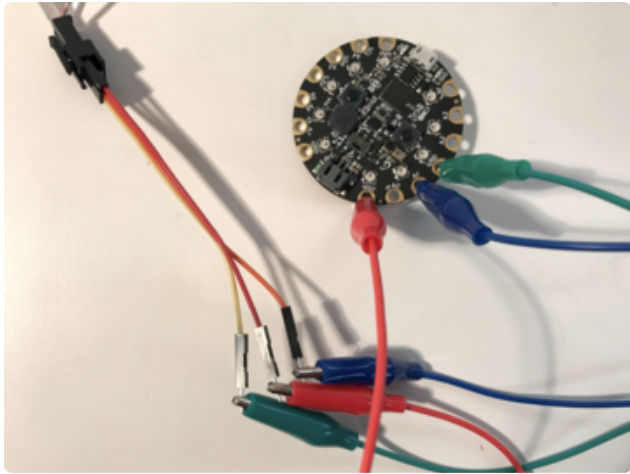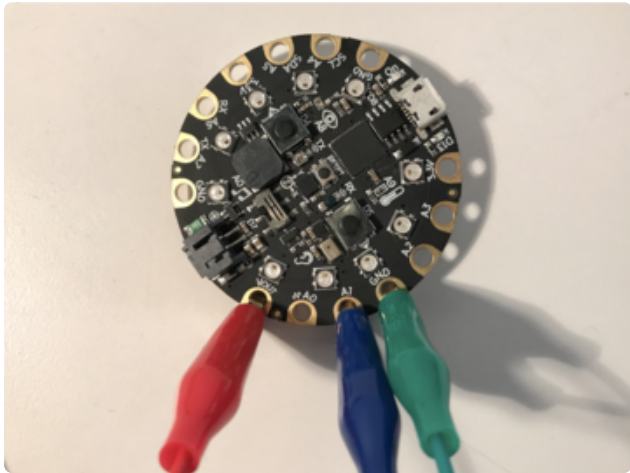

The Circuit

On this NeoPixel strip, the red wire is +5V, the middle wire is data, and the other edge wire is ground.

Using alligator clips from the pads on Circuit Playground Express, connect the red wire to **Vout**, the middle wire to **A1**, and the edge wire to **GND**.
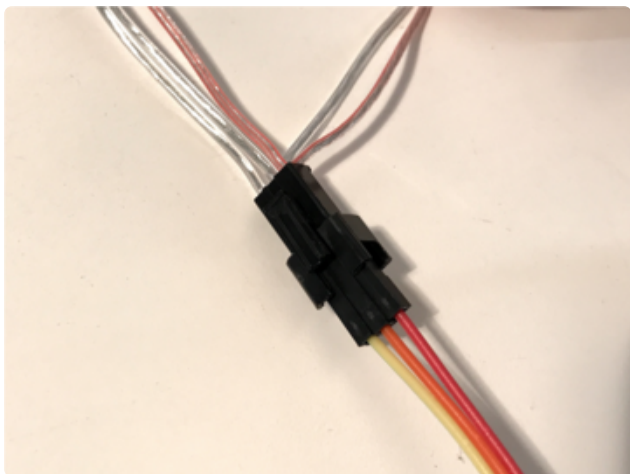
You can use a rechargable battery or AAs

A combination of short male-female jumper wires (http://adafru.it/794) and alligator clips (http://adafru.it/1008) are a fast and simple way to connect the end of the NeoPixel strand to the pads on CPX.

You can also follow this guide (https://adafru.it/DL5) for an alternative method for connecting CPX to the NeoPixel strand (requires soldering).

Just Add Power

To power your NeoPixel Dot strip, just connect a battery to the JST port on Circuit Playground Express and you should see it boot up after a second or two.

Adaptations

Getting Fancy

If you'd like your new glue stick archway to do more than just glow beautifully, you can use MakeCode to quickly incorporate some of Circuit Playground Express's many sensors.

For example, we can alter the original MakeCode so that the rainbow only comes on when the lights are dimmed. This code is available by opening the example below, or you can follow the steps on your own to make these changes.

