Brain Machine kit

Hack Your Brain With Sound & Light

Mitch Altman

Chief Scientist, **Cornfield Electronics**, San Francisco, CA
Inventor of **TV-B-Gone** universal remote controls
Co-founder of **3Ware** (successful Silicon Valley startup)
Pioneer of **VR** (in the mid-1980s)
Founding mentor at **HAX** (1st and biggest hardware accelerator)
Co-founder of **Noisebridge** (San Francisco hackerspace)
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flickr: **maltman23**
WeChat: **mitchaltman**
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Patreon: mitchaltman

THE BUNNY IS A LIE
EASTERHEGG 2026 | EH23

cornfield electronics

Brain Machine kit

Hack Your Brain With Sound & Light

open source hardware

CORNFIELD ELECTRONICS

What is a Brain Machine?

Photo by Sam Murphy

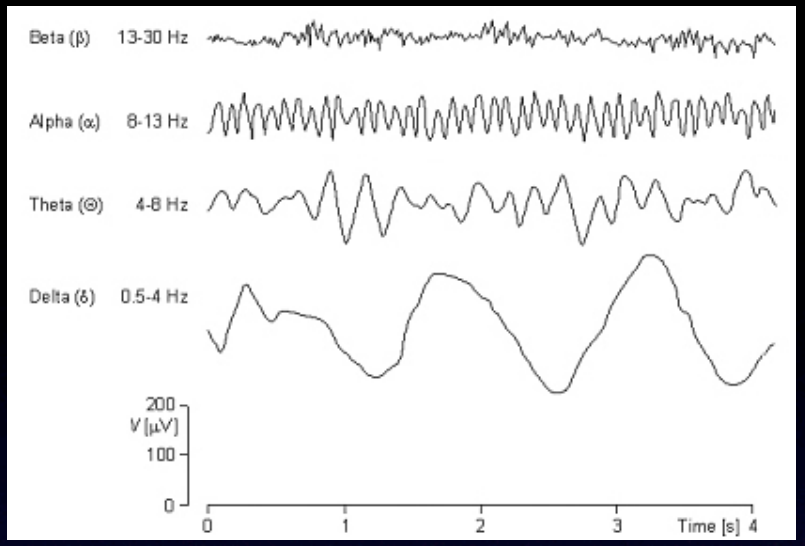
"Entrains" your brain to a desired brainwave sequence through light and sound.

“Entrain” – definition:

Photo by Sam Murphy

“Entrain”: When your brain synchronizes to external brainwave frequencies

Brainwave Types



Beta: 13 to 30Hz
Conscious, External Focus

Alpha: 8 to 13Hz
Spacey, Dreamy, Receptive, Passive

Theta: 4 to 8Hz
Subconscious, Deep Relaxation, Creativity

Delta: ½ to 4Hz
Unconscious, Intuition, Insight

Gamma: 30 to 100Hz
Not well understood, linked to Perception, Alertness, Anxiety

Brainwave Sequences

Essentially the same for all healthy adults

Such as

Awake → Sleep

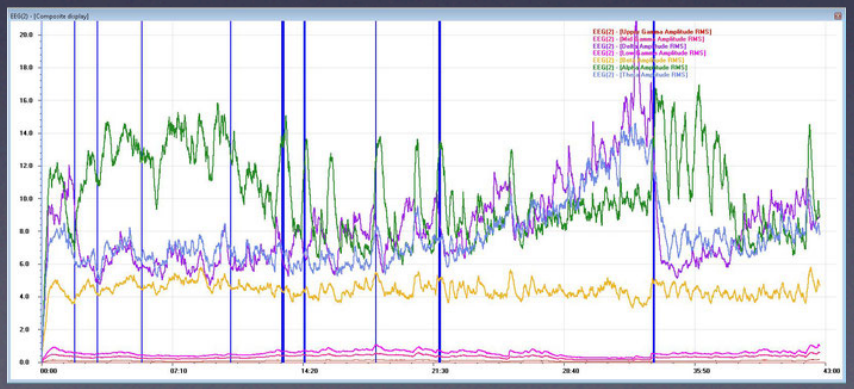
or

Awake → Meditation

Measurable with EEG
(brainwave monitor)

Brainwave Sequences

Essentially the same for all healthy adults



Example – Awake → Meditation:

- Beta (awake)
- add Alpha (spacey, dreamy)
- less Beta (less awake)
- add Theta (subconscious)
- Delta (unconscious, insight)
- hang out here awhile
- reverse process

(come up feeling fabulous)

Genesis of My Idea (1993)

Questions popped up while meditating:

- What would happen if you played back a brainwave sequence?
- Would your brain synch up?
- Would you be in the associated state?

Brief history

Pulsing Sound in Ancient times:
Alpha and Theta
induced by ritual drum rhythms

Pulsing Light in the 2nd Century:
Ptolemy

Brief history (cont'd)

1920s:

Invention of EEG

Hans Berger categorizes brainwave types

1930s:

W. Grey Walter first to knowingly play brainwaves

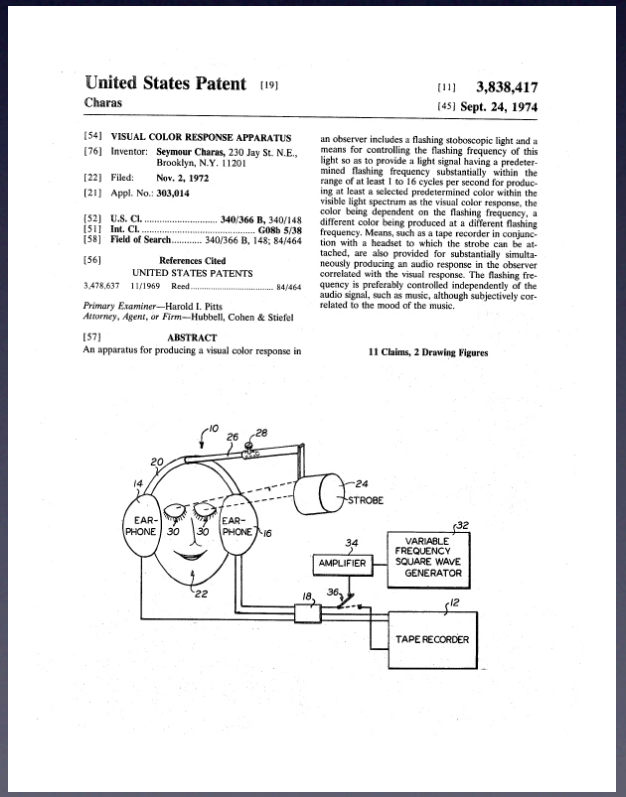
Brief history (cont'd)

1950s:

Invention of Dream Machine

1970s:

Research, first patent, recordings of brainwave sequences, Monroe Institute



United States Patent [19]
Charas

[11] 3,838,417
[45] Sept. 24, 1974

[54] VISUAL COLOR RESPONSE APPARATUS

[76] Inventor: Seymour Charas, 230 Jay St. N.E., Brooklyn, N.Y. 11201

[22] Filed: Nov. 2, 1972

[21] Appl. No.: 303,014

[52] U.S. Cl. ..... 340/366 B, 340/148
[51] Int. Cl. G08b 5/38
[58] Field of Search ..... 340/366 B, 148; 84/464

[56] References Cited
UNITED STATES PATENTS

3,478,637 11/1969 Reed 84/464

Primary Examiner—Harold I. Pitts
Attorney, Agent, or Firm—Hubbell, Cohen & Stiefel

[57] ABSTRACT

An apparatus for producing a visual color response in an observer includes a flashing stoboscopic light and a means for controlling the flashing frequency of this light so as to provide a light signal having a predetermined flashing frequency substantially within the range of at least 1 to 16 cycles per second for producing at least a selected predetermined color within the visible light spectrum as the visual color response, the color being dependent on the flashing frequency, a different color being produced at a different flashing frequency. Means, such as a tape recorder in conjunction with a headset to which the strobe can be attached, are also provided for substantially simultaneously producing an audio response in the observer correlated with the visual response. The flashing frequency is preferably controlled independently of the audio signal, such as music, although subjectively correlated to the mood of the music.

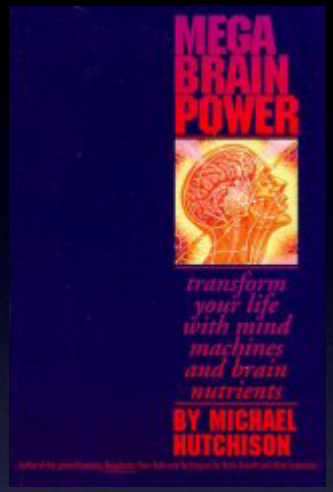
11 Claims, 2 Drawing Figures

Brief history (cont'd)

1950s:
Invention of Dream Machine

1970s:
Research, first patent, recordings of brainwave sequences, Monroe Institute, Disco

Brief history (cont'd)



1980s & 1990s:

- Medical studies
- "Megabrain Power" by Hutchison
- Popularity in mass culture
- Beneficial claims

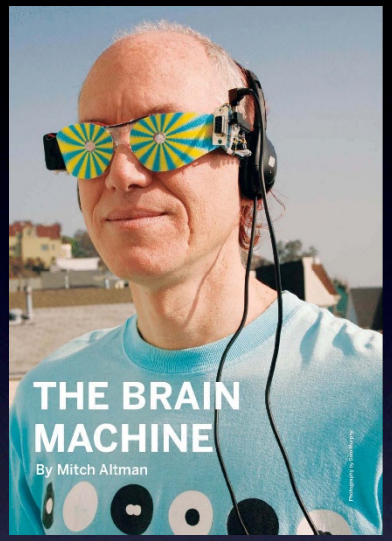
Are claims real?

- Maybe some?
- Certainly not all.
- But why not try and see for yourself?

Cautionary Note:

Light and Sound Machines, such as this one, can be fun for many of us,
but may be seriously dangerous for those prone to seizures or who are photosensitive.

Brief history (cont'd)



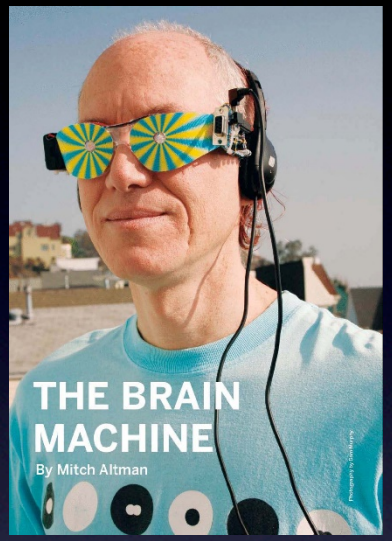
2007:

Make your own Brain Machine article in MAKE #10

Brief history (cont'd)

"Weekend Projects" video by Bre Pettis, 2007

Brief history (cont'd)



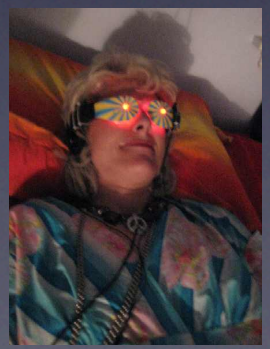
2007:

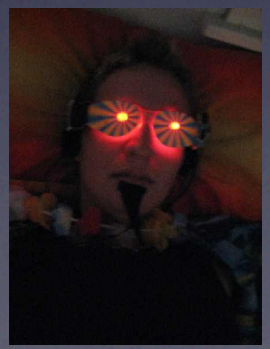
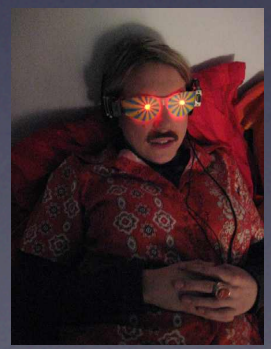
Make your own Brain Machine article in MAKE #10

Popular at parties





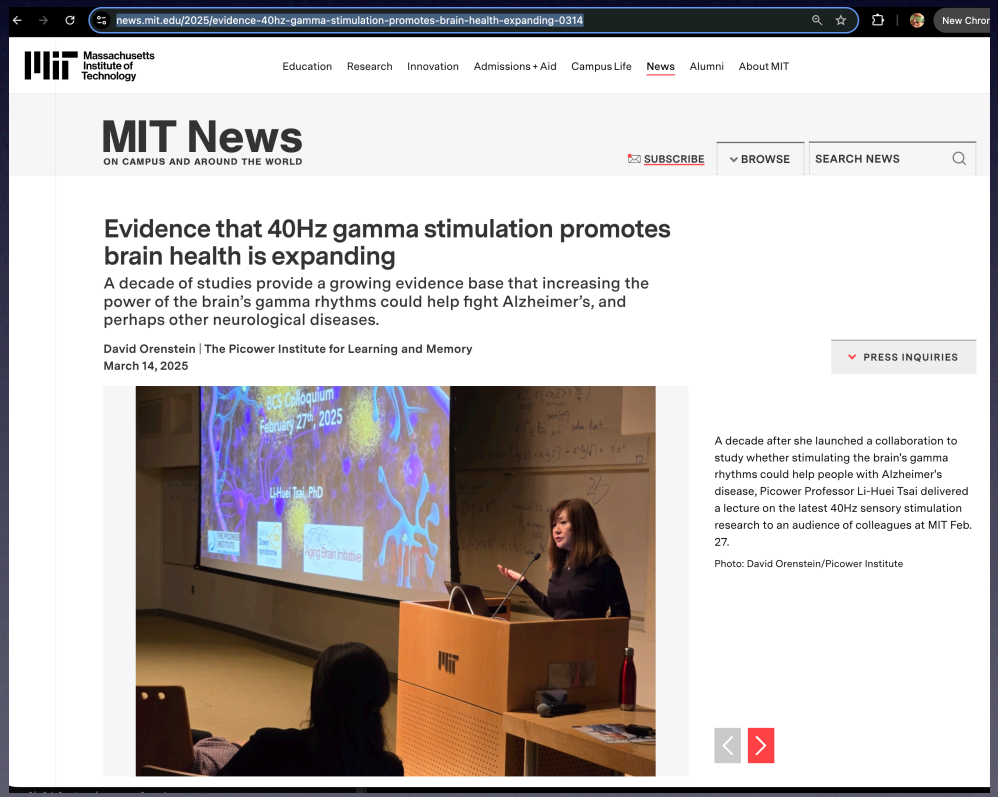


Brief history (cont'd)

2025:

MIT publishes evidence of 40Hz gamma stimulation helping fight Alzheimer's



https://news.mit.edu/2025/evidence-40hz-gamma-stimulation-promotes-brain-health-expanding-0314

Brief history (cont'd)

2026:

* Many studies corroborate gamma helping Alzheimer's
(search for: "40Hz gamma Alzheimers")

* Try searching for:
"40Hz gamma therapy"
and see what you find

*** Long Covid / Brain Fog?*

*** CFS/ME?*

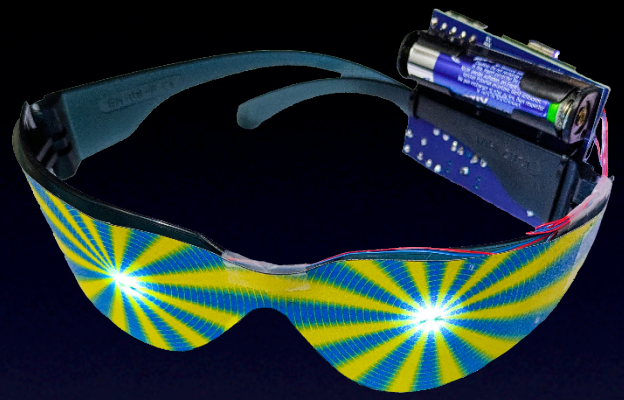
Promising? Or, wishful thinking?

