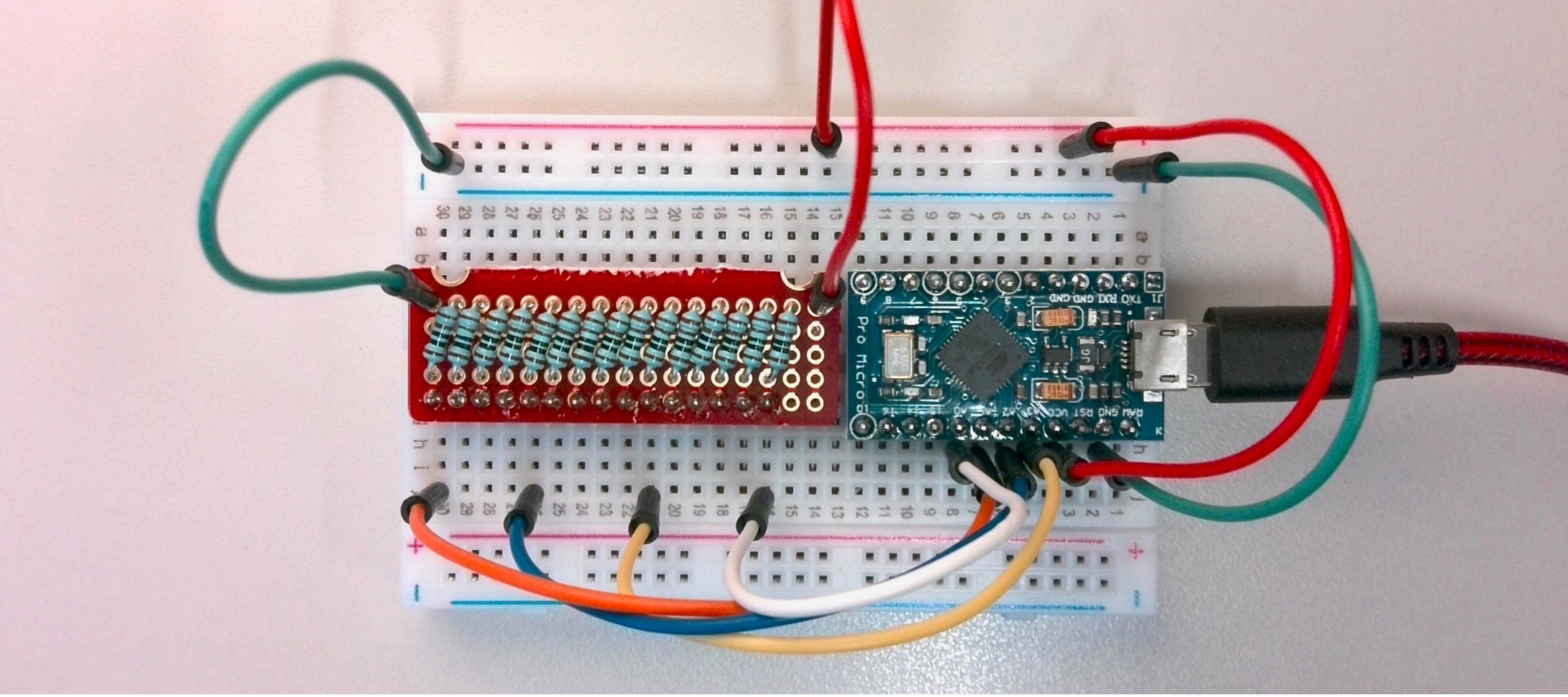
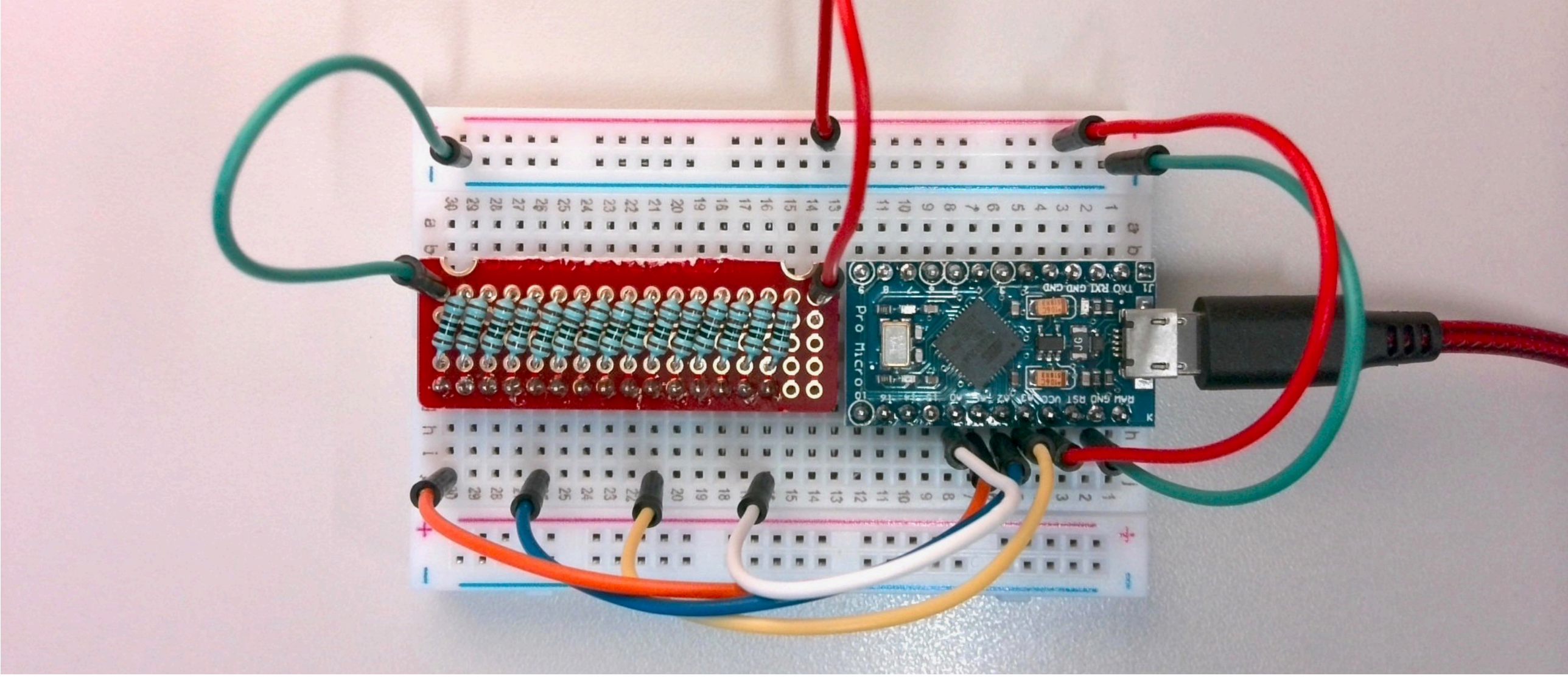


EXPLORATION

UWTMC

Matt Borland - 2019



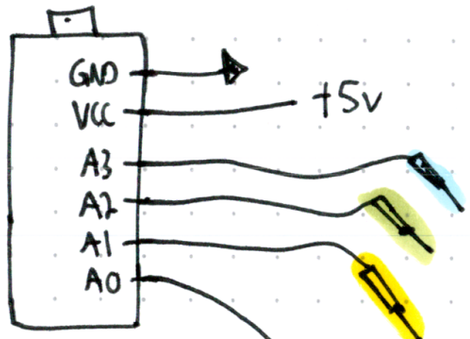
WE'RE MAKING AN INSTRUMENT THAT MAKES USERS EXPLORE A MUSICAL SPACE

We'll use a voltage divider and a "patching" paradigm to send sequences of MIDI data to our computer which we'll turn into sound with a software synthesizer!

EXPLORATION!

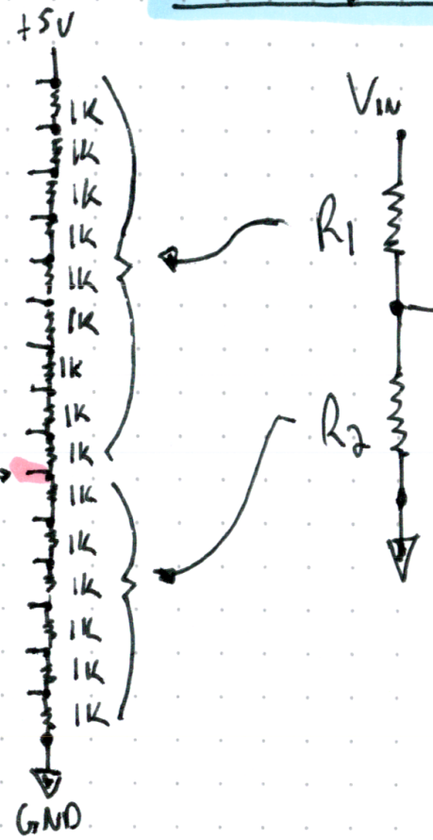
GO EXPLORE!

ARDUINO PRO MICRO



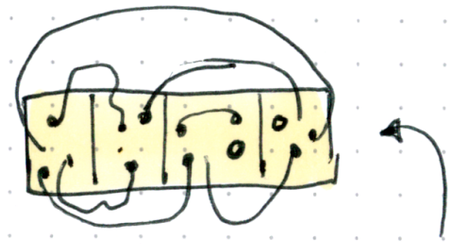
"PATCHING" TO DIFFERENT VOLTAGES ON THE VOLTAGE DIVIDER WILL ALLOW US TO INPUT DIFFERENT CONTROL SIGNALS TO THE ALGORITHM RUNNING ON OUR ARDUINO!

VOLTAGE DIVIDER



$$V_{OUT} = \frac{R_2}{R_1 + R_2} \cdot V_{IN}$$

VOLTAGE DIVIDERS LET US USE PRECISE VOLTAGES TO DO OTHER THINGS IN OUR CIRCUIT.



"MODULAR SYNTHS" USE A SIMILAR PATHING PARADIGM AND "CONTROL VOLTAGE" OR "CV"

THERE ARE 16^4 UNIQUE COMBINATIONS TO EXPLORE

65,536

UWTMC EXPLORATION 2019

DOWNLOADS

You need two pieces of software. Both are free and multi-platform!

Download the Arduino IDE

ARDUINO 1.8.10

The open-source Arduino Software (IDE) makes it easy to write code and upload it to the board. It runs on Windows, Mac OS X, and Linux. The environment is written in Java and based on Processing and other open-source software.
This software can be used with any Arduino board.
Refer to the Getting Started page for Installation instructions.