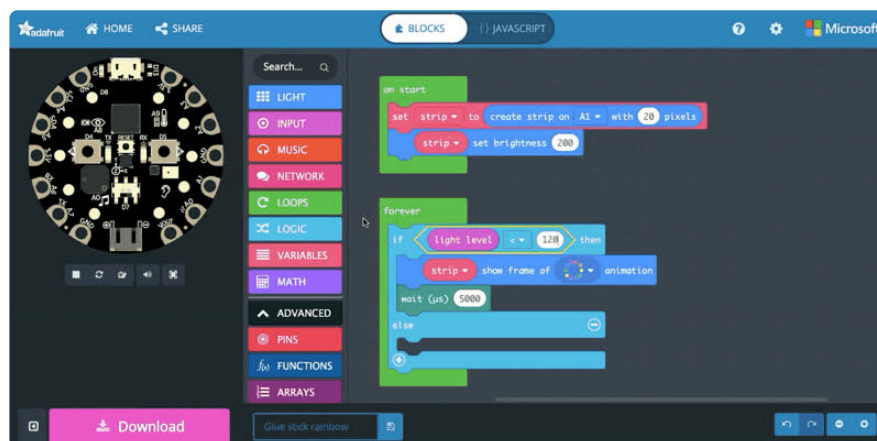**Open the second example in MakeCode**

First, grab an `if/else` statement from the Logic block. Drag the previous code into this new `if/else` statement and place that all back into the `forever` block.
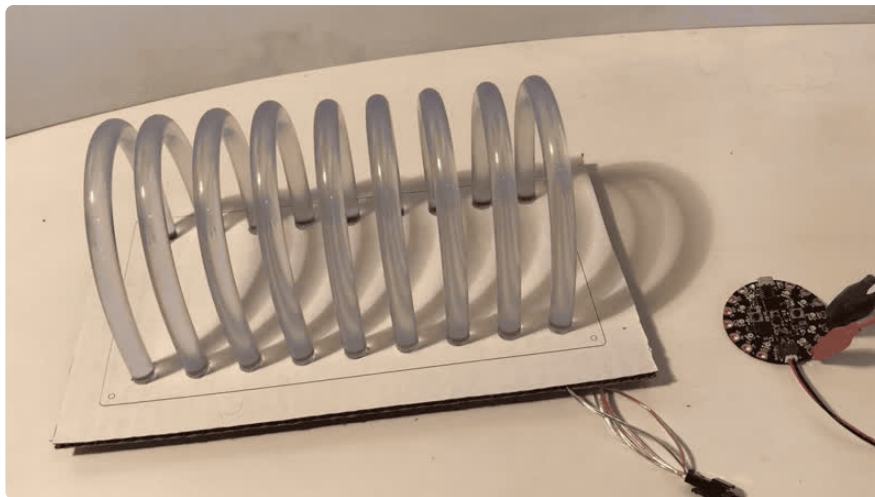
Insert `light level` into the `if true` statement. The light level is measured from 0-255 and can be adjusted to suit whatever light conditions you're in, but `120` is a good starting place.

In the `else` section, drag in `strip clear` from the **NEOPIXEL** block.

Voila! Your rainbow now responds to light and dark: by covering the light sensor on Circuit Playground Express with my hand, the rainbow is turned on.

Laser Cut Option

If you have access to a laser cutter, some acrylic parts make a beautiful and much more robust platform than cardboard can.
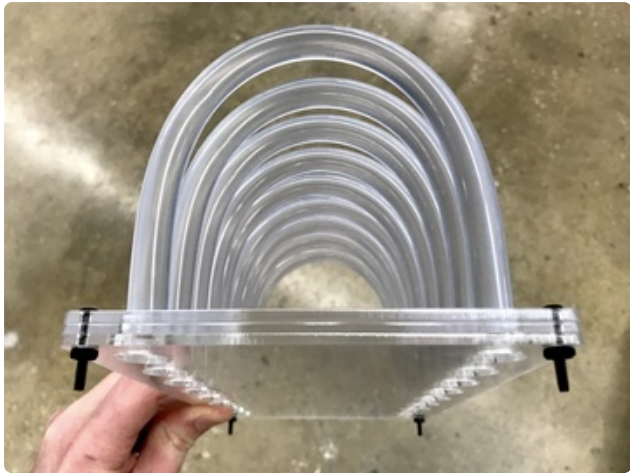
Pick acrylic at least as thick as the NeoPixel strip you have so that the pixels can be sandwiched between two pieces.

Download the design file below and import into your laser's software.

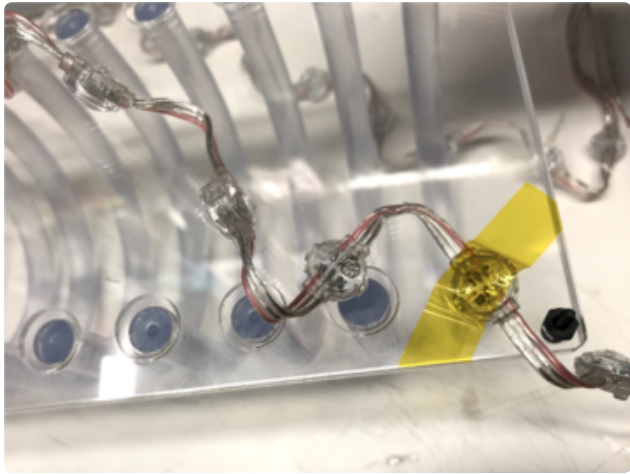NOTE: you may have to adjust the hole sizes depending on the brand of glue stick you have.