Motivation for MAKE Brain Machine

- Cheap (commercial “Mind Machines” cost $$$)
- Beginner’s project
- Show how fun microcontrollers are
- Hallucinate wildly without side-effects
- Trick people into meditating

Hack of Ladyada’s MiniPOV kit

New Version of the Brain Machine kit



- Way easier to solder
- Uses Arduino – way easy to re-program and hack on
- Very well documented – easy to modify, great to learn from
- Easily add Gamma waves to a Brainwave sequence
- Easily to add alternate blinking LEDs (left/right)
- Runs on one AAA battery – light-weight / more comfortable

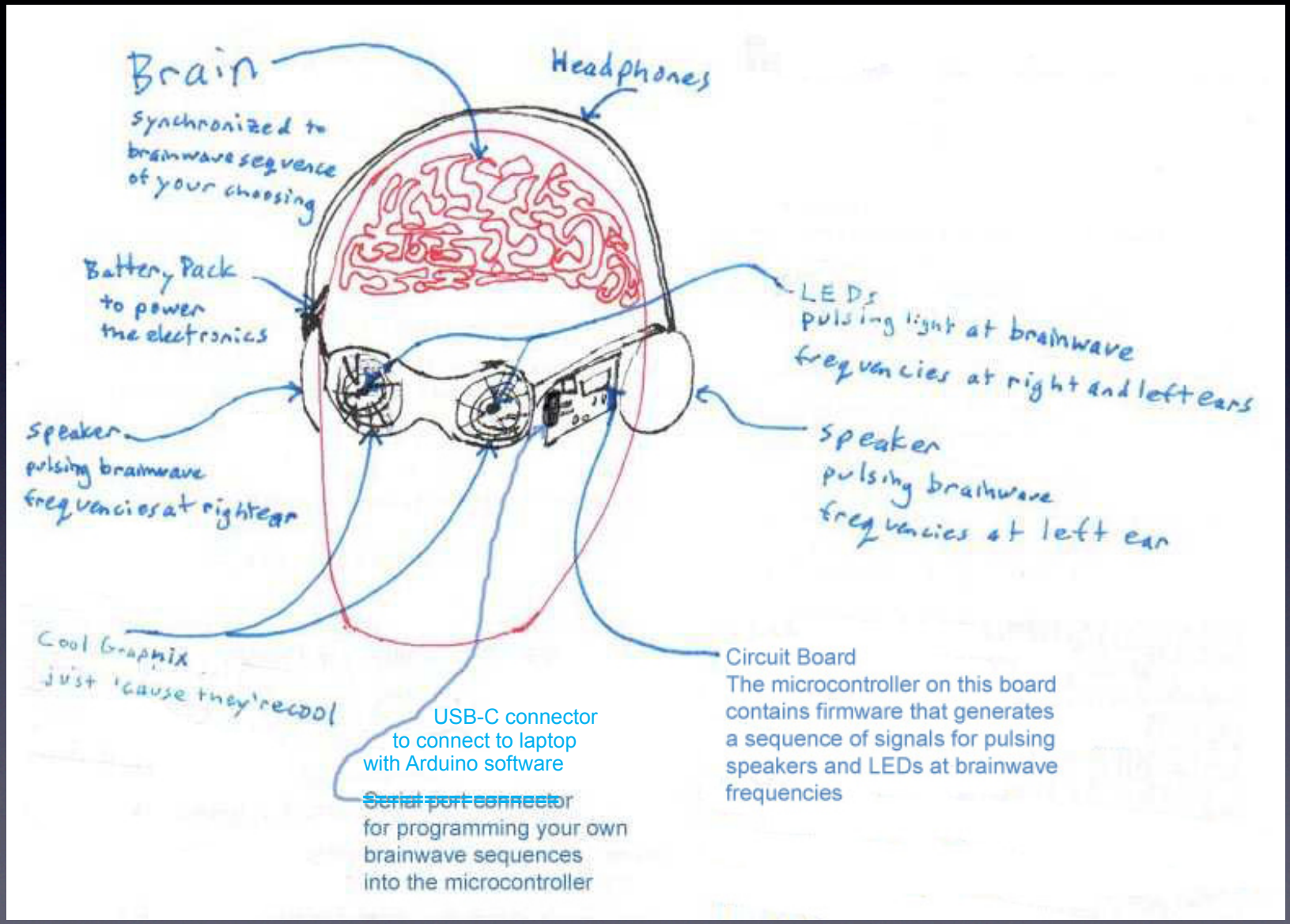
Brain Machine Theory

Sound & Light together
to entrain (non-invasively)
your brain to a brainwave sequence

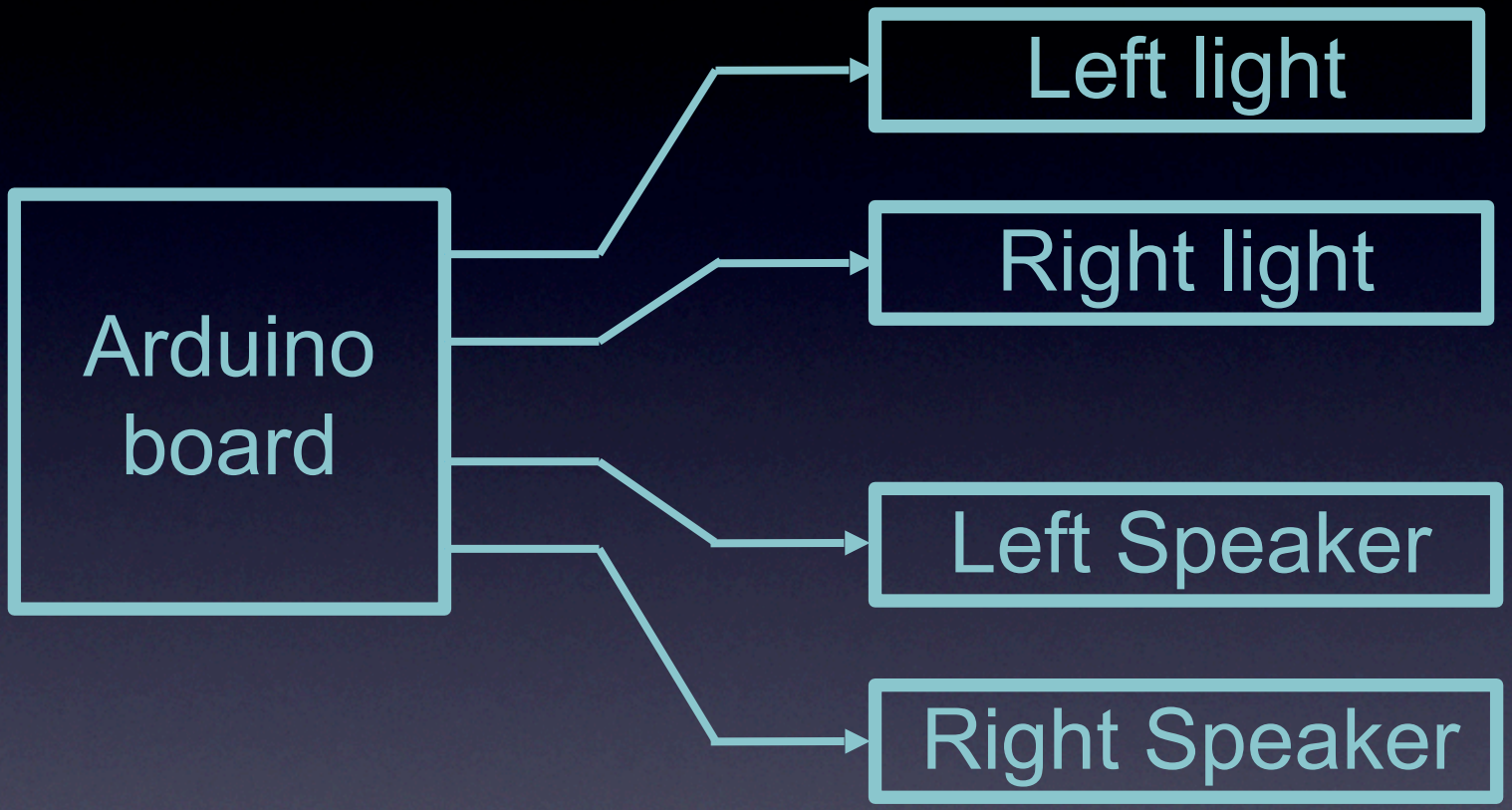
Simplified model for a brainwave sequence:
only one brainwave frequency at a time

Brain Hacking:

By pulsing sound & light at brainwave frequencies you can make your brain track any sequence you like



Hardware


Arduino board
Left light
Right light
Left Speaker
Right Speaker

Program / Firmware / “Sketch”

Play
each entry
in the
Brainwave Table

Brainwave Table

- Start with lots of Beta
  (awake / conscious)
- Add Alpha
  (dreamy / trancy)
- Reduce Beta
  (less conscious)
- Start adding Theta
  (more subconscious)
- Pulse in some Delta
  (creativity)
- Then reverse
  the above

(to come up refreshed)

Program / Firmware / “Sketch”
Brainwave Table (detailed)

```
} const brainwaveTab[] PROGMEM = {
    { 'b', 600000 },    ←  Beta waves for 60 seconds
    { 'a', 100000 },    ←  Alpha waves for 10 seconds
    { 'b', 200000 },
    { 'a', 150000 },   (divide by 10,000 to get seconds)
    { 'b', 150000 },
    { 'a', 200000 },
    { 'b', 100000 },
    { 'a', 300000 },
    { 'b',  50000 },
    { 'a', 600000 },
    { 't', 100000 },
    { 'a', 300000 },
    { 't', 200000 },
    { 'a', 300000 },
    { 't', 300000 },
    { 'a', 150000 },
    { 't', 600000 },
    { 'a', 150000 },
    { 'b',  10000 },
    { 'a', 150000 },
    { 't', 600000 },
    { 'd',  10000 },
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    { 'a', 200000 },
    { 'b',  50000 },
    { 'a', 200000 },
    { 'b', 150000 },
    { 'a', 150000 },
    { 'b', 200000 },
    { 'a', 100000 },
    { 'b', 250000 },
    { 'a',  50000 },
    { 'b', 600000 },
    { '0', 0 }          ←  last entry is always {‘0’, 0}
};
```

- use Upper-Case for alternating blinking Left/Right (instead of simultaneous blinking in both eyes
  example: {‘B’, 600000 }, -- Blink lights alternately at Beta for 60 seconds
- use ‘g’ or ‘G’ for Gamma waves
  example: {‘g’, 6000000 }, -- Blink lights at Gamma for 600 seconds (10 minutes)

Binaural Beats

An effective means for entraining your brain to sound

Somewhat like beat frequencies:


Base tone


Alpha Offset tone


Alpha Beat Frequency

Binaural Beats

An effective means for entraining your brain to sound

Somewhat like beat frequencies:


Base tone


Alpha Offset tone


Alpha Beat Frequency

Except it's just in your head!
(not physical – only perceived)

Meditation

Here are just a few different ways to meditate:

- breathe
- follow thoughts
- ignore thoughts
- focus on an intention (like a problem)
- make up your own way

What’s It Like?

What's It Like?

A few photos

from my

Brain Machine workshop

at Chaos Communications Camp 2007:

What's It Like?

What's It Like?

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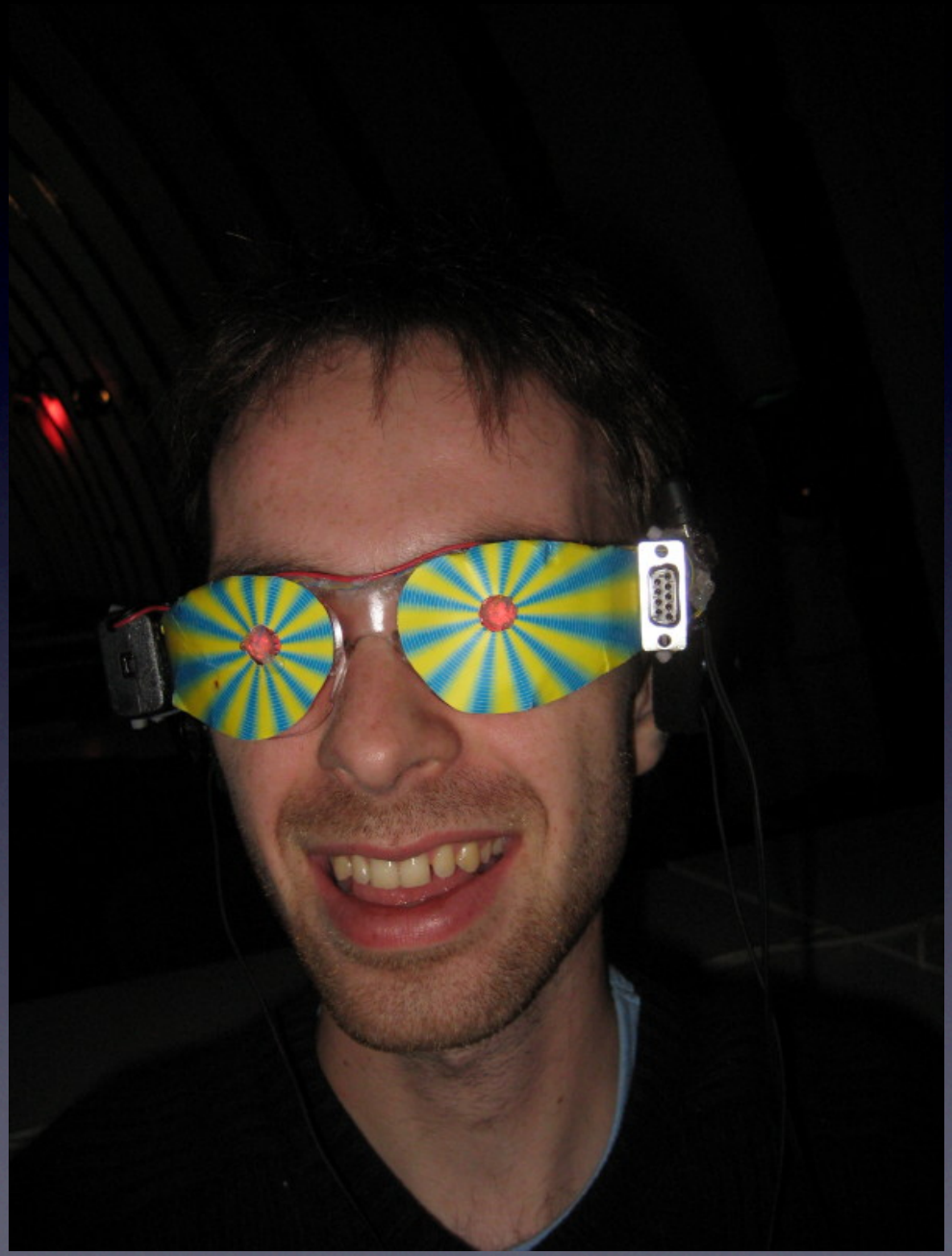

What's It Like?