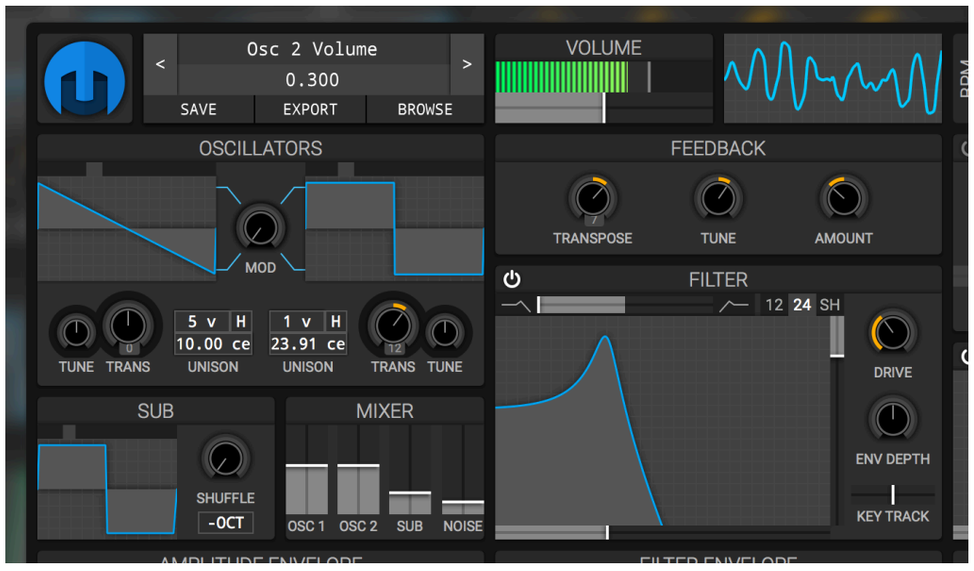
Windows Installer, for Windows XP and up
Windows ZIP file for non admin install

Windows app Requires Win 8.1 or 10
Get

Mac OS X 10.8 Mountain Lion or newer

Linux 32 bits
Linux 64 bits
Linux ARM 32 bits
Linux ARM 64 bits

Release Notes
Source Code
Checksums (sha512)



Arduino IDE - a software platform used to program your microcontroller.

https://www.arduino.cc/en/Main/Software

Helm - a software synthesizer to make musical sounds with your computer.

https://tytel.org/helm/

FILES

Workshops this term are at CML! All sessions run 3:30-5:30pm at Critical Media Lab, located in Communitech, 151 Charles St. W., Kitchener.

Sept. 18th: Deformation - MIDI Balloons: DeformationFiles.zip

Oct. 2nd: Gravity - Shruti Box: GravityFiles.zip

Oct. 23rd: Continuity - Seaboard and Bop Pad: ContinuityFiles.zip

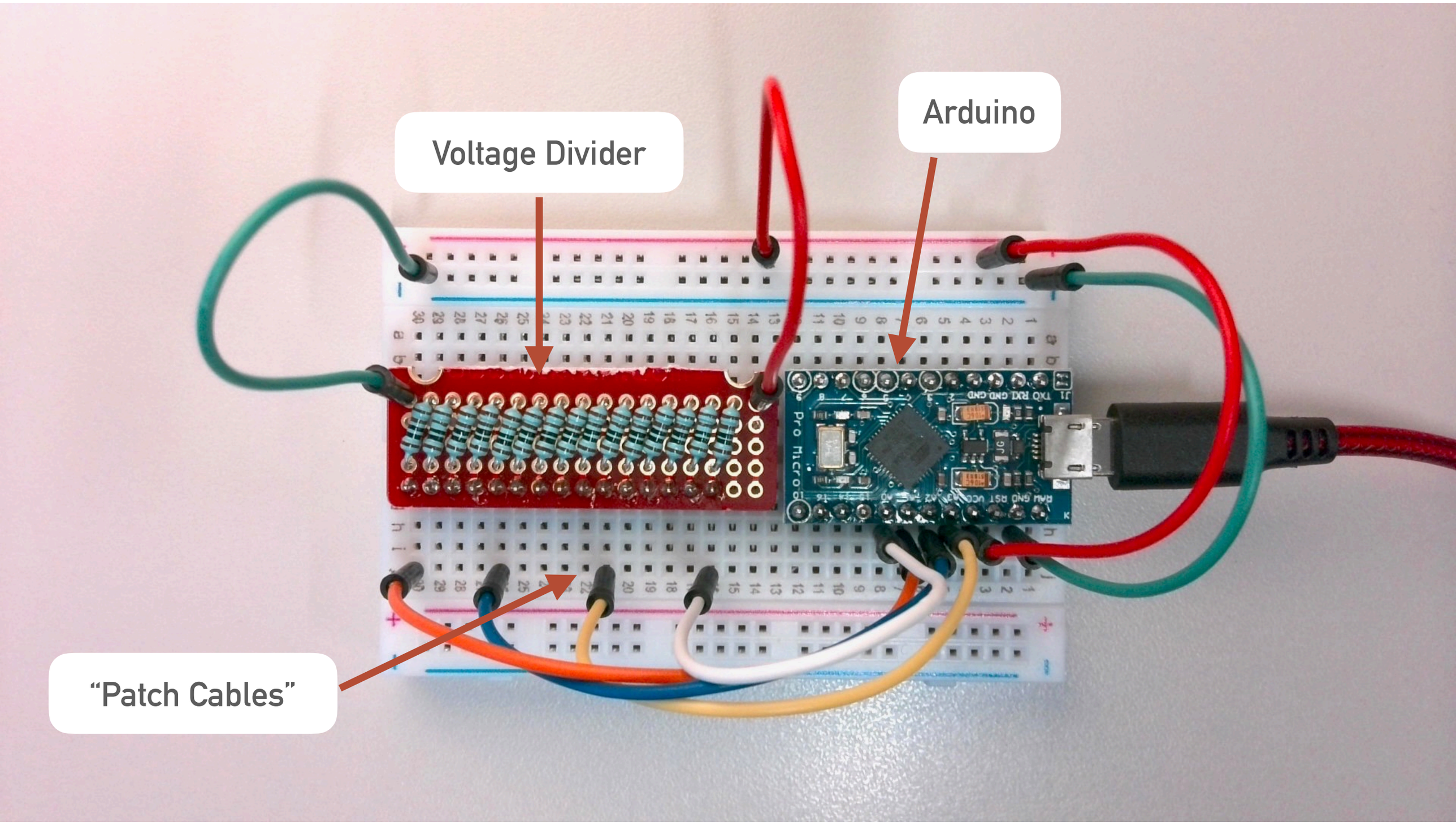
Nov. 6th: Complexity - Modular Synthesis: ComplexityFiles.zip

Nov. 20th: Exploration - Co-play Patch Table: ExplorationFiles.zip

Each session will start with an explanation of a musical interface and a discussion of its expressivity, followed by a hands-on build with the sensing technology being explored, then the opportunity to develop improvisational skills through jamming with other participants on the instruments you've just built. Make sure to bring your laptop to be able to program and power your instrument!

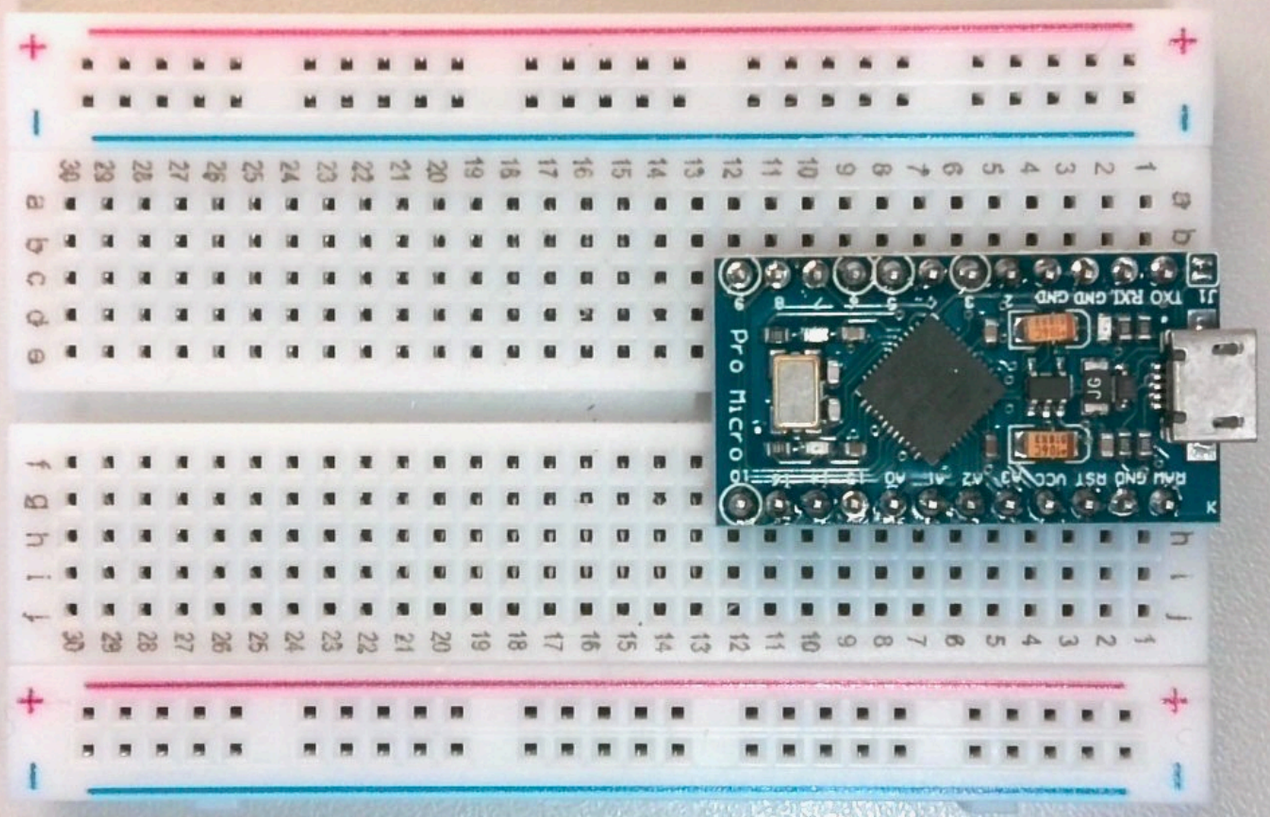
Files are available as a ZIP at https://uwtmc.com

HOOKING UP YOUR CIRCUIT – COMPONENT NAMES

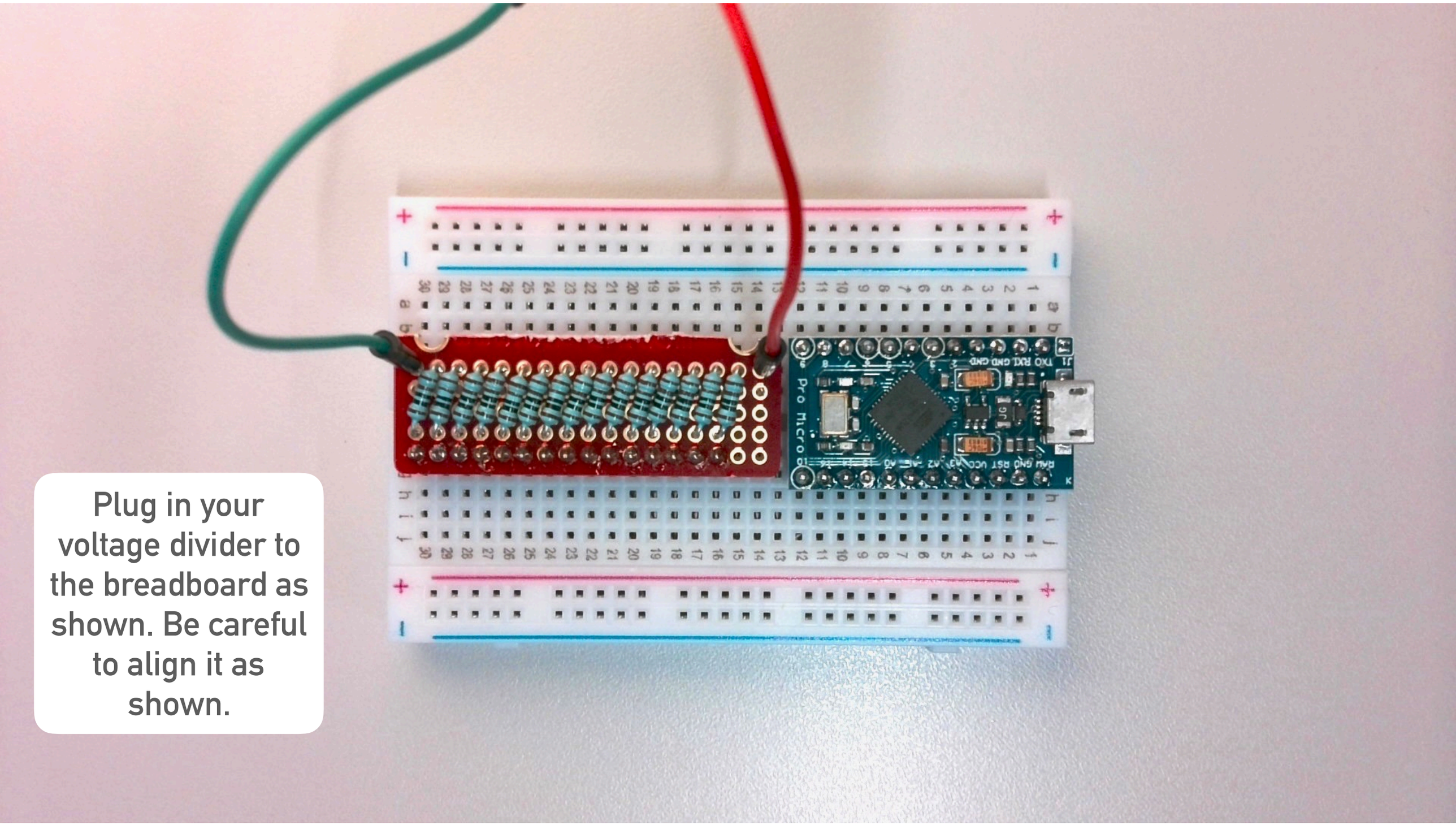


HOOKING UP YOUR CIRCUIT!