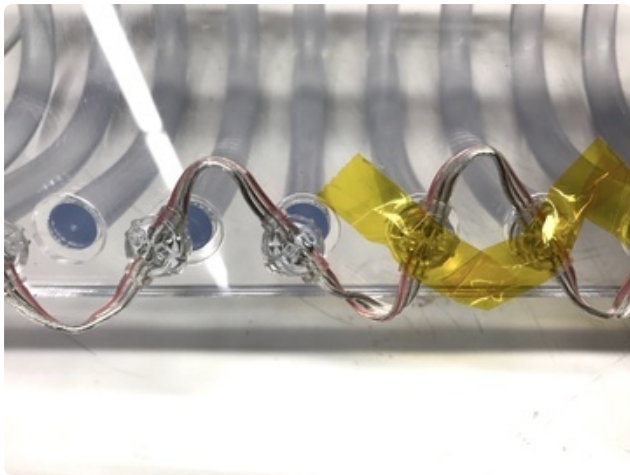LED_glue_stick_matrixAI.ai

https://adafru.it/DKE
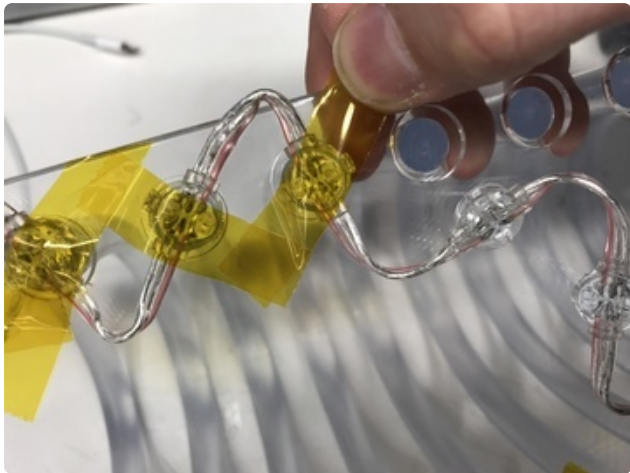
Cut out acrylic pieces on a laser cutter.
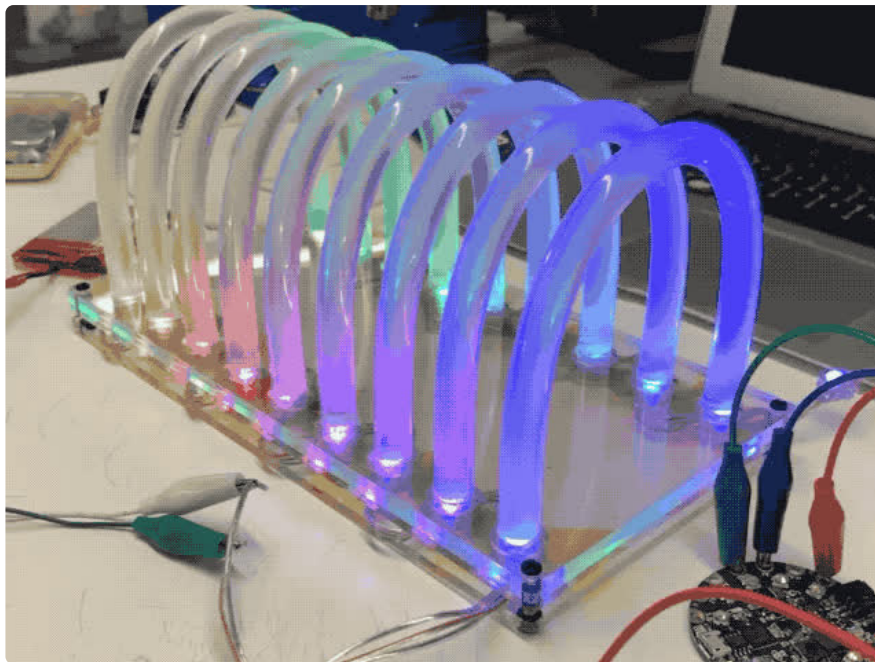
Insert glue sticks into holes.

Tape each NeoPixel dot down.

Sandwich the NeoPixels between the bottom two plates. This will ensure they stay firmly in place.

Alternative Designs

If a rainbow archway doesn't suit your purposes, there are many other avenues of design that can be explored.

Other matrix layouts are worth exploring. Weaving glue sticks together may also produce a strange effect.

Exploring Further

If you enjoy MakeCode and want to continue exploring you can check out lots more MakeCode projects on the Adafruit Learn System (https://adafru.it/Bwv).