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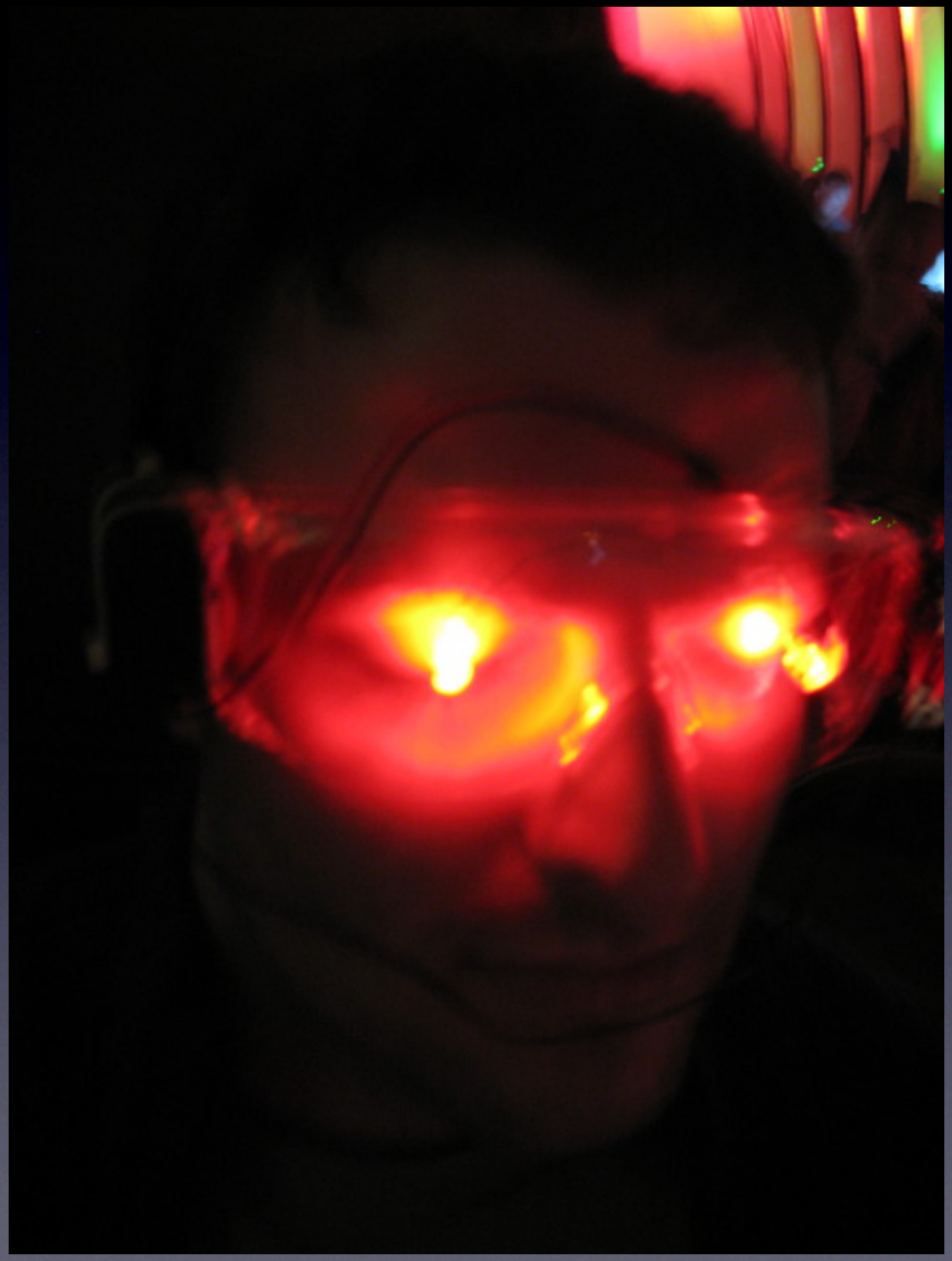

What's It Like?

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What's It Like?

Further Study

Books:

"Megabrain Power: New Tools and Techniques for Brain Growth and Mind Expansion." by Michael Hutchison, Ballantine Books, 1996

"The High-Performance Mind" by Anna Wise, Tarcher, 1997

"Dreamachine Plans" by Brion Gysin, Temple Press, 2006

"The Living Brain" by W. Grey Walter, Penguin, 1967

Websites:

Anna Wise:
http://www.annawise.com
– Unfortunately, Anna Wise died in 2010, and since then not much has happened with her technology

"Clinical Guide to Light and Sound" by Thomas Budzynski, PhD:
http://sica.stanford.edu/events/brainwaves/theclinicalguidetosoundandlight.pdf
– Unfortunately, this link no longer works, and the PDF seems to have disappeared from the internet

Seymour Charas' 1974 patent (first SLM patent):
https://ppubs.uspto.gov/pubwebapp/static/pages/ppubsbasic.html
Quick lookup: 3838417

The Monroe Institute:
http://www.monroeinstitute.com/
– Unfortunately, the founder, Robert Monroe, died in 1995, and since then the website has lost its repository of useful information

Wikipedia has some interesting pages. A good starting place is the "Mind Machine" page:
http://en.wikipedia.org/wiki/Mind_machine

MIT article on evidence of 40Hz gamma helping Alzheimer's:
https://news.mit.edu/2025/evidence-40hz-gamma-stimulation-promotes-brain-health-expanding-0314

Questions?

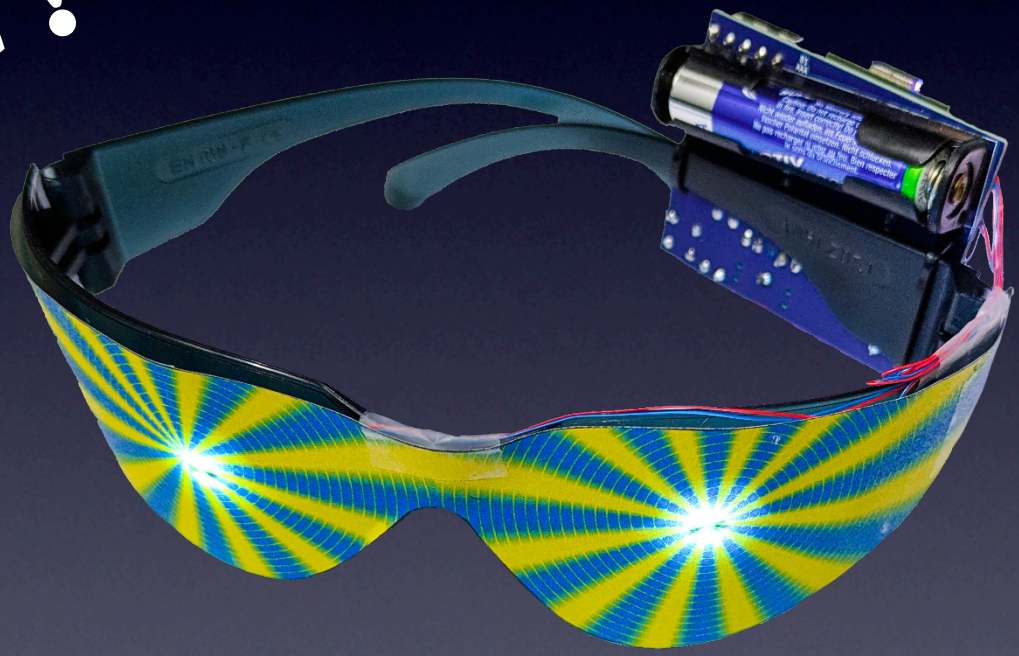
Tools

(Don't bring these home)

Tools

Your Brain Machine

Yours to bring home !



Learn To Solder

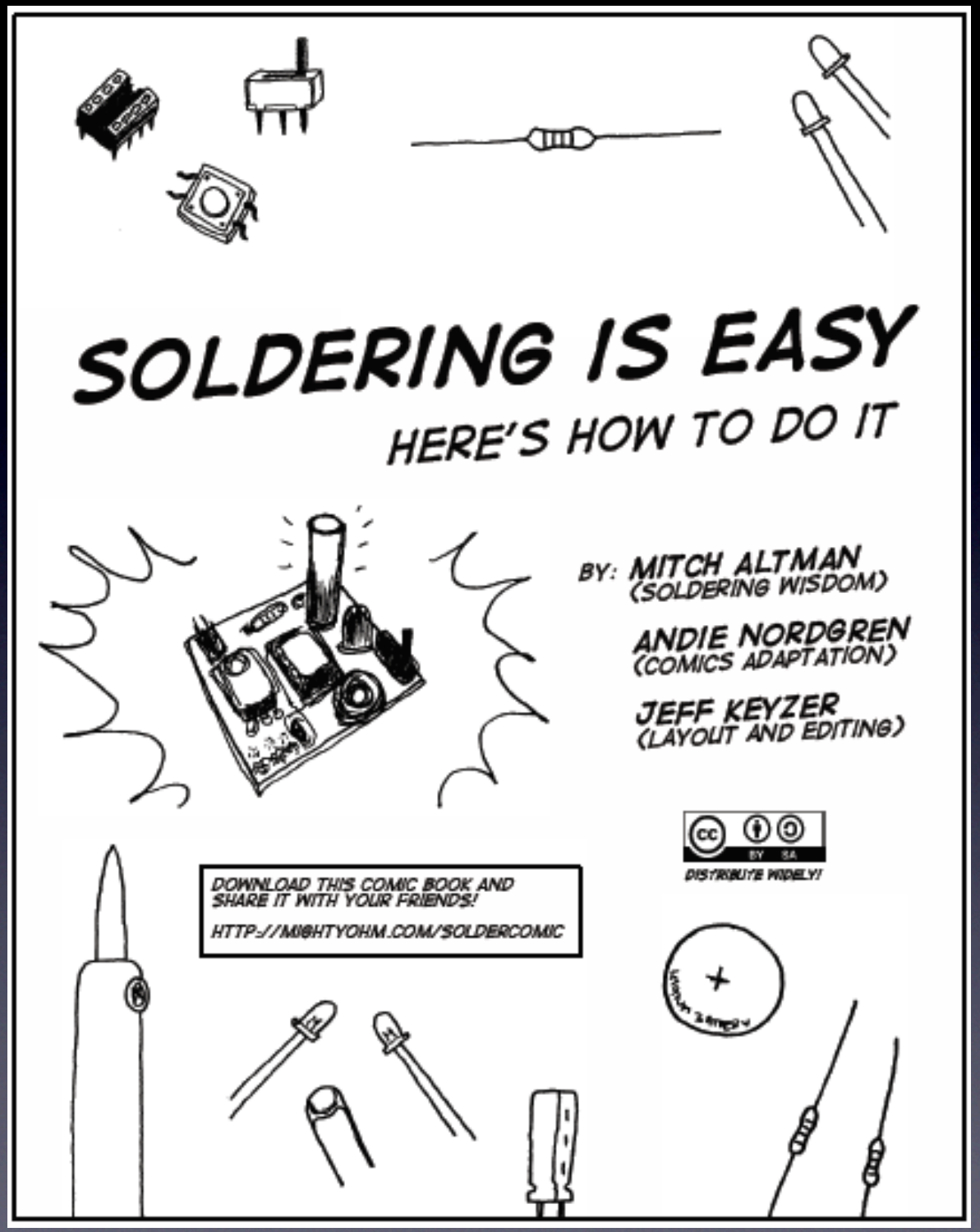
The following photos will show you how to solder.

But feel free to download the “Soldering Is Easy” comic book for free!

(In many different languages.)

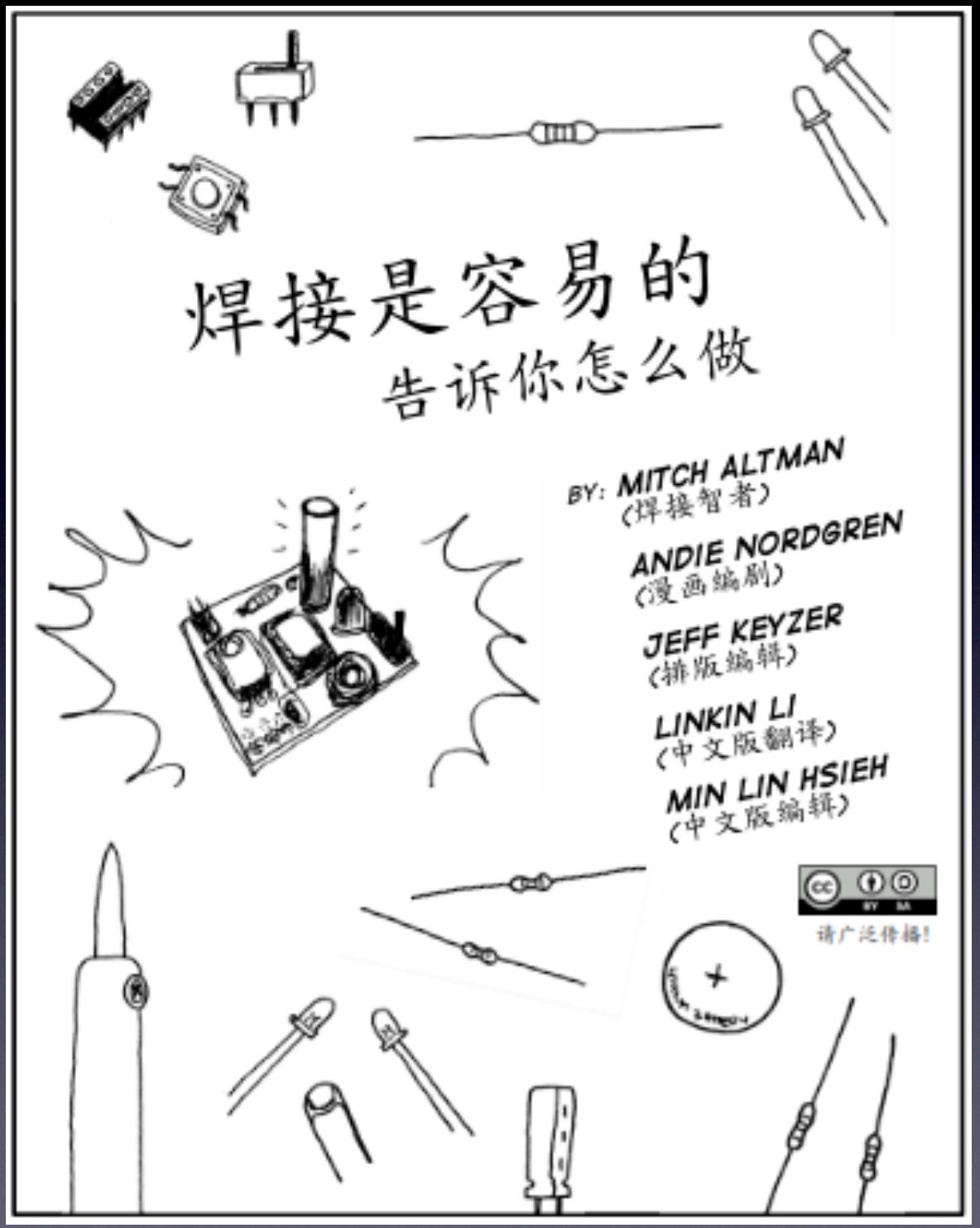
download for free at:
http://mightyohm.com/soldercomic