Start with just your arduino plugged into the breadboard.

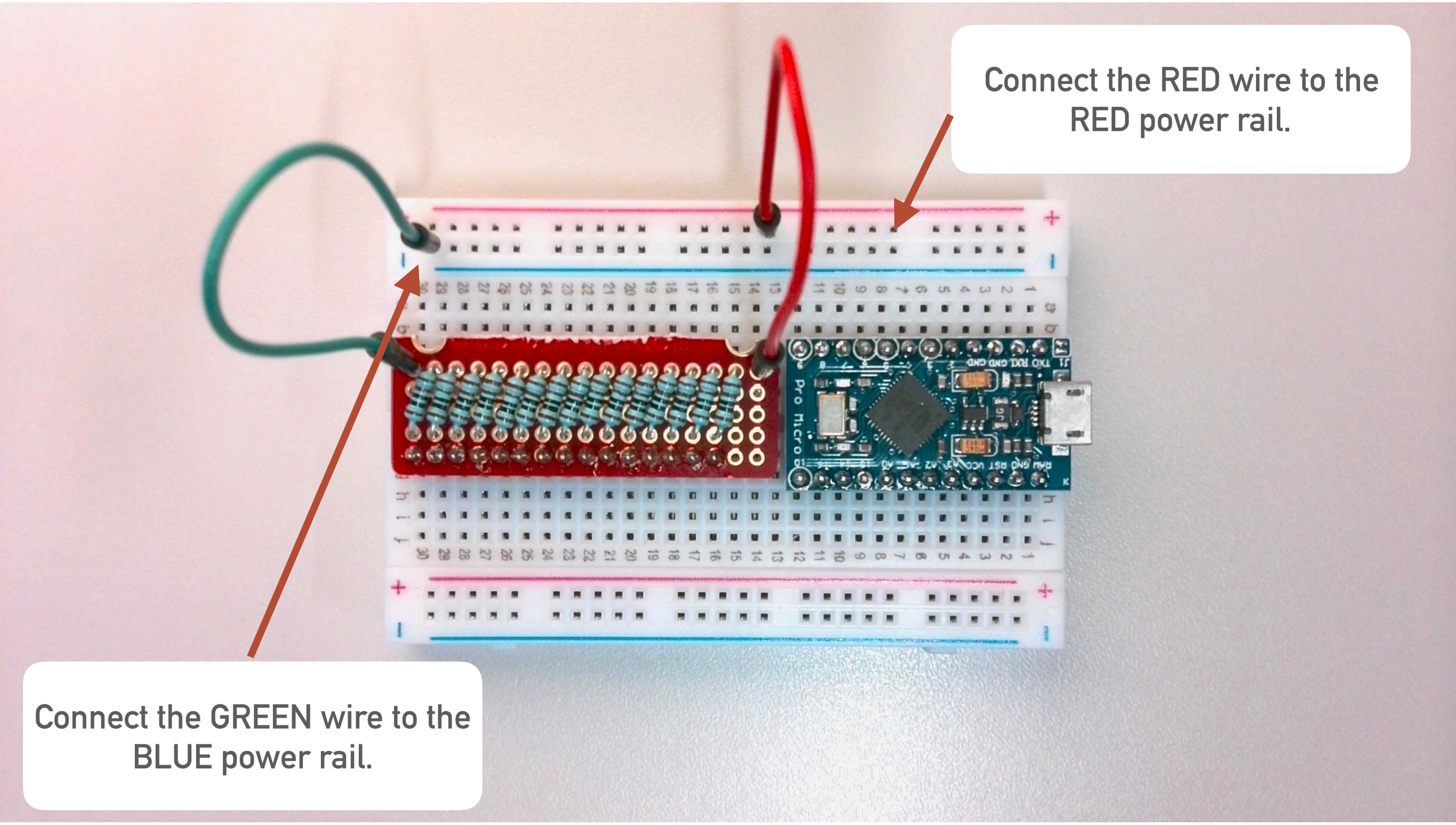


HOOKING UP YOUR CIRCUIT!

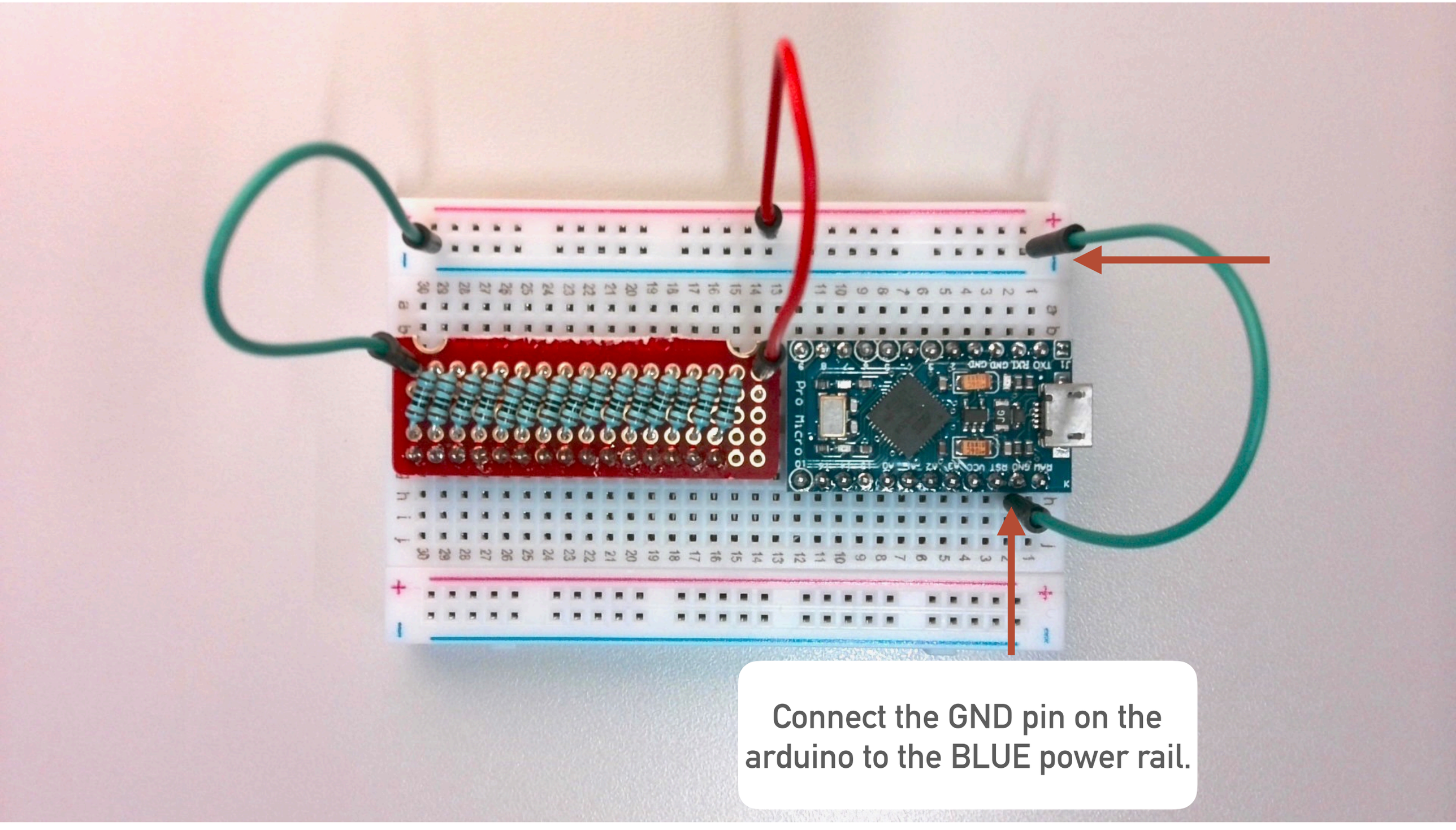


Plug in your voltage divider to the breadboard as shown. Be careful to align it as shown.

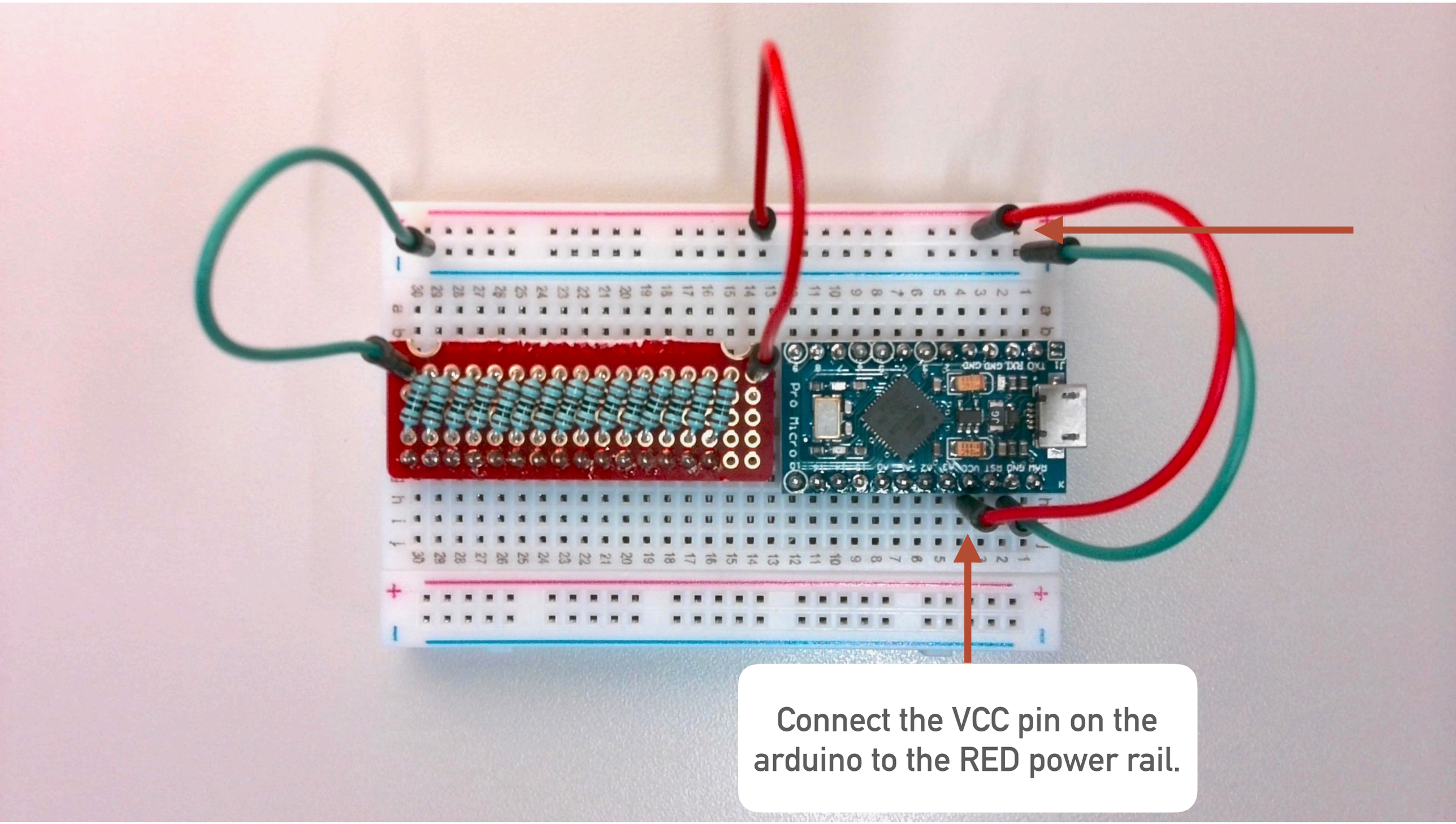
HOOKING UP YOUR CIRCUIT!



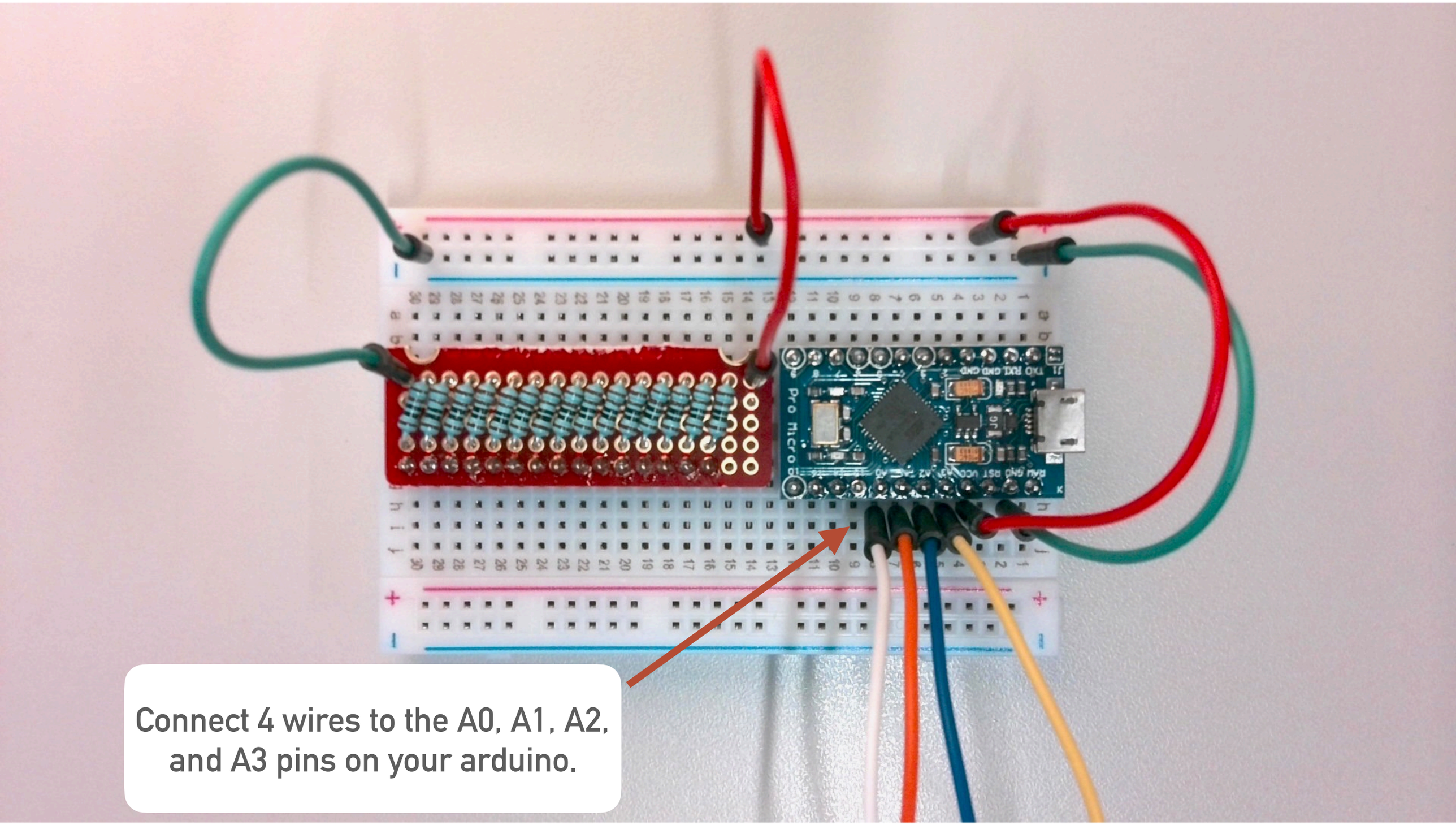
HOOKING UP YOUR CIRCUIT!



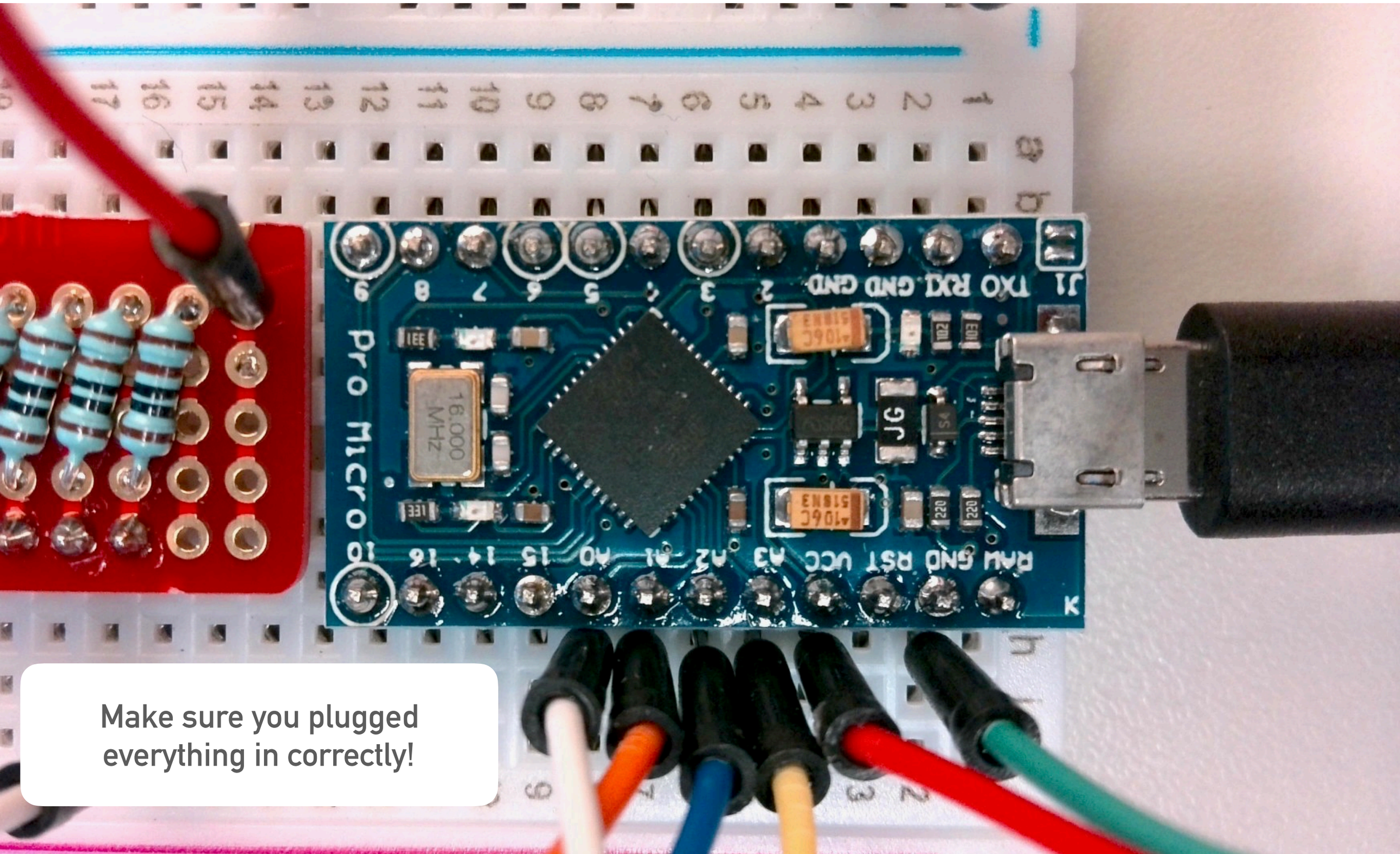
HOOKING UP YOUR CIRCUIT!



HOOKING UP YOUR CIRCUIT!

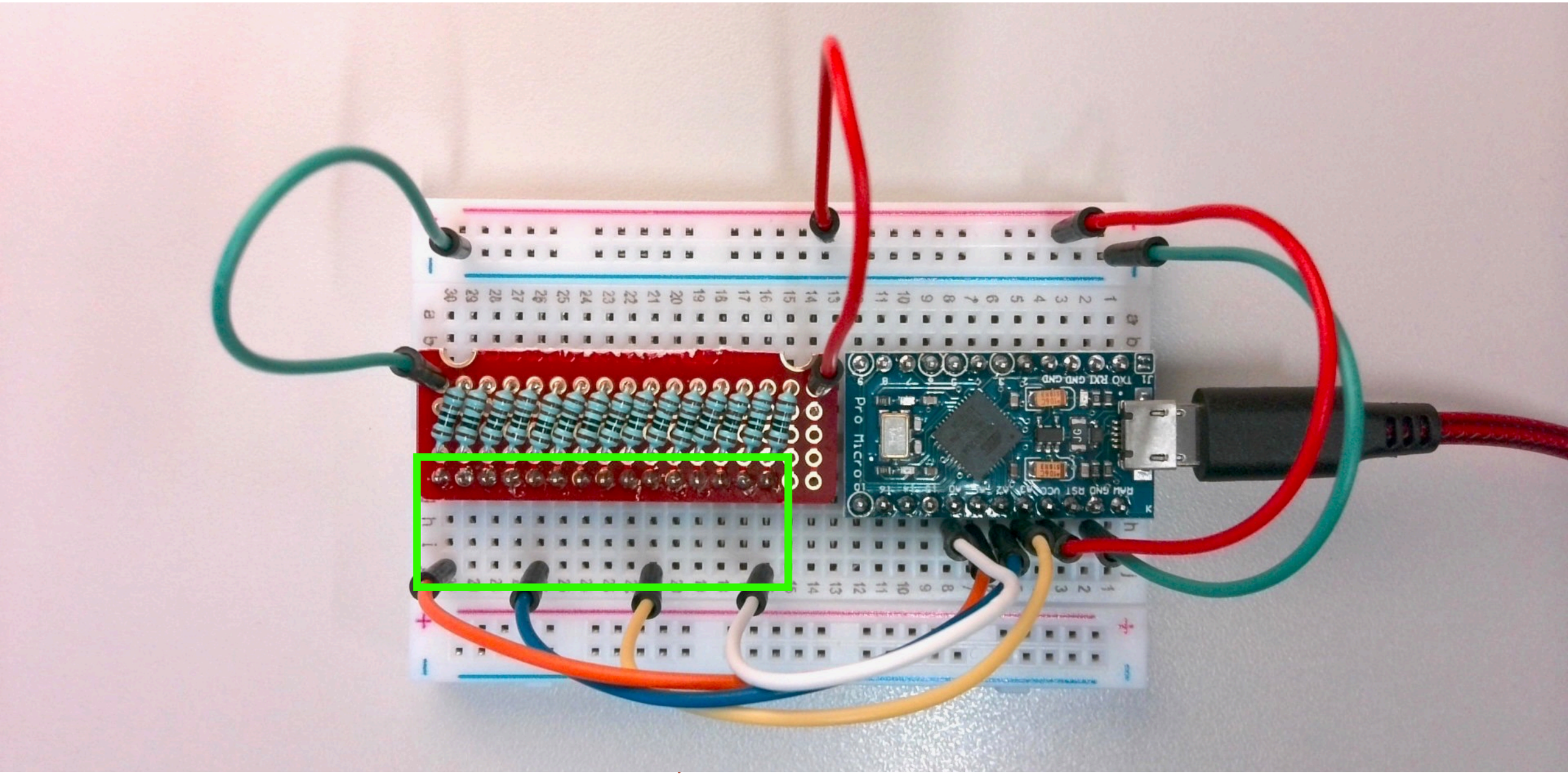


HOOKING UP YOUR CIRCUIT!