Learn To Solder



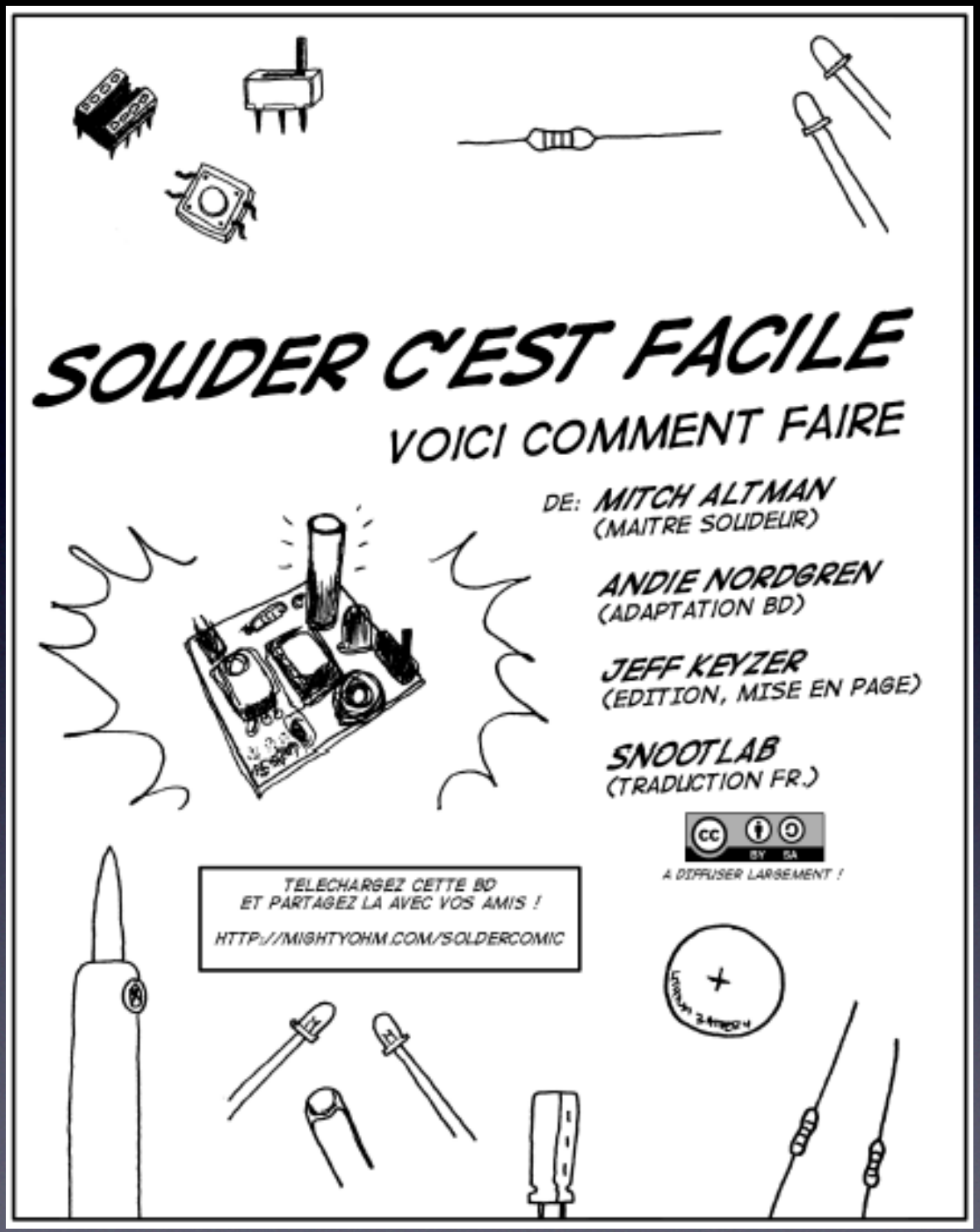
download for free at:
http://mightyohm.com/soldercomic
(In many different languages.)

Learn To Solder



download for free at:
http://mightyohm.com/soldercomic
(In many different languages.)

Learn To Solder



download for free at:
http://mightyohm.com/soldercomic
(In many different languages.)

Learn To Solder

download for free at:
http://mightyohm.com/soldercomic
(In many different languages.)

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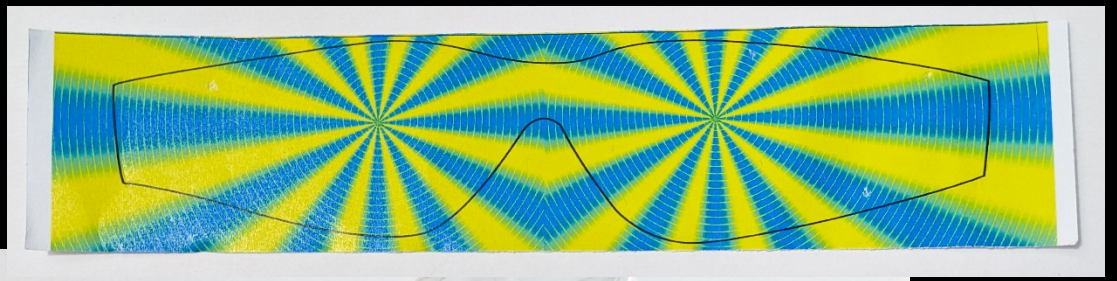
download for free at:
http://mightyohm.com/soldercomic
(In many different languages.)

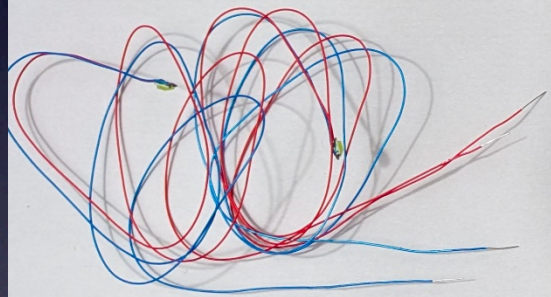
Trippy Graphix



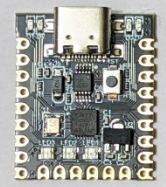
Earbuds

Glasses

LED1, LED2



Arduino Nano



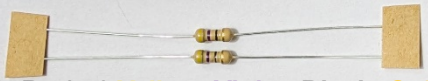
Power Supply

R1, R2 (4.7K) Yellow, Violet, Red, Gold

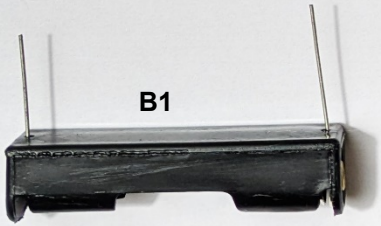
J1

C1, C2

R3, R4 (47) Yellow, Violet, Black, Gold



Header pins

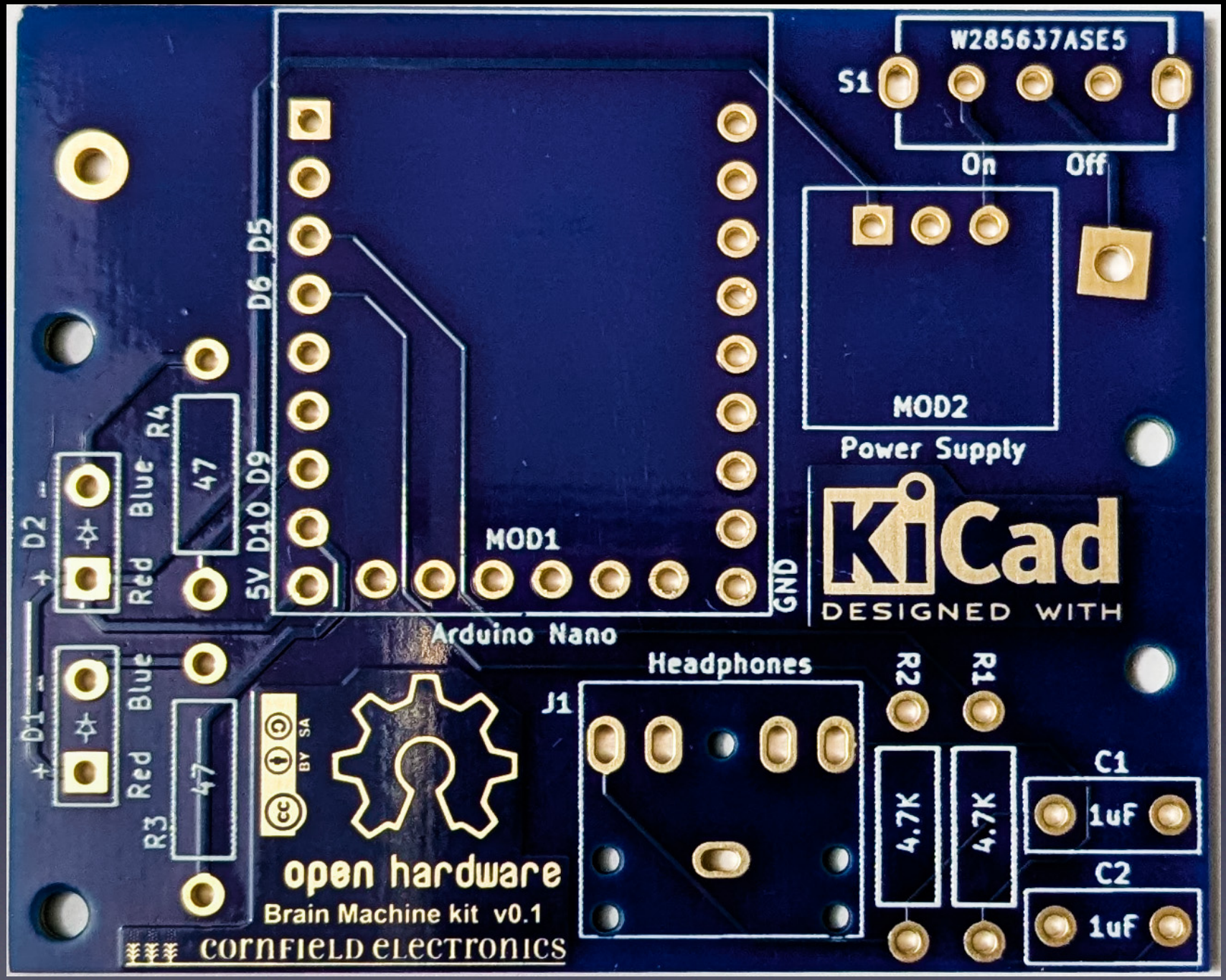


B1

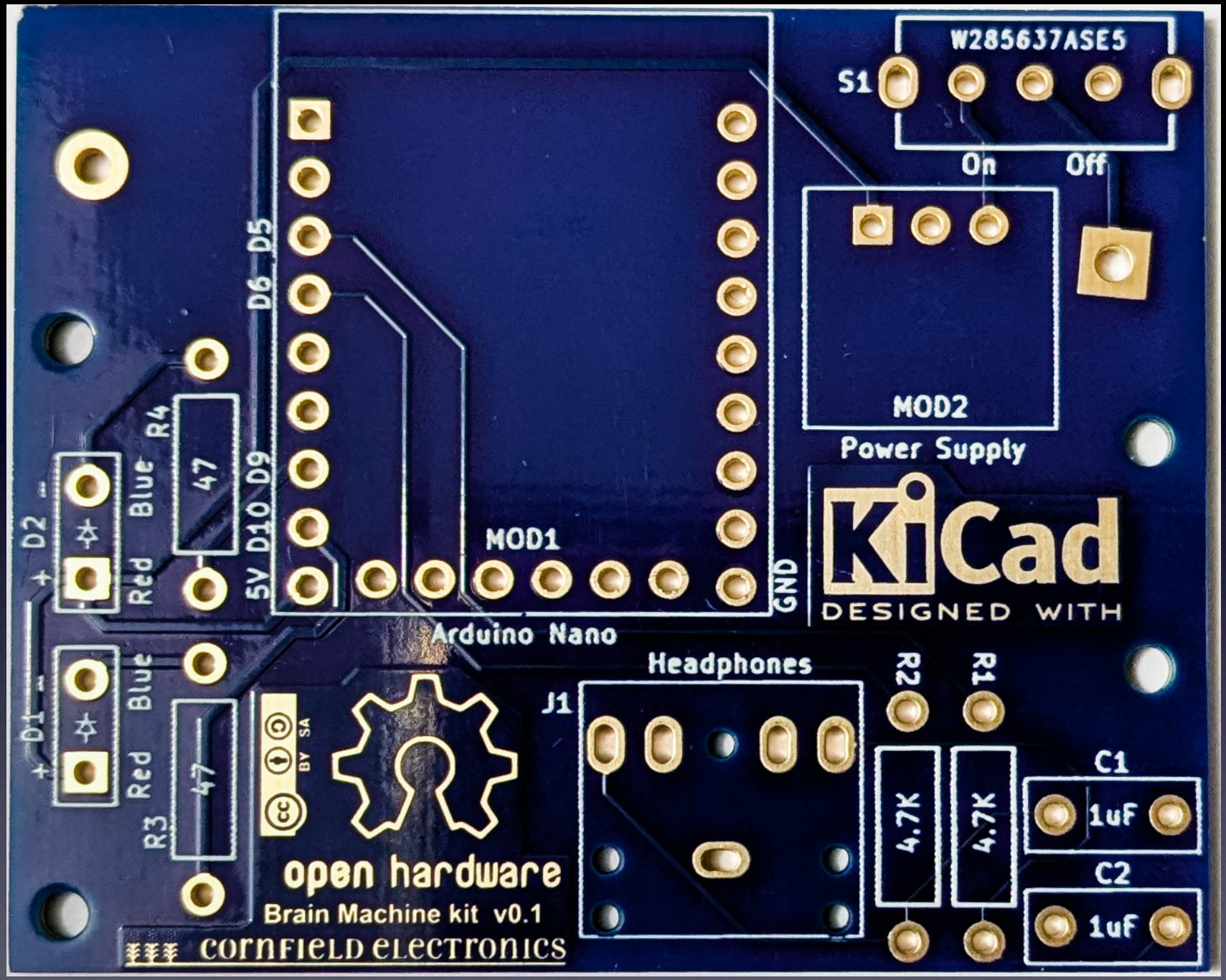
S1

Zip ties

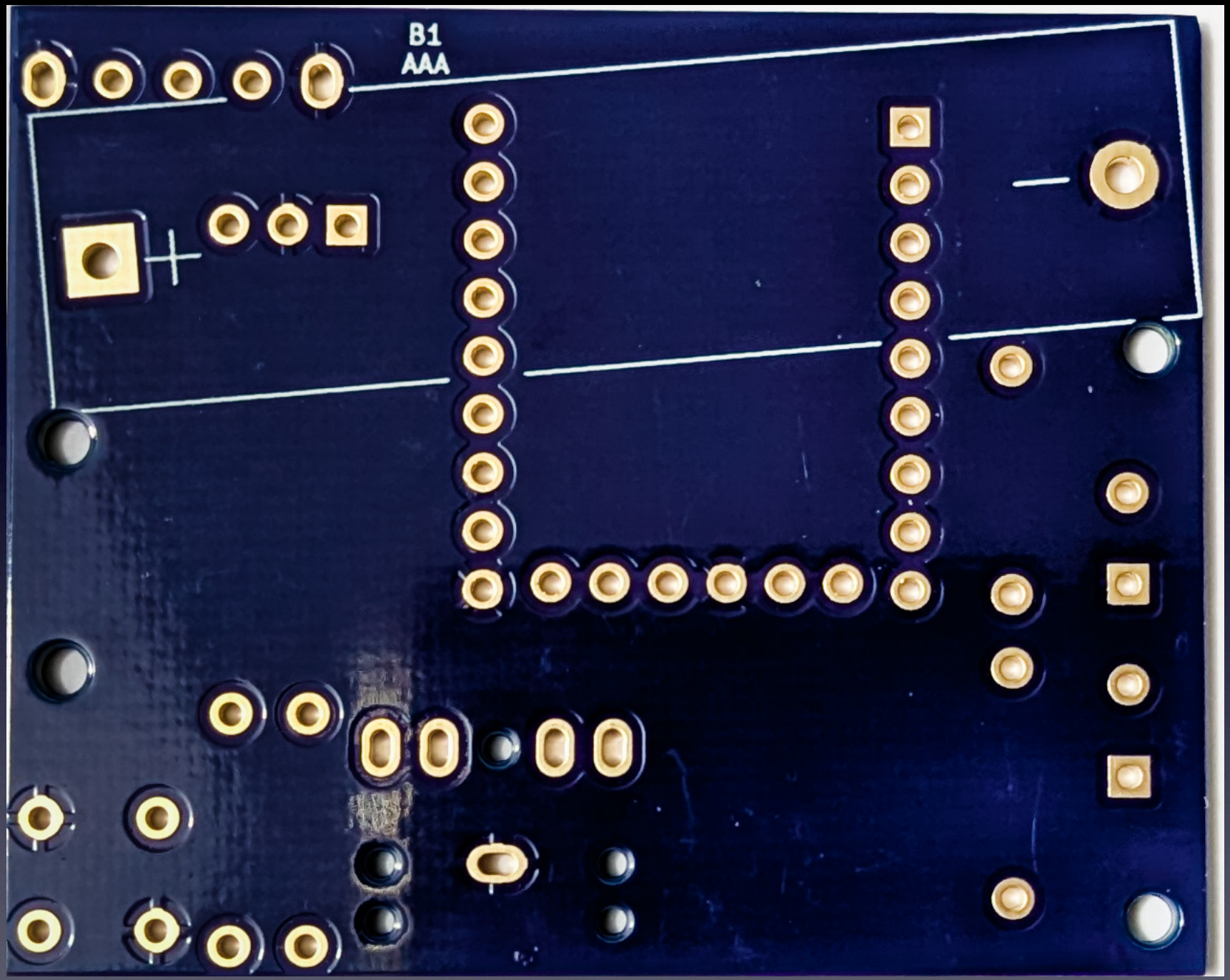
All of the parts



The board we'll solder the parts to



Front/Top of board



Back/Bottom of board

Note:

Since we will use Lead-Free solder it is helpful to also have flux paste in a syringe and Isopropyl Alcohol

The tools you'll need:

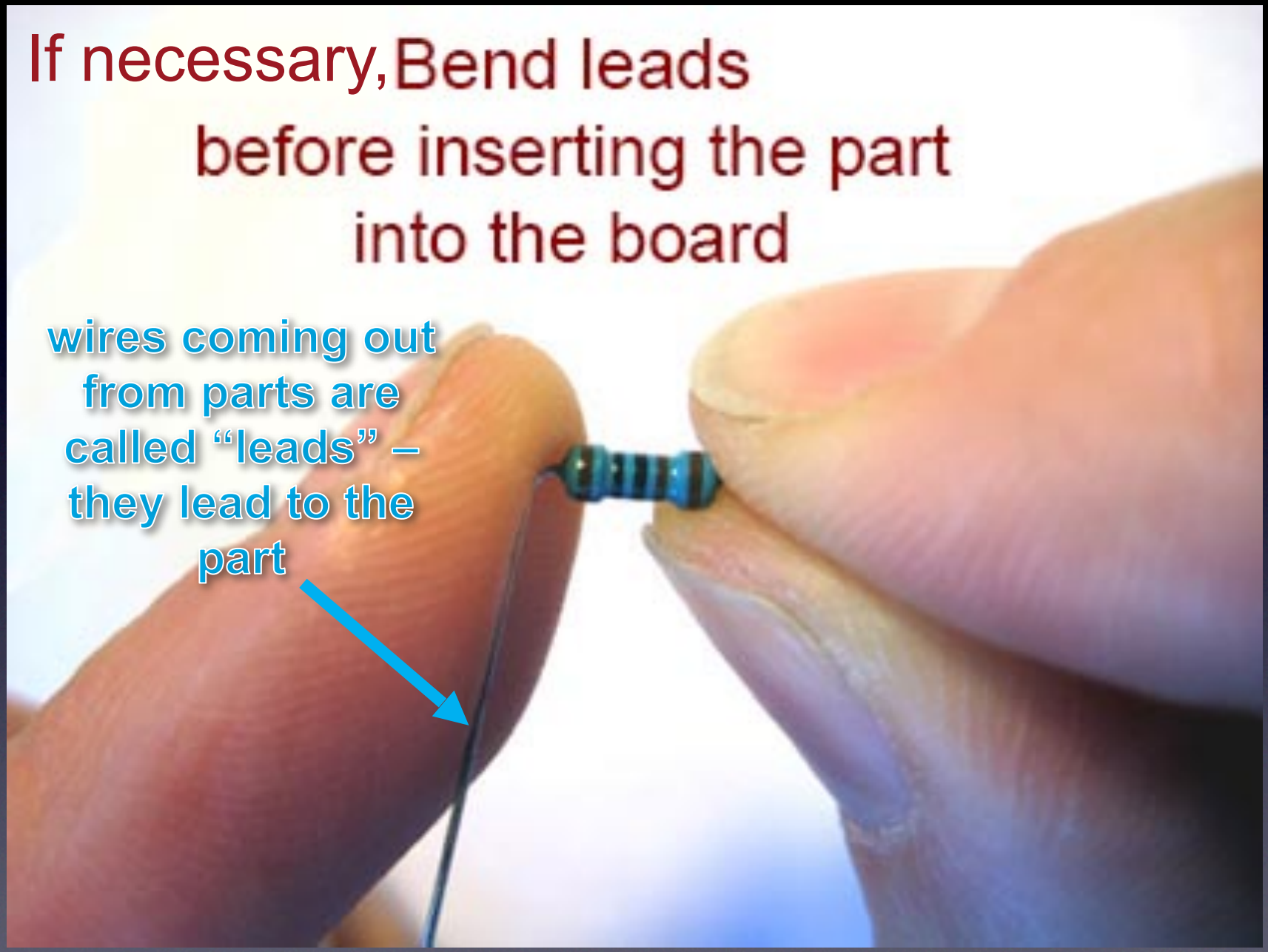
- soldering Iron (35W or less)
- solder (*more details coming*)
- soldering iron stand
- cellulose kitchen sponge *(not plastic!)*
- *small* wire cutter
- tape
- felt-tip pen
- scissors

Our first part

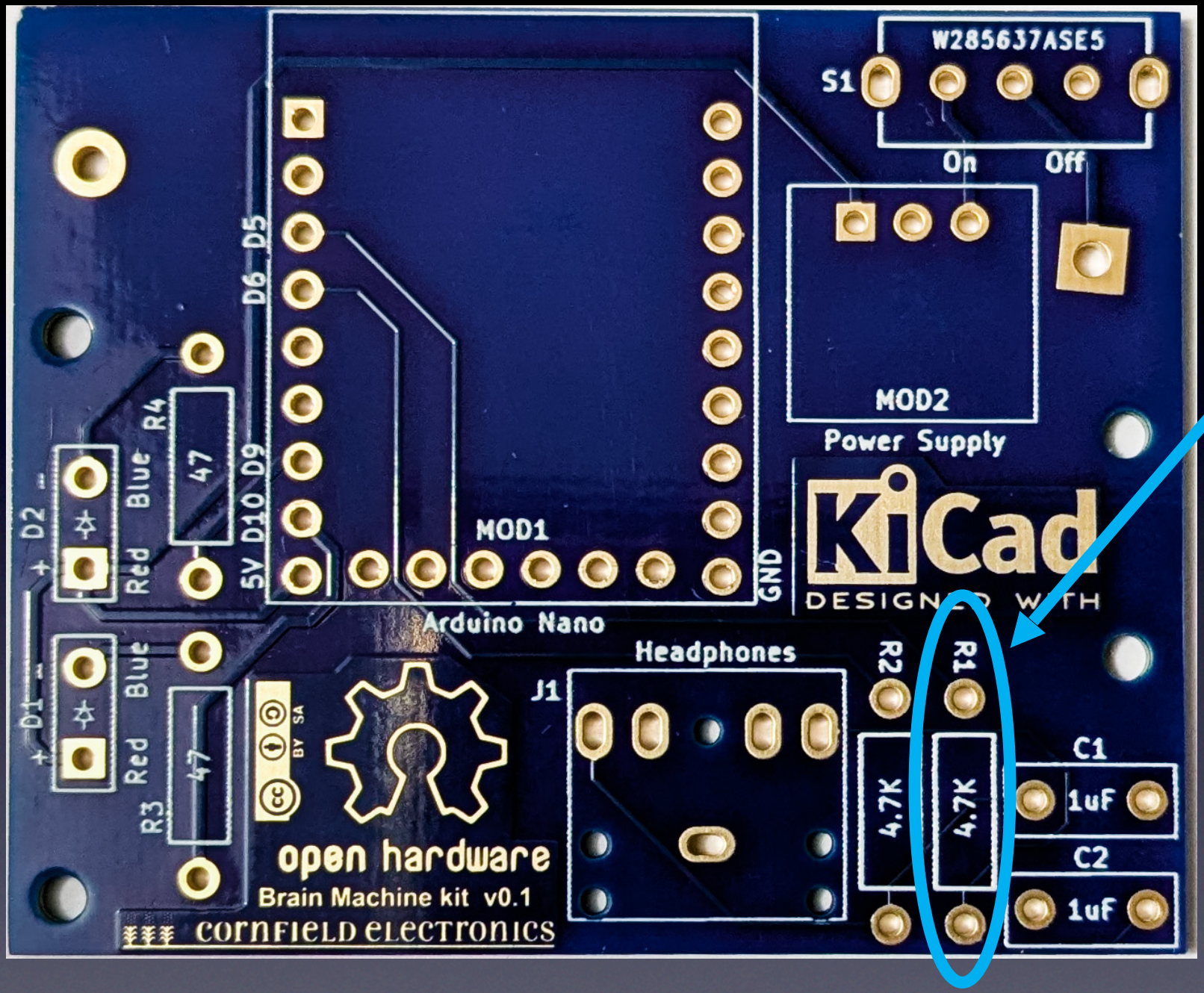
R1: Yellow, Violet, Red

(***not:*** **Yellow, Violet, ~~Black~~)**

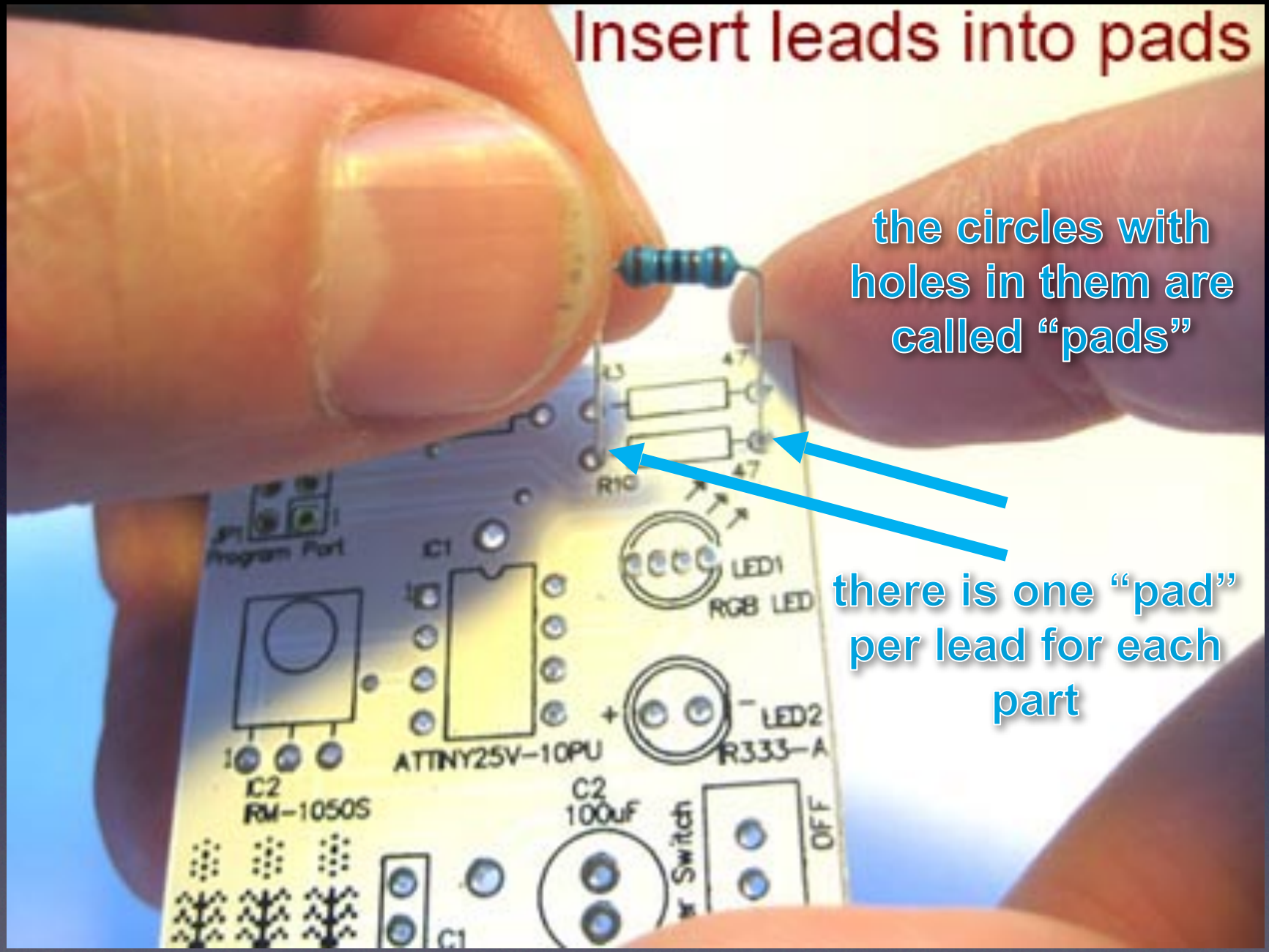
Some parts, such as resistors, need their leads bent first