Make sure you plugged everything in correctly!

HOOKING UP YOUR CIRCUIT!

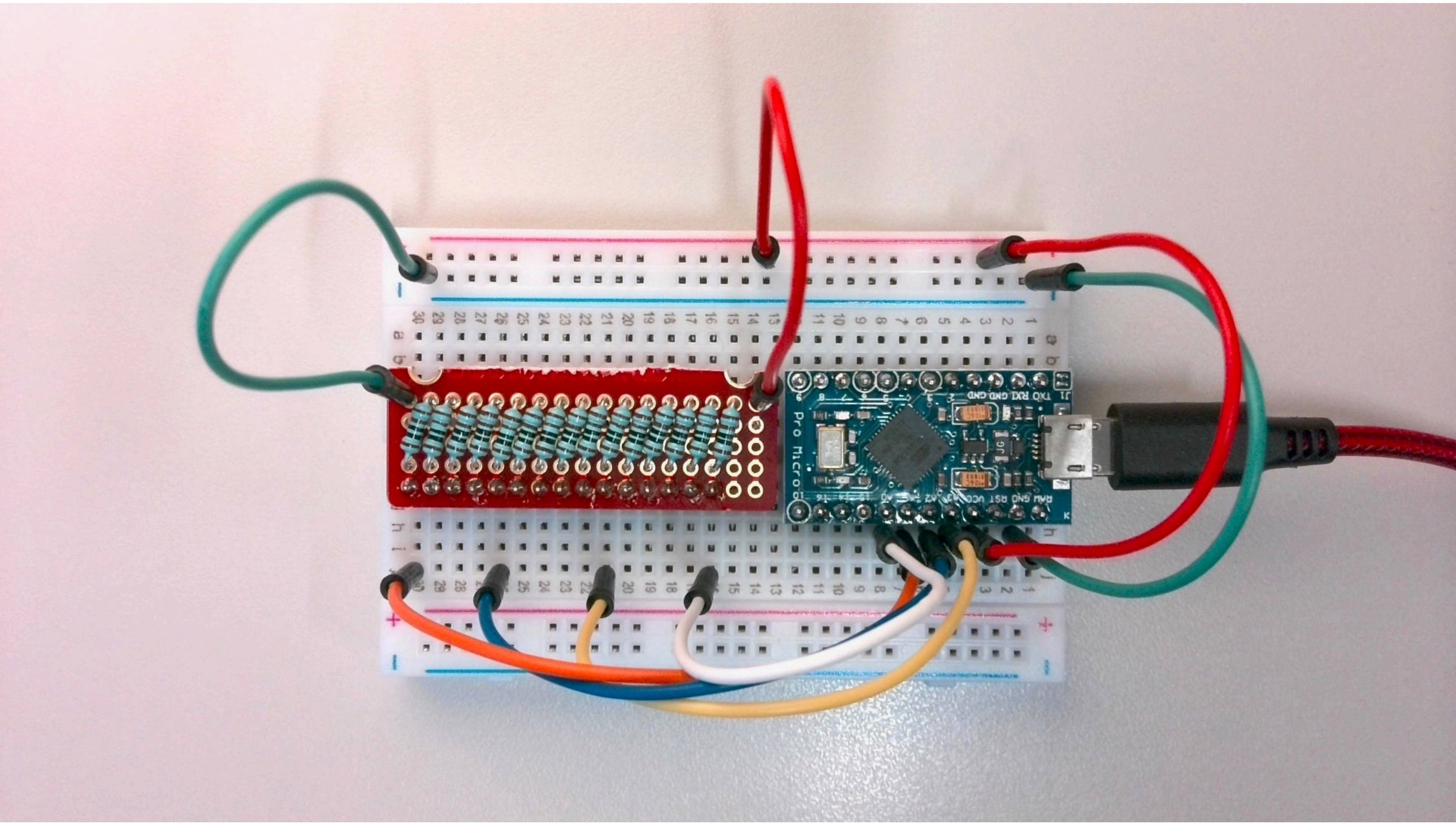


Connect the other ends of those 4 wires to any of the 15 pins of the voltage divider. It doesn't matter which ones you use. Changing which pins these 4 wires are connected to on the voltage divider will change the way the instrument sends MIDI messages to your computer.

SAFETY CHECK!

BEFORE PLUGGING THE USB CABLE INTO YOUR COMPUTER GET MATT TO CHECK YOUR BOARD SO YOU KNOW IT'S SAFE AND NOTHING WILL BREAK!

PLUG IN THE USB CABLE, THEN GO PROGRAM IT!



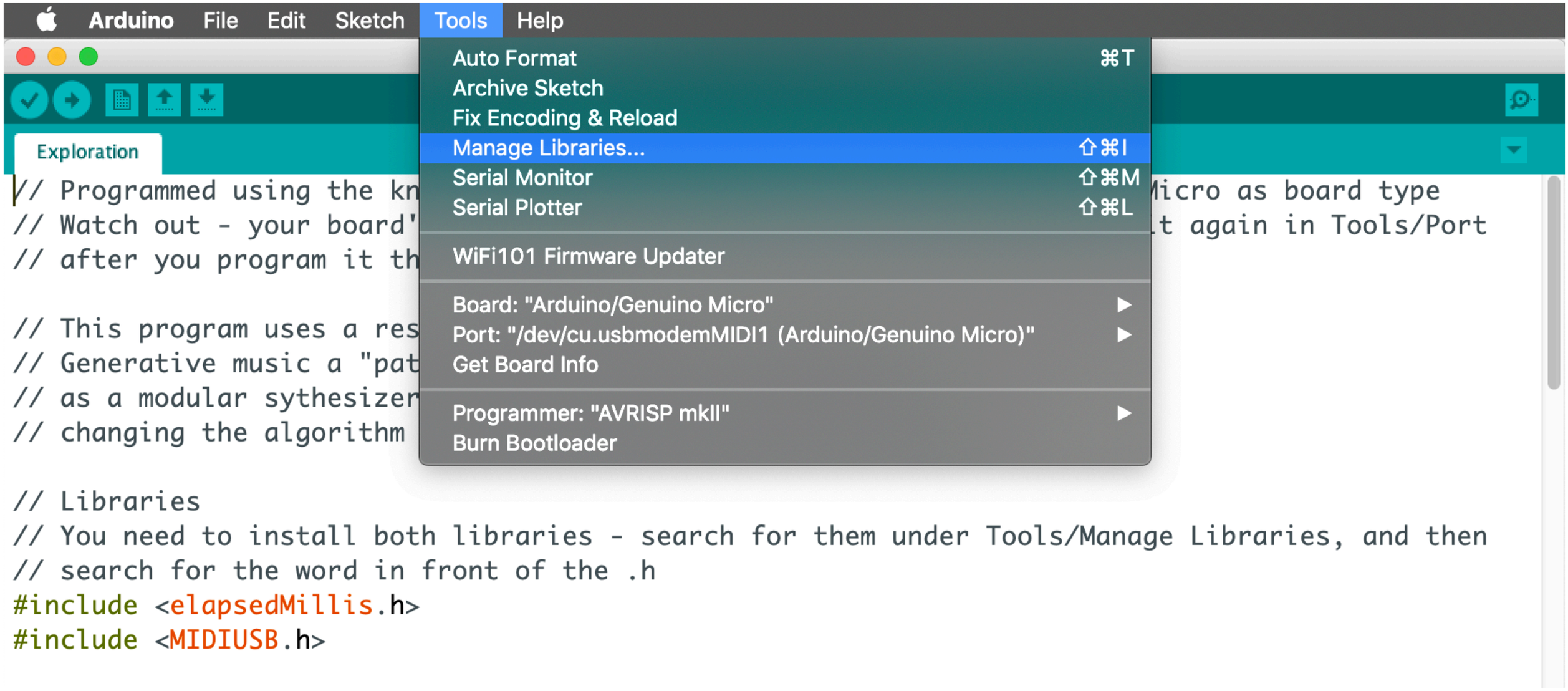
ON YOUR COMPUTER

Open "Exploration.ino"

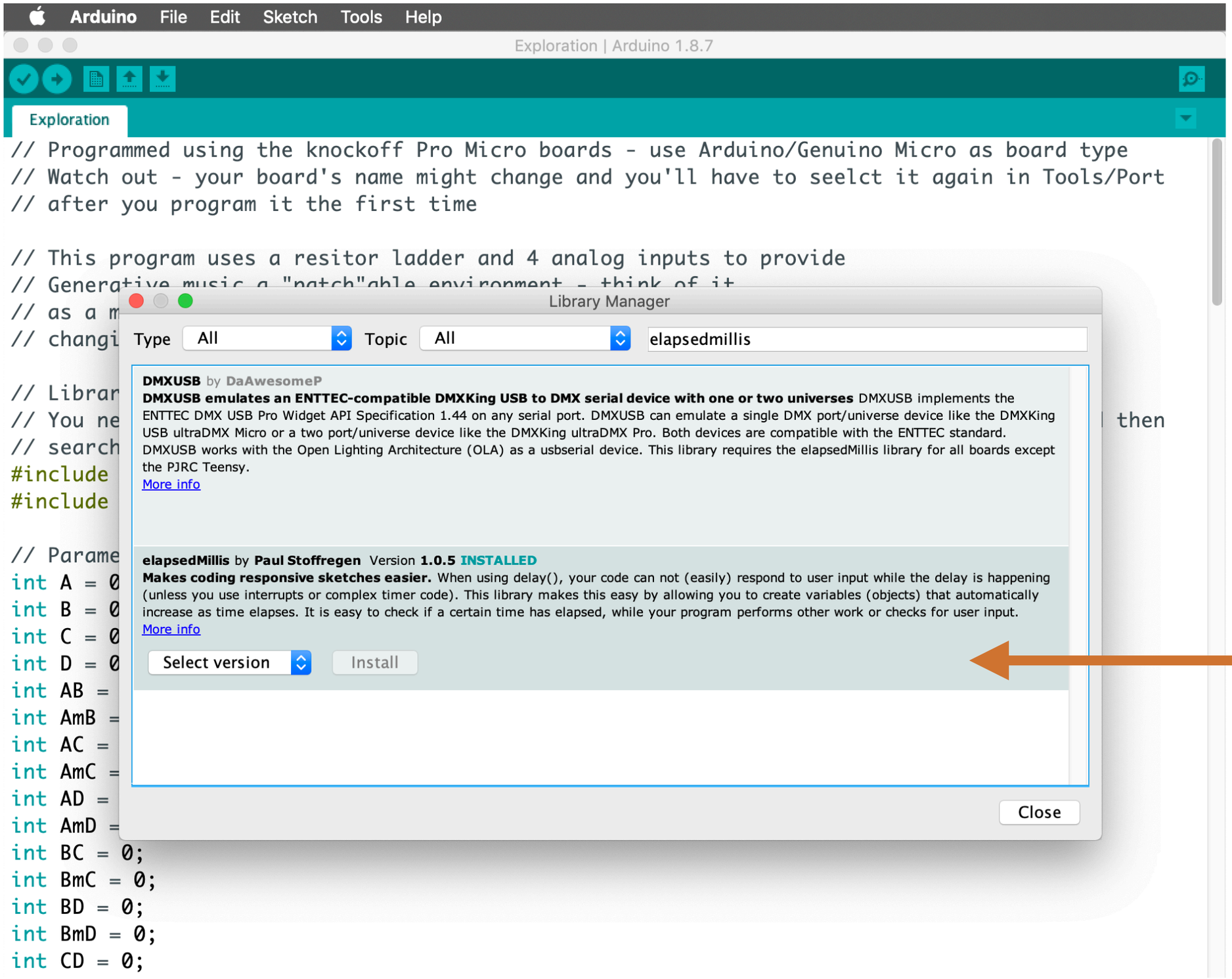
Arduino IDE - a software platform used to program your microcontroller.

https://www.arduino.cc/en/Main/Software

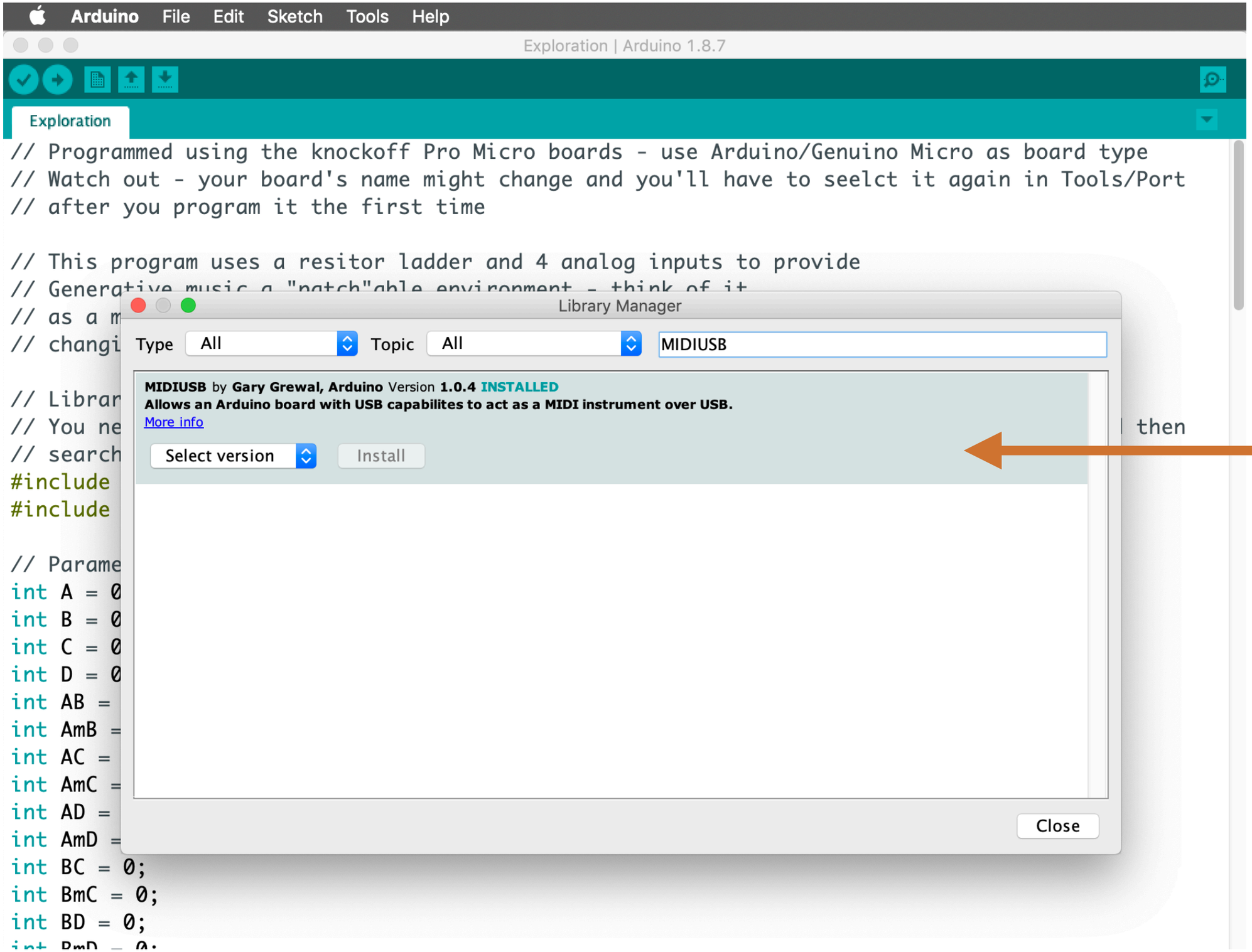
LIBRARIES – INSTALL THESE TO ADD FUNCTIONS TO YOUR PROGRAM