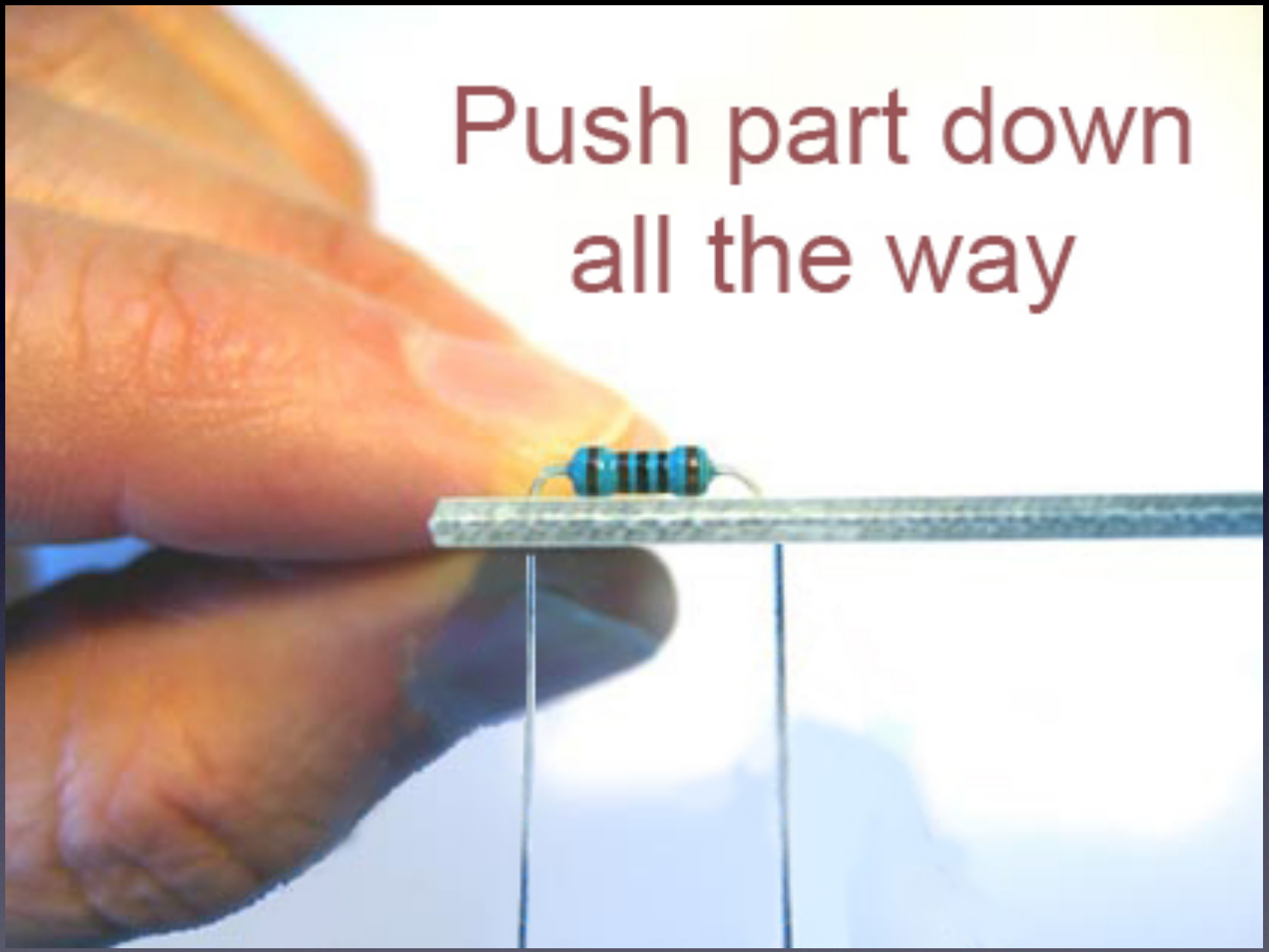


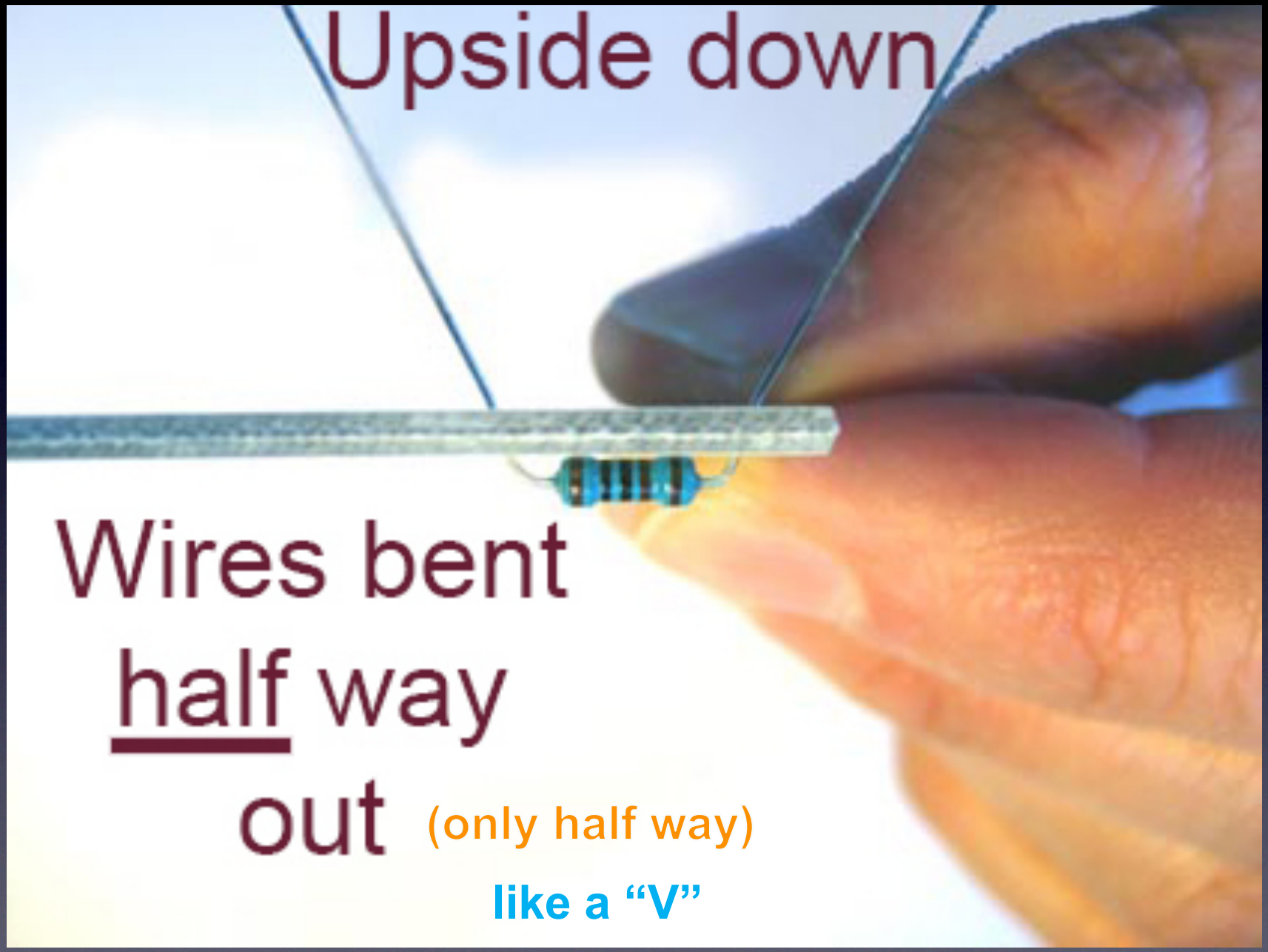
R1 – this is how it will look *before* inserting it into the board



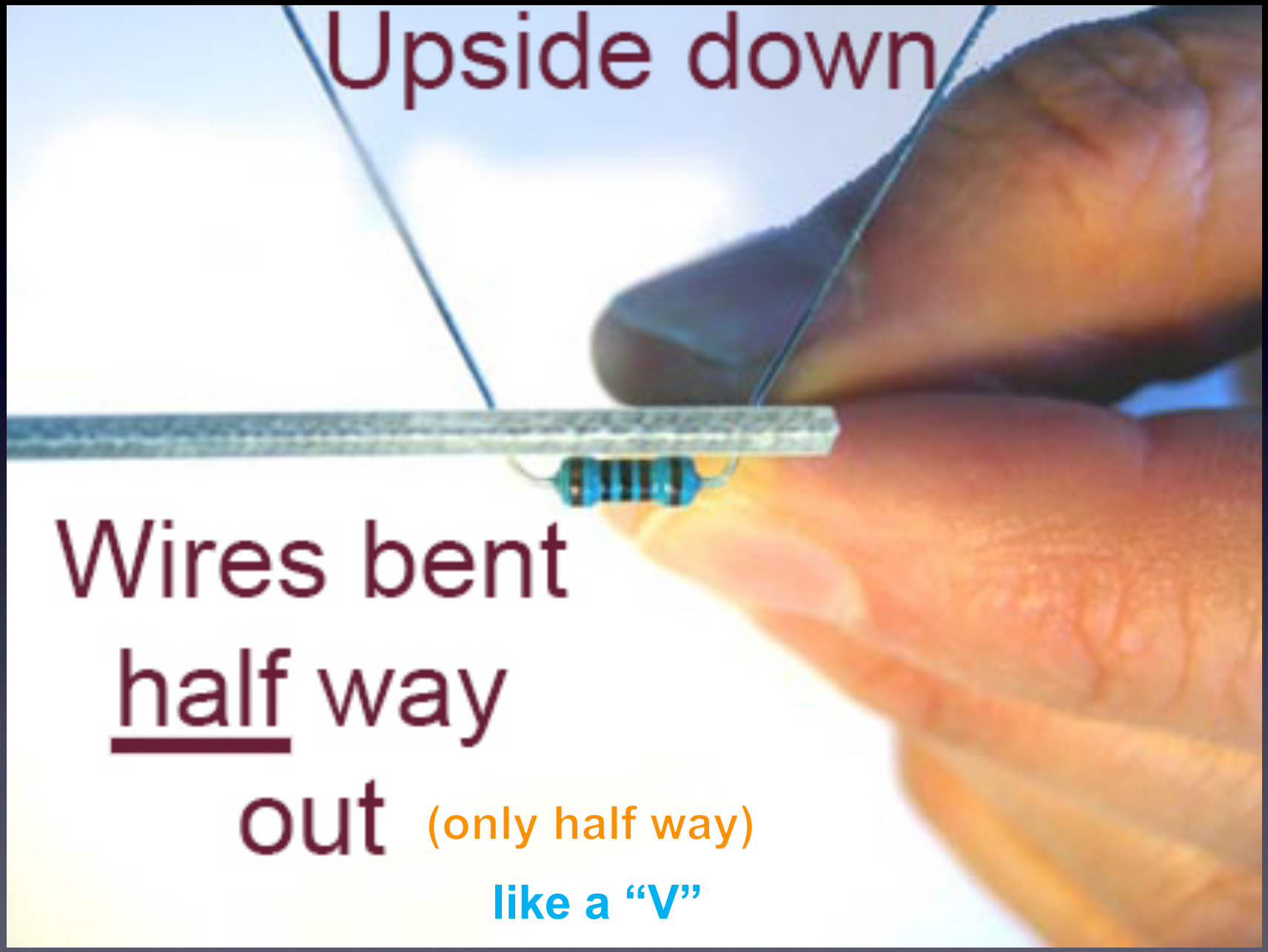
R1 – this is where it goes


Insert leads into pads
the circles with holes in them are called “pads”
there is one “pad” per lead for each part
R3
47
R10
47
IC1
LED1
RGB LED
ATTINY25V-10PU
LED2
IR333-A
IC2
RM-1050S
C2
100uF
Switch
OFF
C1

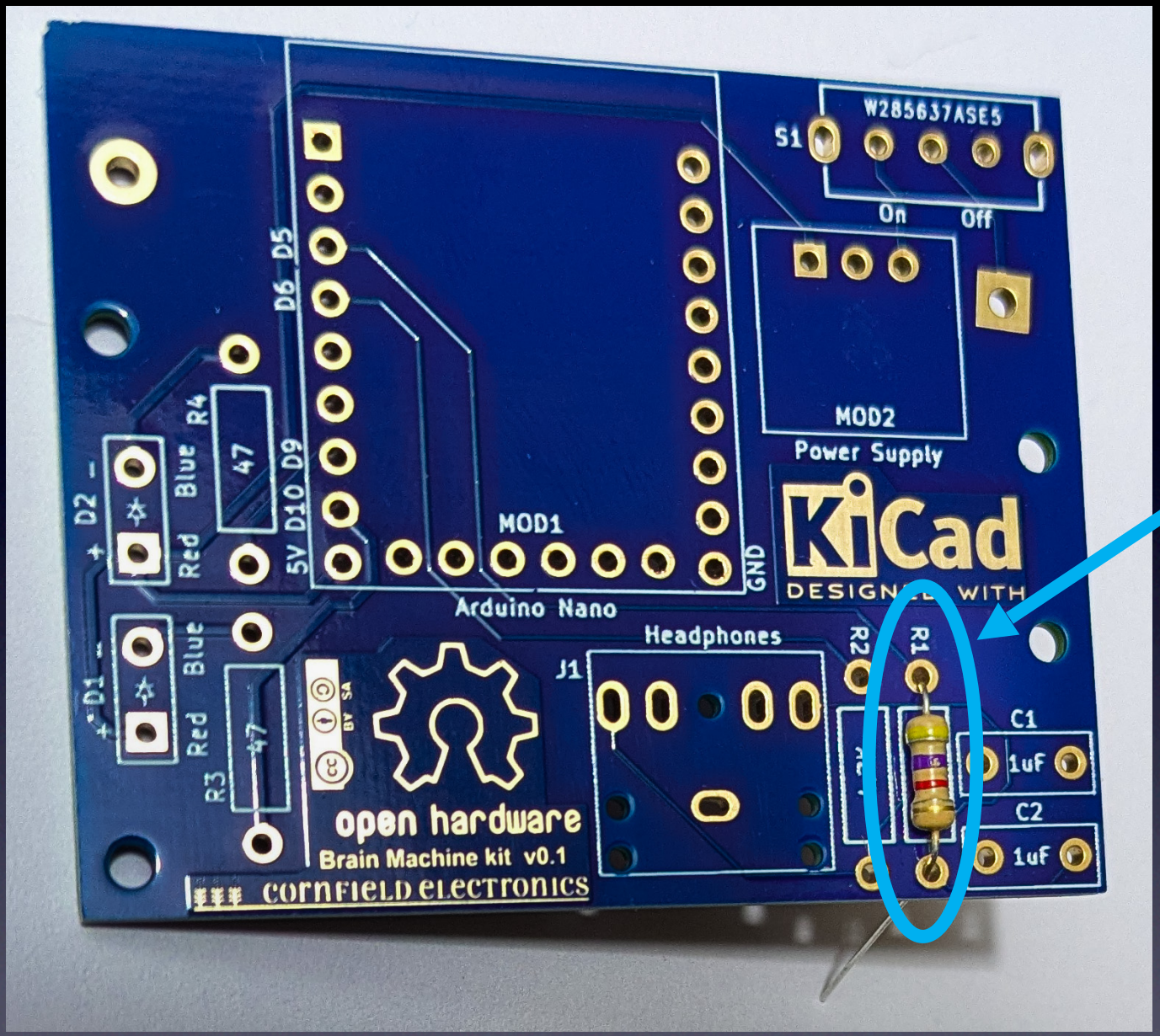

Push part down
all the way



so that the part won’t fall out while soldering it



Ready to Solder !



R1 – inserted into the board

How to hold a soldering iron

(Like a pencil – held from underneath)

Important

The best kind of solder for DIY electronics:

(Sn – Tin / Pb – Lead)

63/37 rosin core,

0.031” (0.8mm) diameter (or smaller)

(60/40 is also good)

Note:

Most
Lead-Free **solder**
has poisonous fumes!

This is what we will use:

A good kind of solder for DIY electronics:

This is the only good Lead-Free ***solder I have found!***

(after years of searching)

Kester
K100LD Rosin
(not "No Clean")
0.031" diameter (0.8mm)

This is what we will use:

A good kind of solder for DIY electronics:

This is the only good Lead-Free solder I have found!

(after years of searching)

Kester **K100LD Rosin** Solder

0.031” diameter (0.8mm)

AMTECH NC-559-ASM

99%

Note:

Since we will use *Lead-Free* solder
it is *helpful*
to also have
***flux paste* in a syringe**
and Isopropyl Alcohol

Another good kind of solder for DIY electronics:

This is another good Lead-Free solder I have found!

Duratool
D01685 Rosin

0.7mm diameter

(as good as the Kester K100LD Rosin)

Another good kind of solder for DIY electronics:

This is another good Lead-Free solder I have found!

MG Chemicals
4900 Rosin (112g, 227g, 454g)

0.8mm diameter

(as good as the Kester K100LD Rosin)

Another good kind of solder for DIY electronics:

This is another good Lead-Free solder I have found!

iFixit
IF145-077-2 (12g)
1.0mm diameter

(as good as the Kester K100LD Rosin)

3 Safety Tips…

Safety Tip #1:

Hot!!

(When you touch the tip,
you *will* let go quickly every time!)