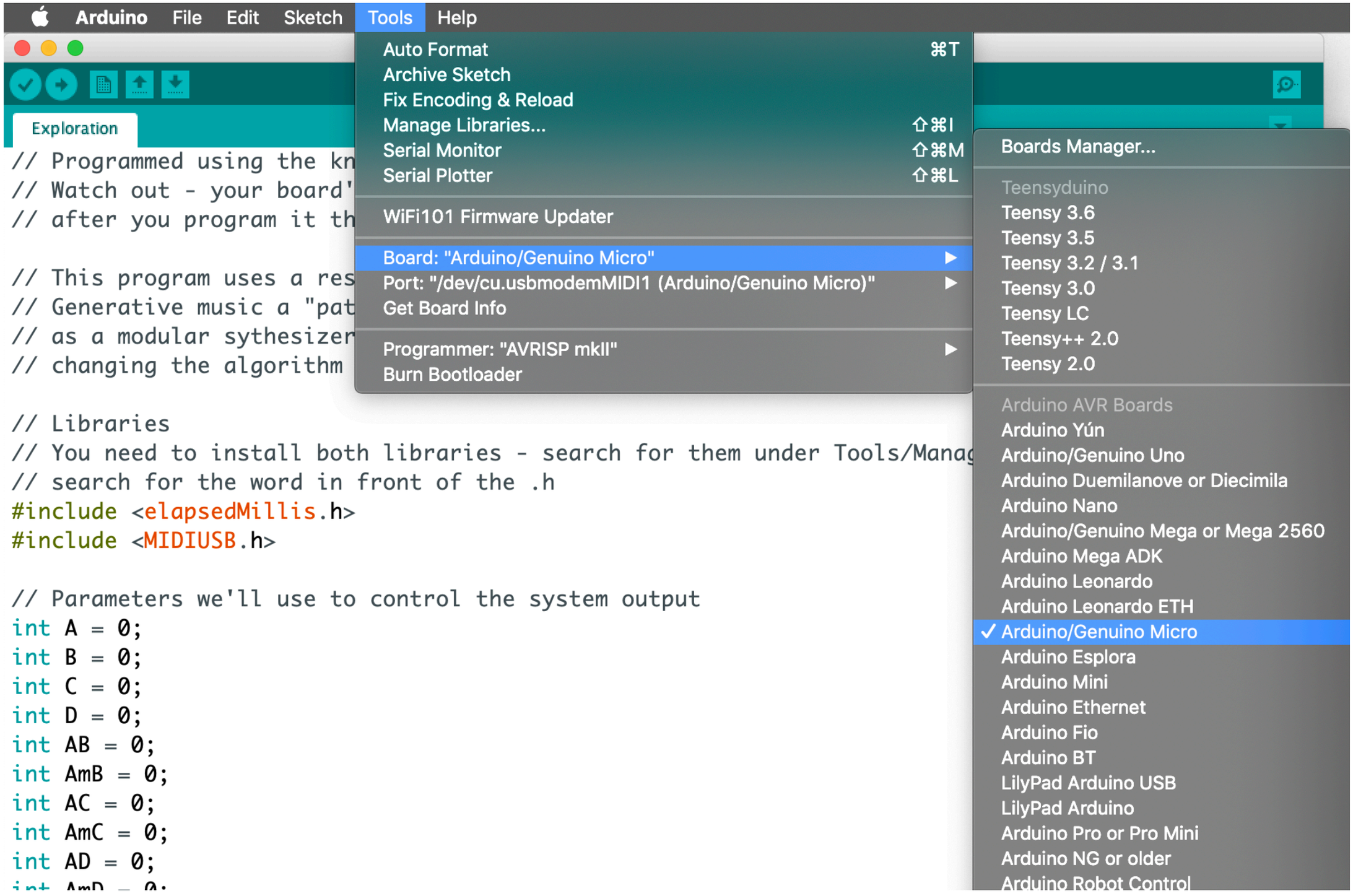
LIBRARIES – ELAPSEDMILLIS



LIBRARIES – MIDIUSB



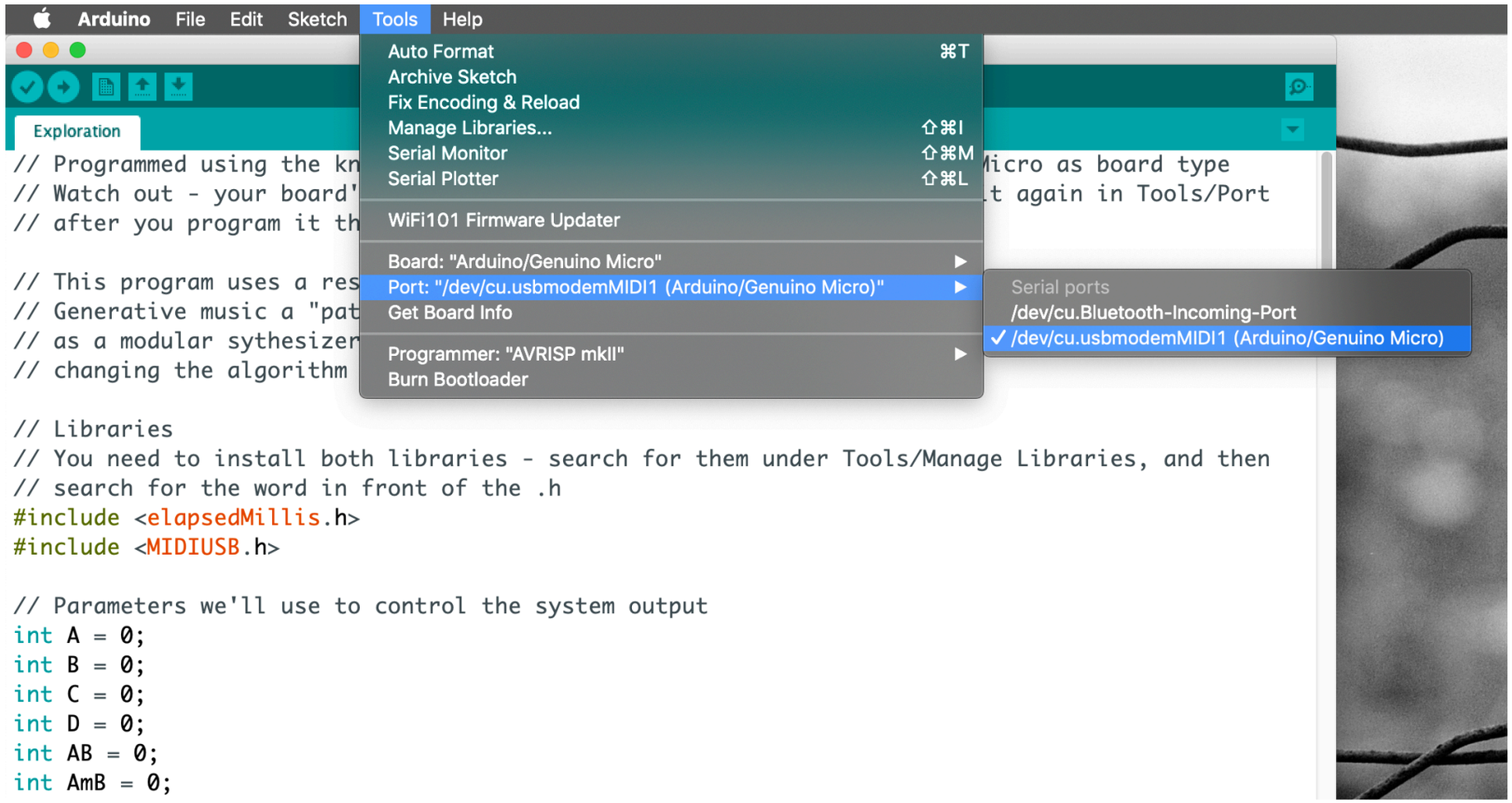
PROGRAM YOUR DEVICE – BOARD TYPE



PROGRAM YOUR DEVICE – PORT

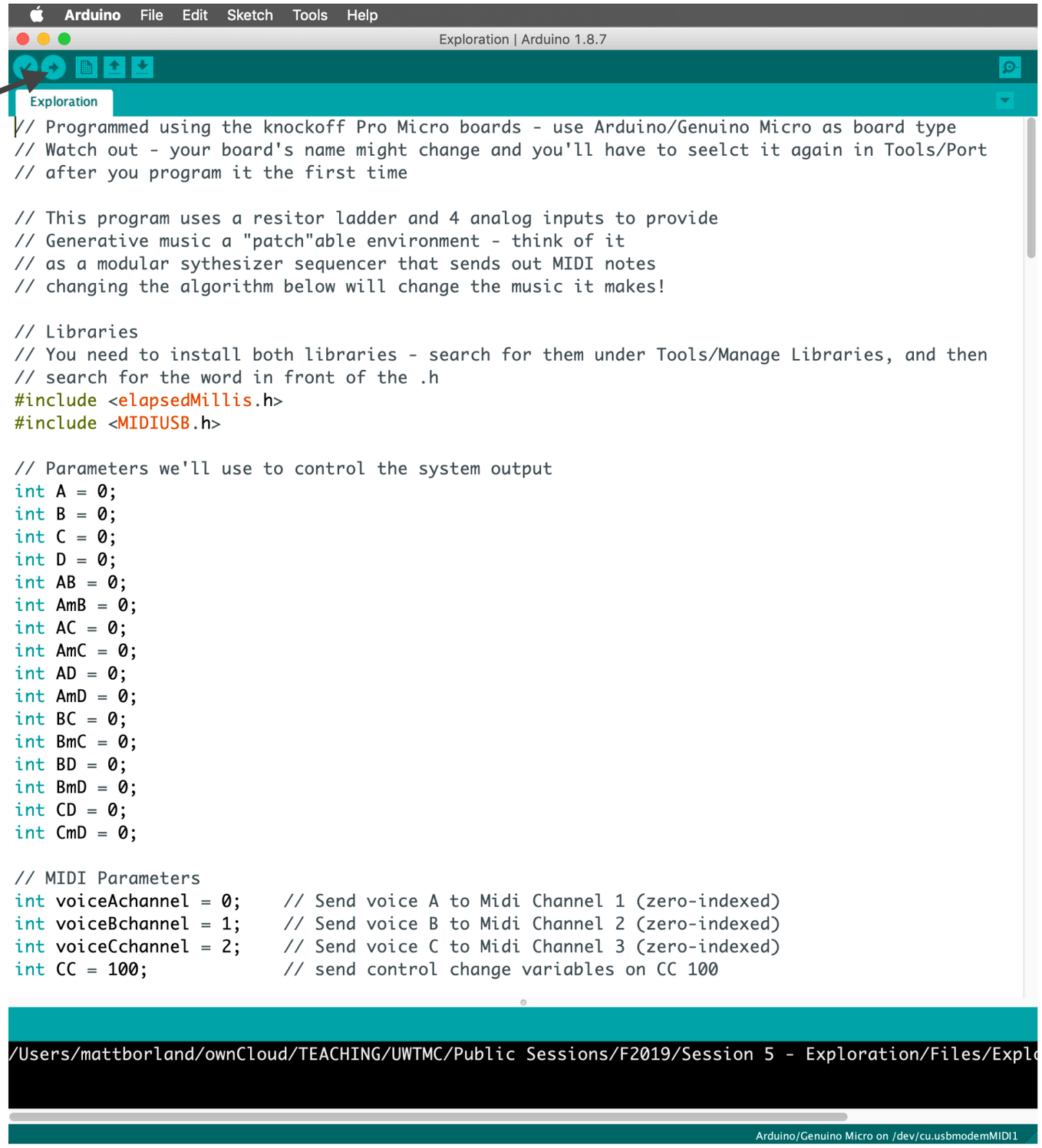
Sometime this name changes after programming, so you may need to reselect this from time to time.

If you get an error that says “board not found” you should check it’s plugged in and that your port is selected correctly.



PROGRAM YOUR DEVICE – EXPLORATION.INO

With your arduino plugged in, press the ARROW button to compile the code and send it to the arduino.

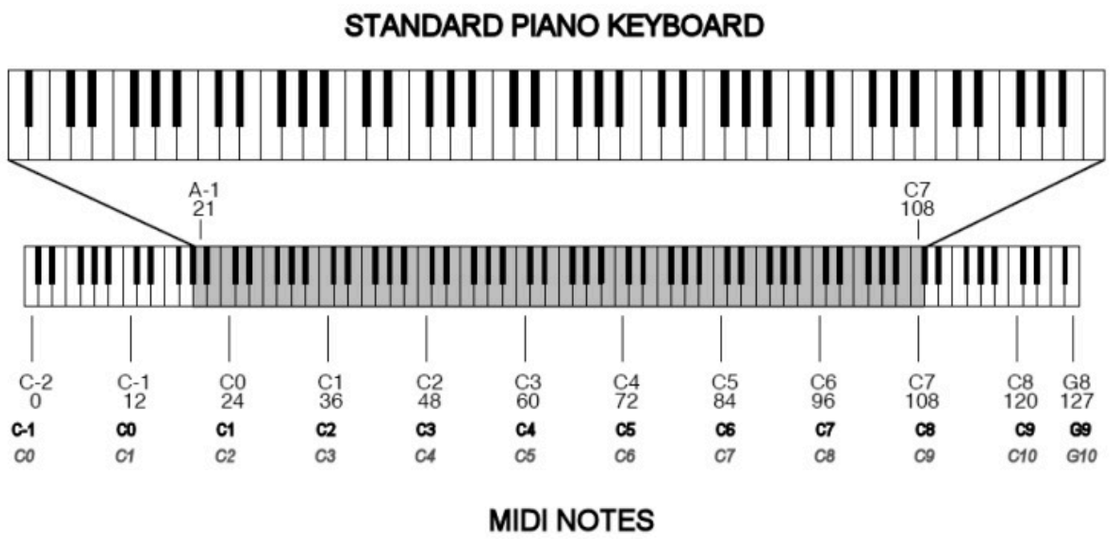


CHANGE YOUR NOTES!

There is a set of 16 notes that the instrument will pick from. You can change these notes to change the key or harmonies that are created. You don't have to have 16 unique notes, they can all be the same, or can be repeated.

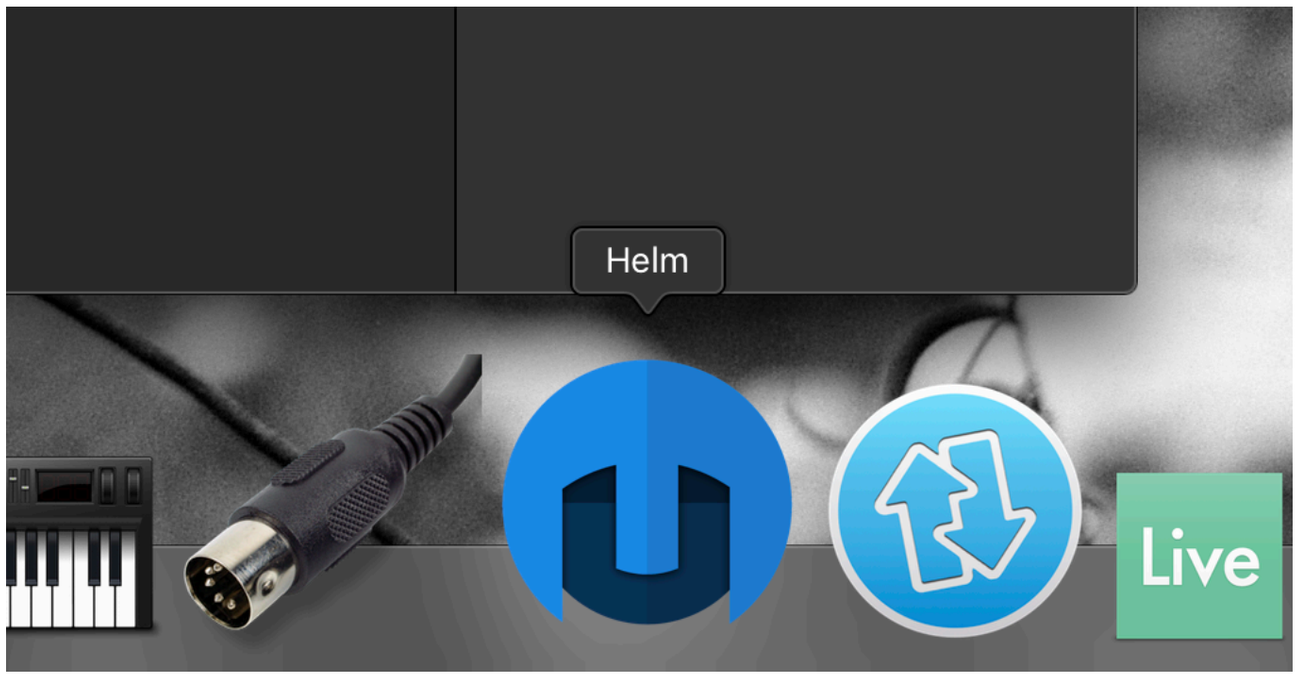
YOU DO HAVE TO HAVE 16 NOTES or the code might break and cause an error that crashes your instrument.

```
|
// You can change which pitch plays by changing these MIDI Note Numbers
// You need to have 16 numbers here. They don't all have to be different, but there
// have to be 16 total.
byte pitch[] = {43, 47, 48, 52, 55, 59, 60, 64, 67, 71, 72, 76, 79, 83, 84, 88};
```



https://en.wikipedia.org/wiki/MIDI

OPEN HELM – SOFTWARE SYNTHESIZER



Helm - a software synthesizer
to make musical sounds with
your computer.

https://tytel.org/helm/

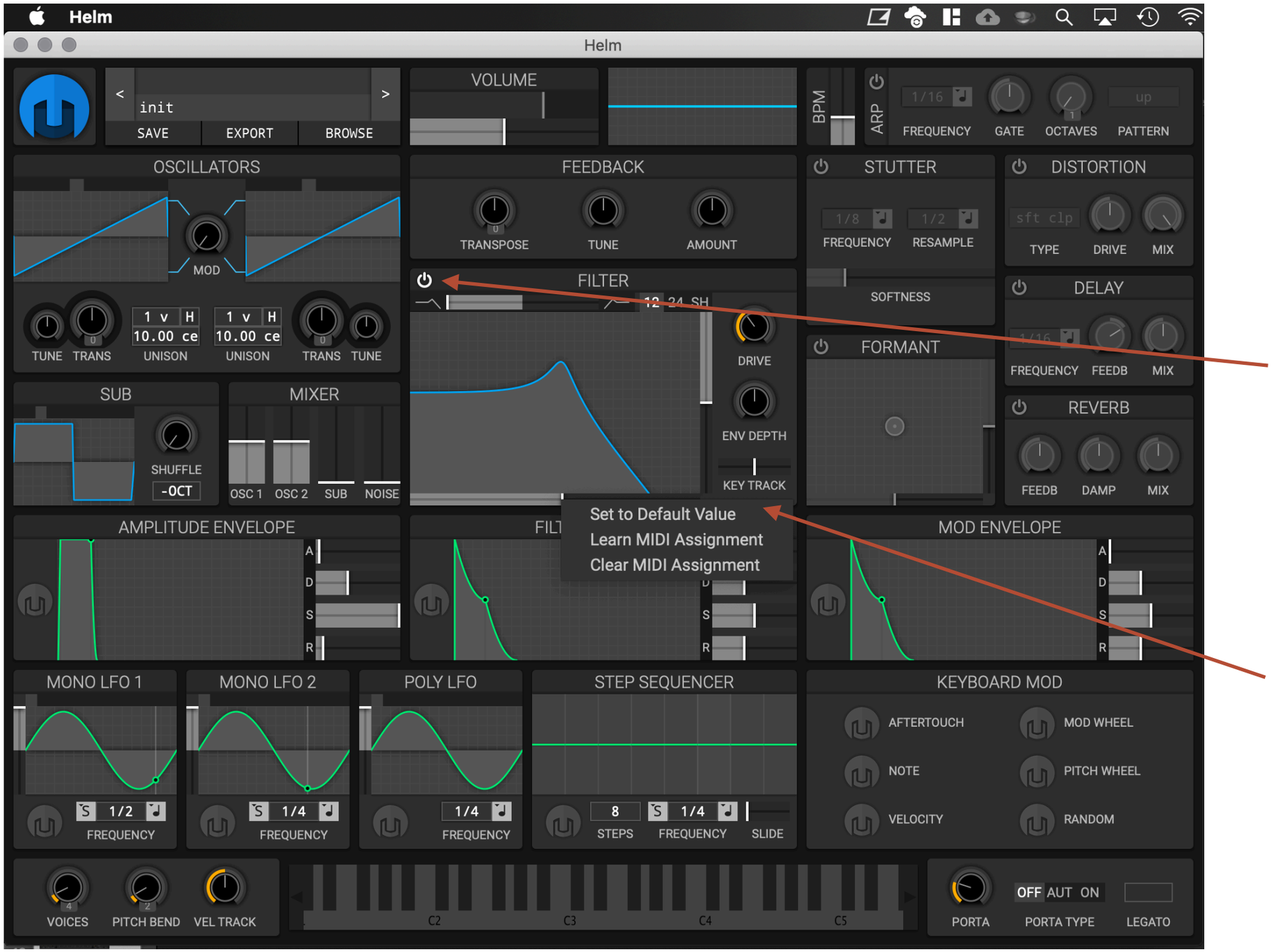
SETUP HELM

Click here to open the menu to select a sound

Make sure your laptop's speakers are on and turned up!

Try different sounds, then click done.

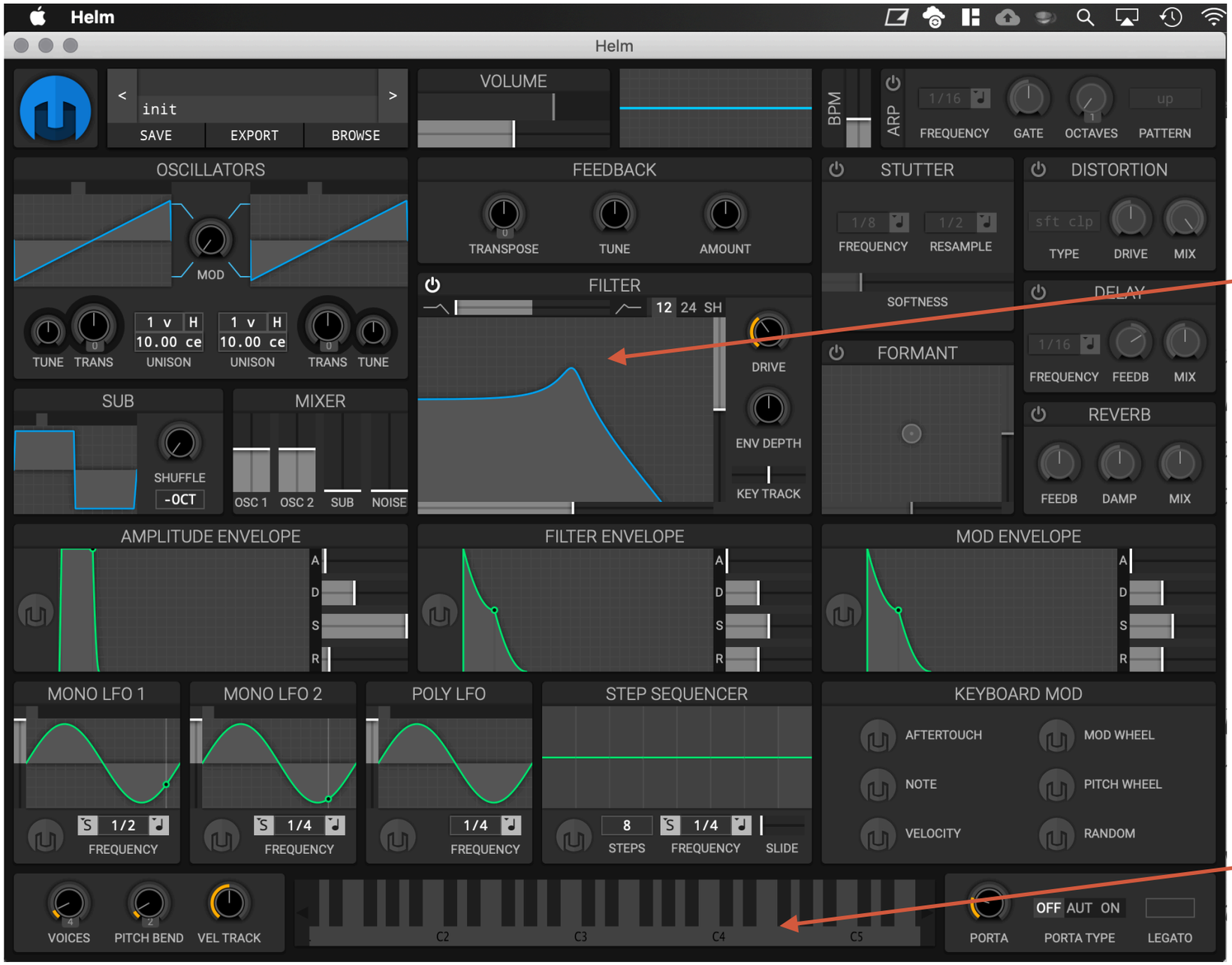
SETUP HELM



Make sure the filter is on - it shouldn't be greyed out. If it is greyed out, click the ON button here.

Right Click the bar below the filter, then click "Learn MIDI Assignment"

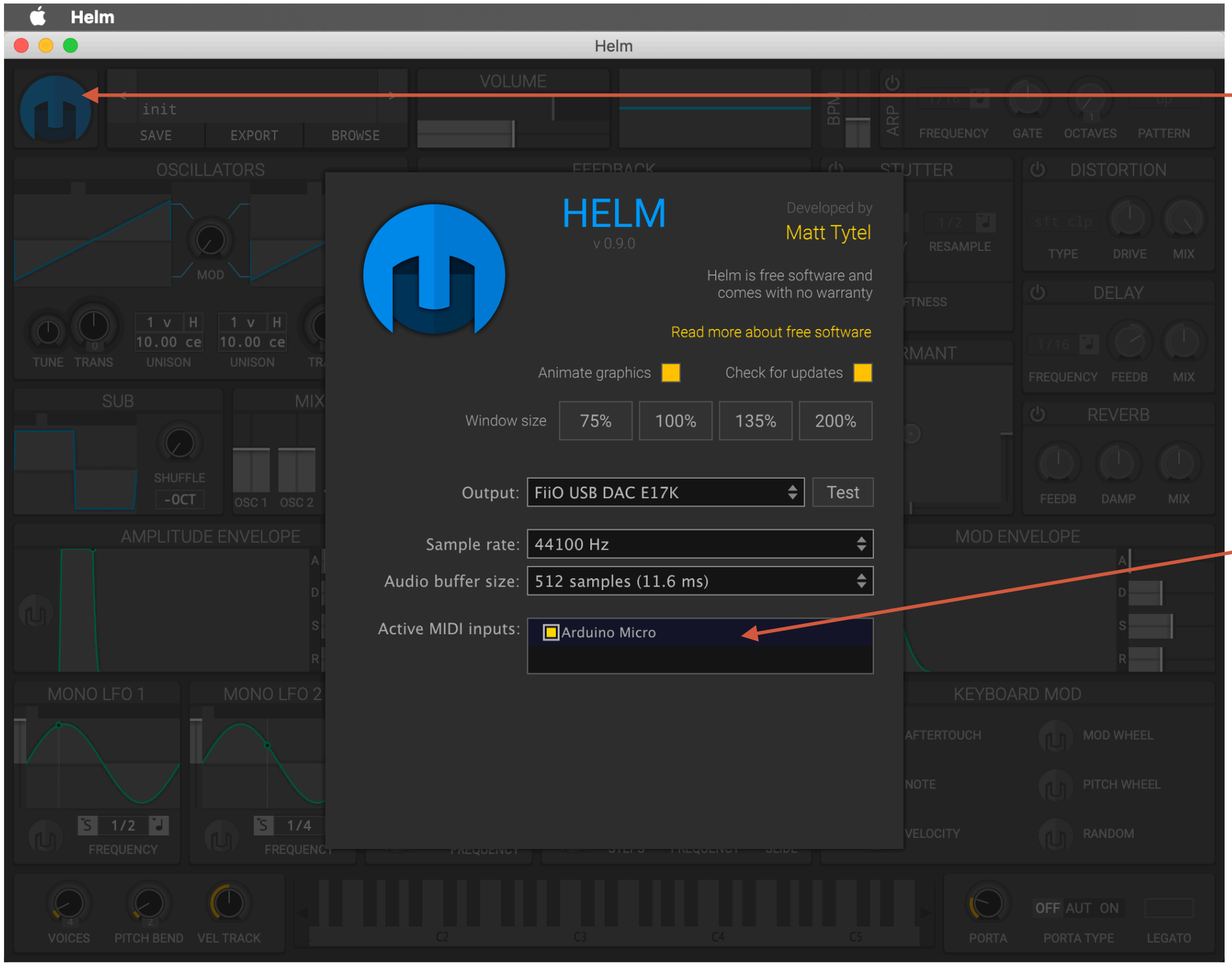
SETUP HELM



You should see the filter peak move back and forth if you have wires plugged in anywhere other than having all four in the left most pin of the voltage divider!

You should see the keys of the piano lighting up from time to time.

NOT WORKING? CHECK THE MIDI PORT



Click the HELMet to get this dialog to open.

You should see "Arduino Micro" as a MIDI input, with a yellow box showing it is selected.