Safety Tip #2:

Soldering chemicals are toxic

But they easily wash off your hands with soap and water

Safety Tip #3:

(coming soon…)

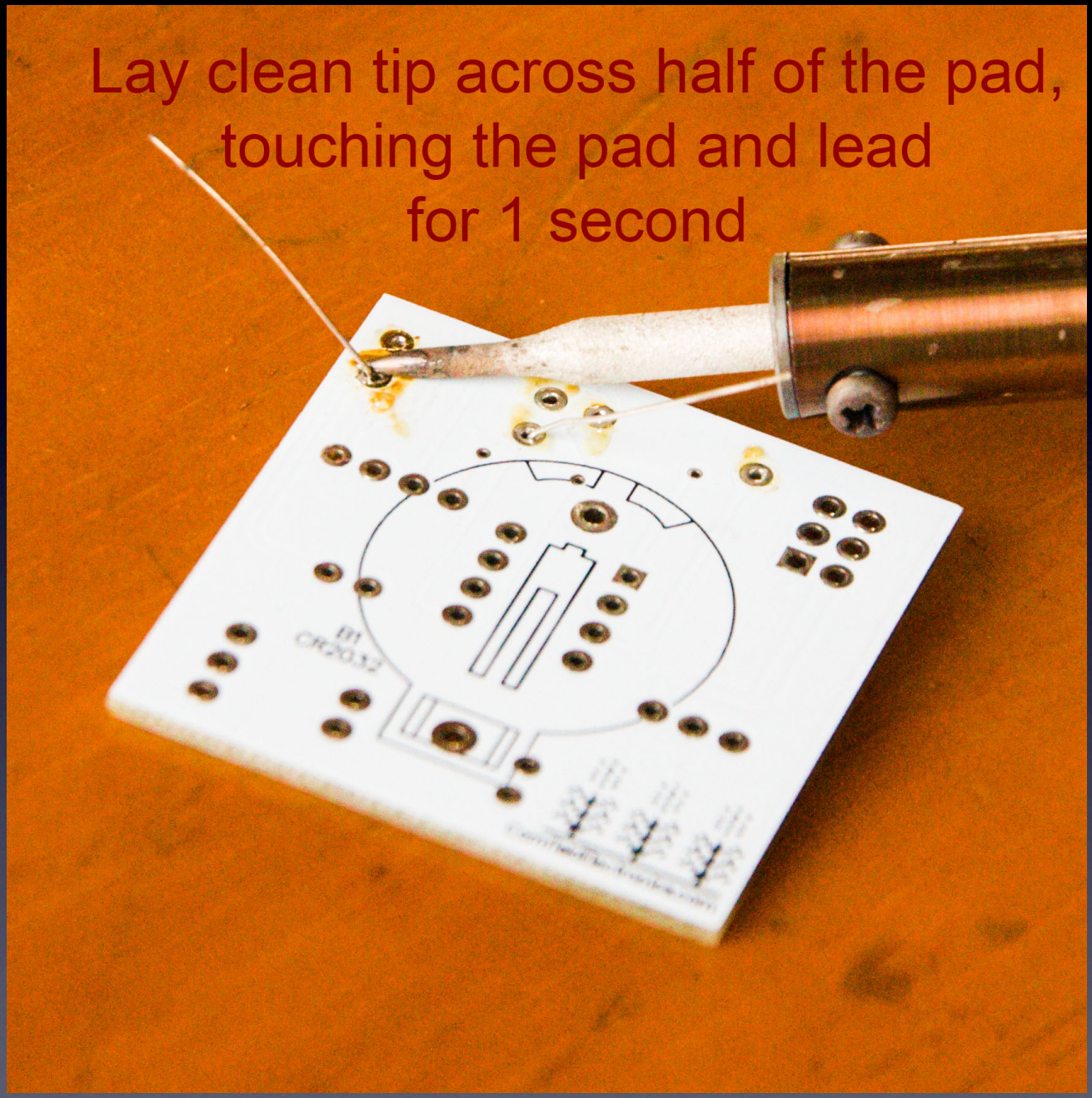
2 secrets
to good soldering…

Secret #1:

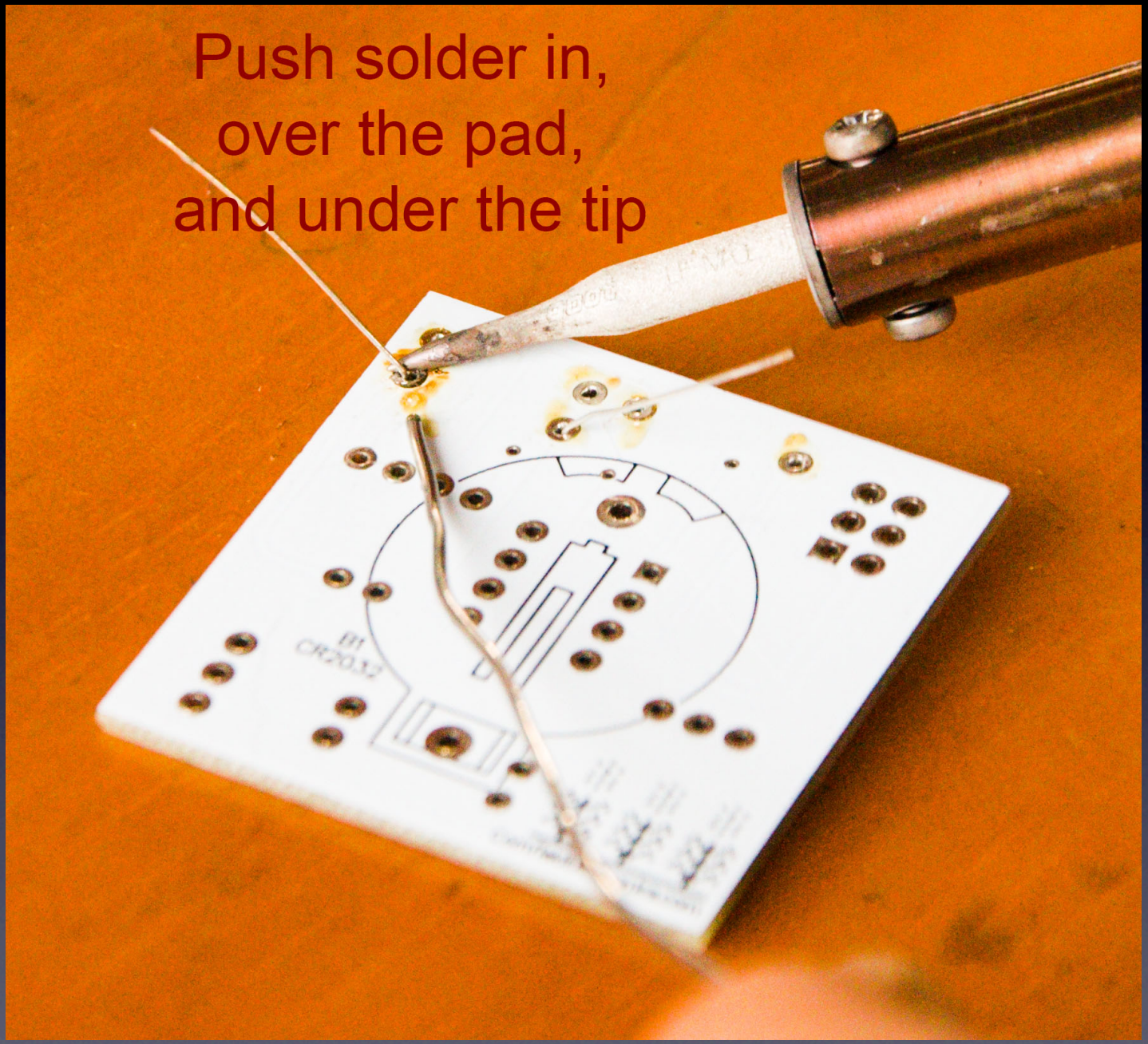
Clean the tip!
(before every solder connection)

Bang (lightly) 3 times,
Swipe, Rotate, Swipe (on the sponge):

Keep the tip shiny silver!

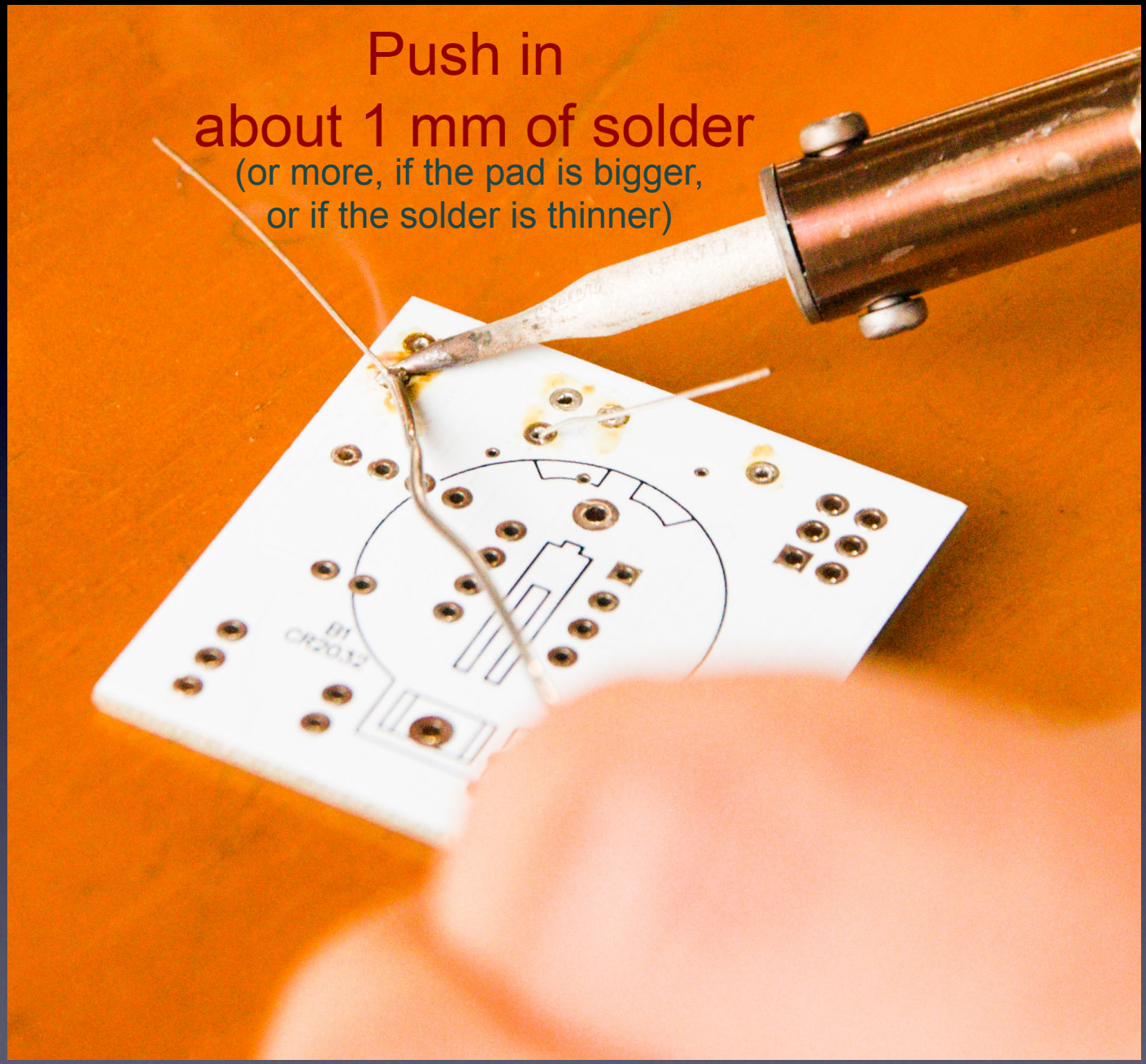

Lay clean tip across half of the pad,
touching the pad and lead
for 1 second

Do this quickly (slowly doesn't work well) – solder in & out in about 1 second



IMPORTANT: Make sure solder melts on the underside of the soldering iron tip (not the side or top of the soldering iron tip)!

Do this quickly (slowly doesn't work well) – solder in & out in about 1 second



Make sure solder melts on the <u>underside</u> of the soldering iron tip
(not the side or top of the soldering iron tip)!

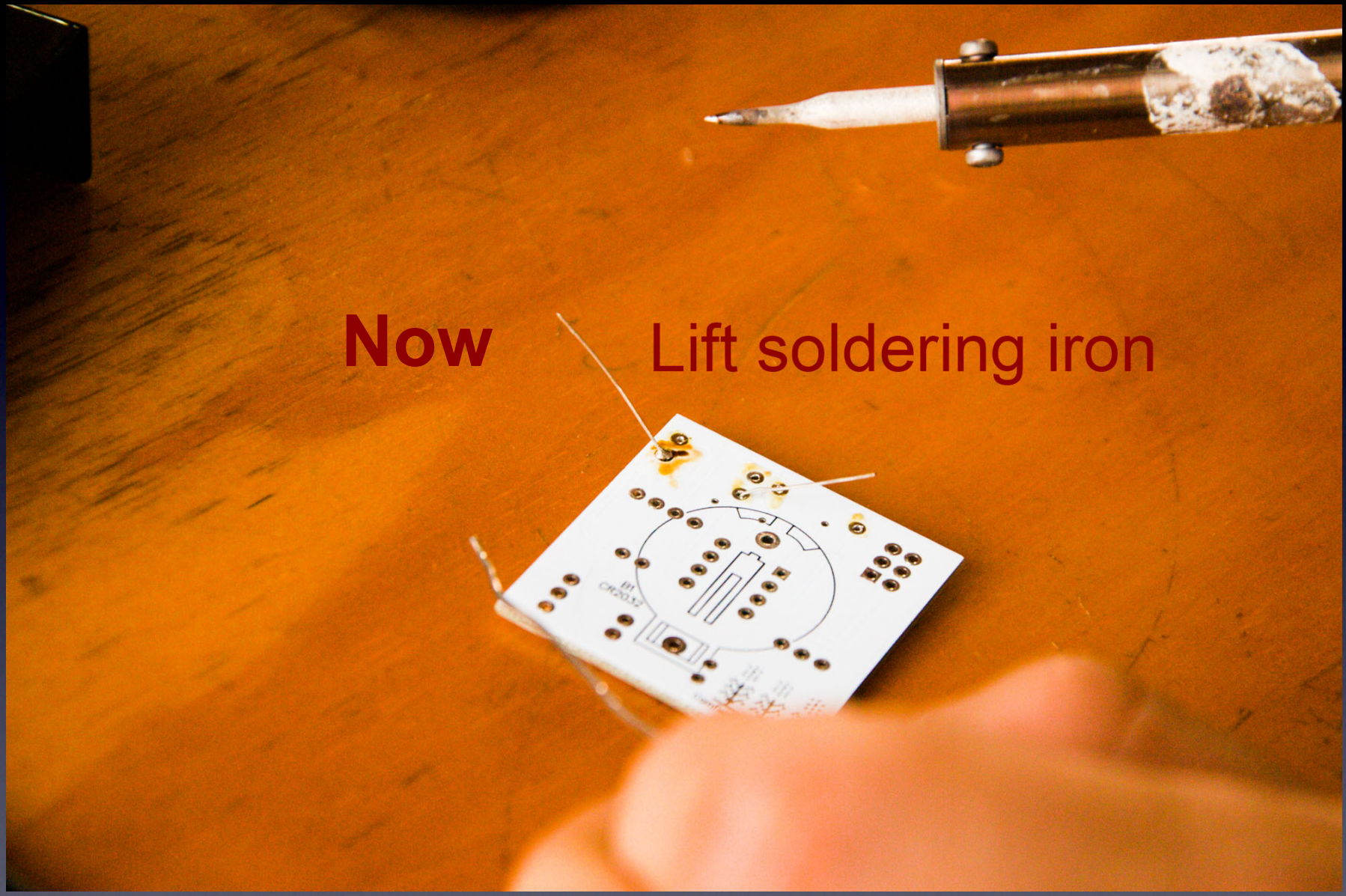
HEY !!!

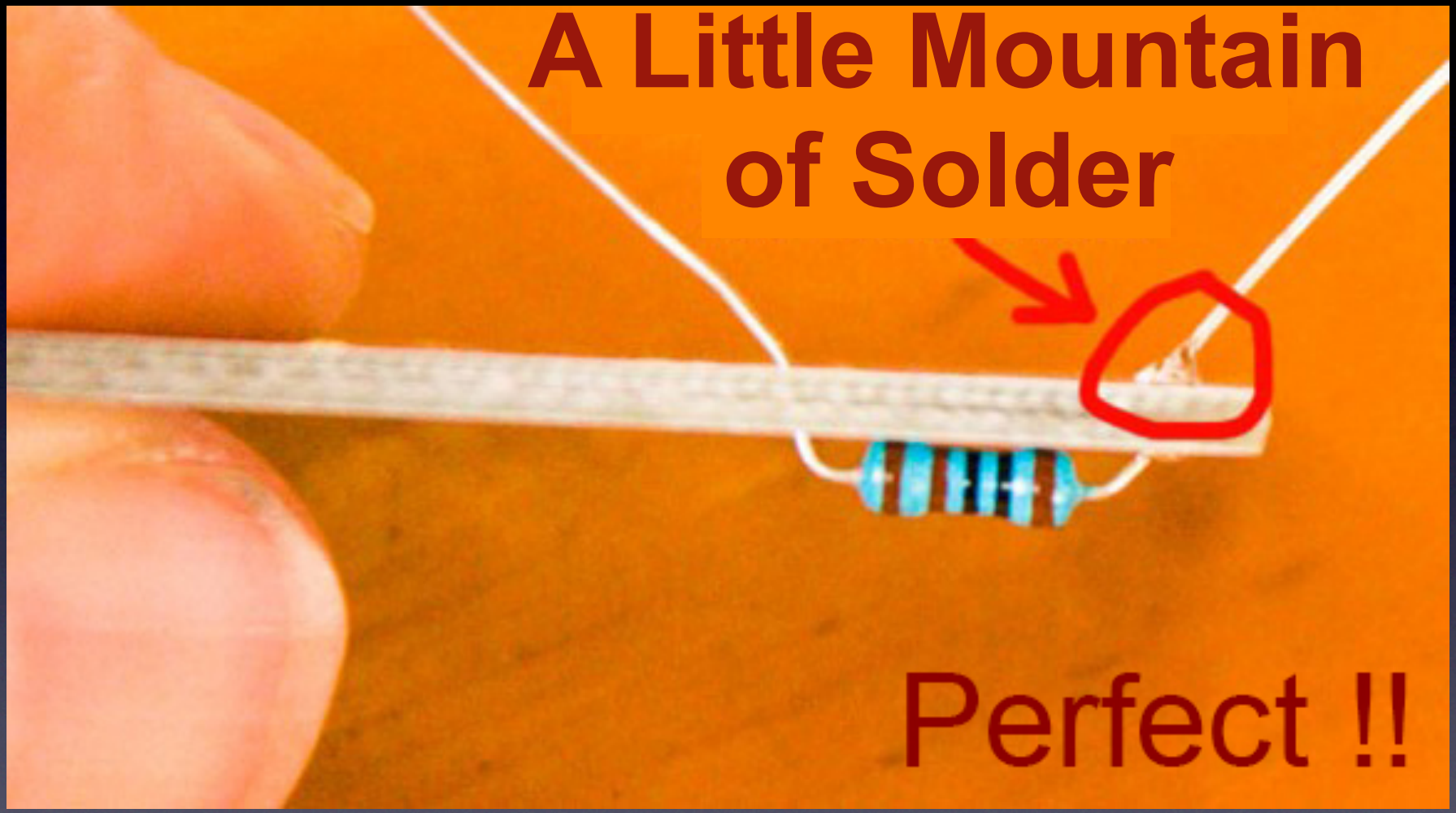
KEEP HOLDING TIP DOWN FOR 1 MORE SECOND !!

WAIT !!
Don’t lift the tip !!

Secret #2:

Keep hot tip down
1 second
For solder to flow !!


Now
Lift soldering iron



If you can see any of the pad, or the hole, you need more solder – so, just do all the steps again to make it perfect.

The Rhythm !

is just as important as the preceding steps!

The Rhythm !

and speed (about 1 second per step)

The Rhythm !

and speed (about 1 second per step)

Clean the tip

The Rhythm !

and speed (about 1 second per step)

Tip Down

The Rhythm !

and speed (about 1 second per step)

Solder In

The Rhythm !

and speed (about 1 second per step)

Solder Out

The Rhythm !

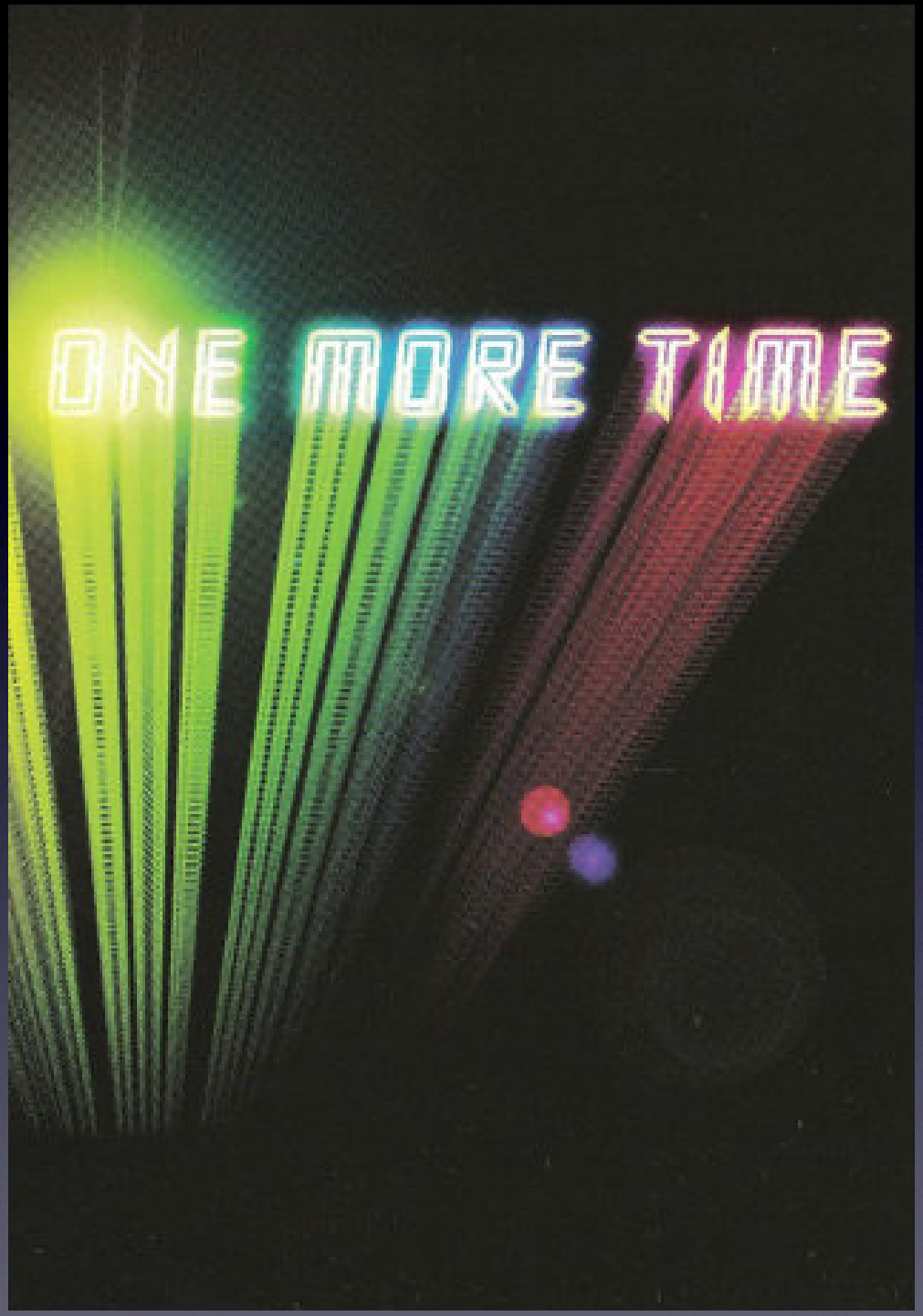
and speed (about 1 second per step)

WAIT !

The Rhythm !

and speed (about 1 second per step)

Lift Tip


ONE MORE TIME

The Rhythm !

and speed (about 1 second per step)

The Rhythm !

and speed (about 1 second per step)

Clean the tip

The Rhythm !

and speed (about 1 second per step)

Tip Down

The Rhythm !

and speed (about 1 second per step)

Solder In

The Rhythm !

and speed (about 1 second per step)

Solder Out

The Rhythm !

and speed (about 1 second per step)

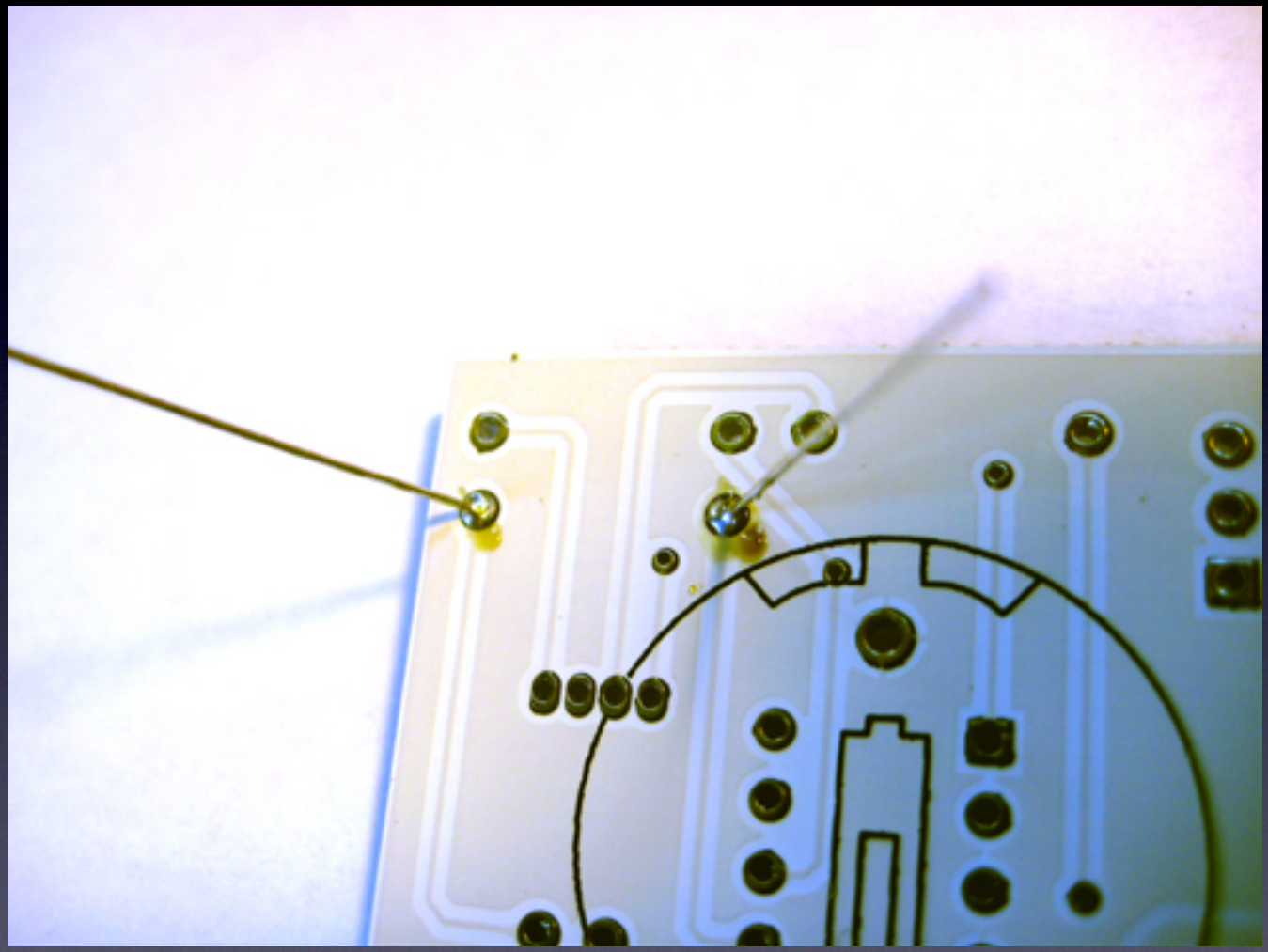
WAIT !

The Rhythm !

and speed (about 1 second per step)

Lift Tip

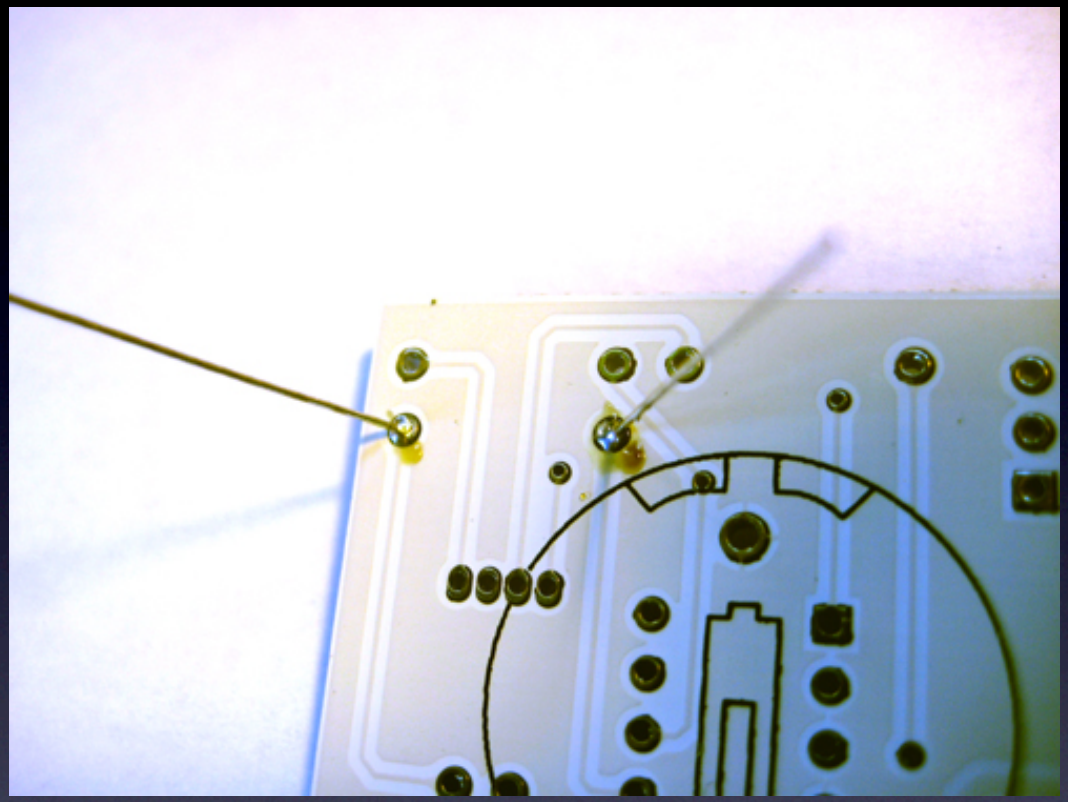
Solder all of the leads of the part to the board



For this part, there are two leads

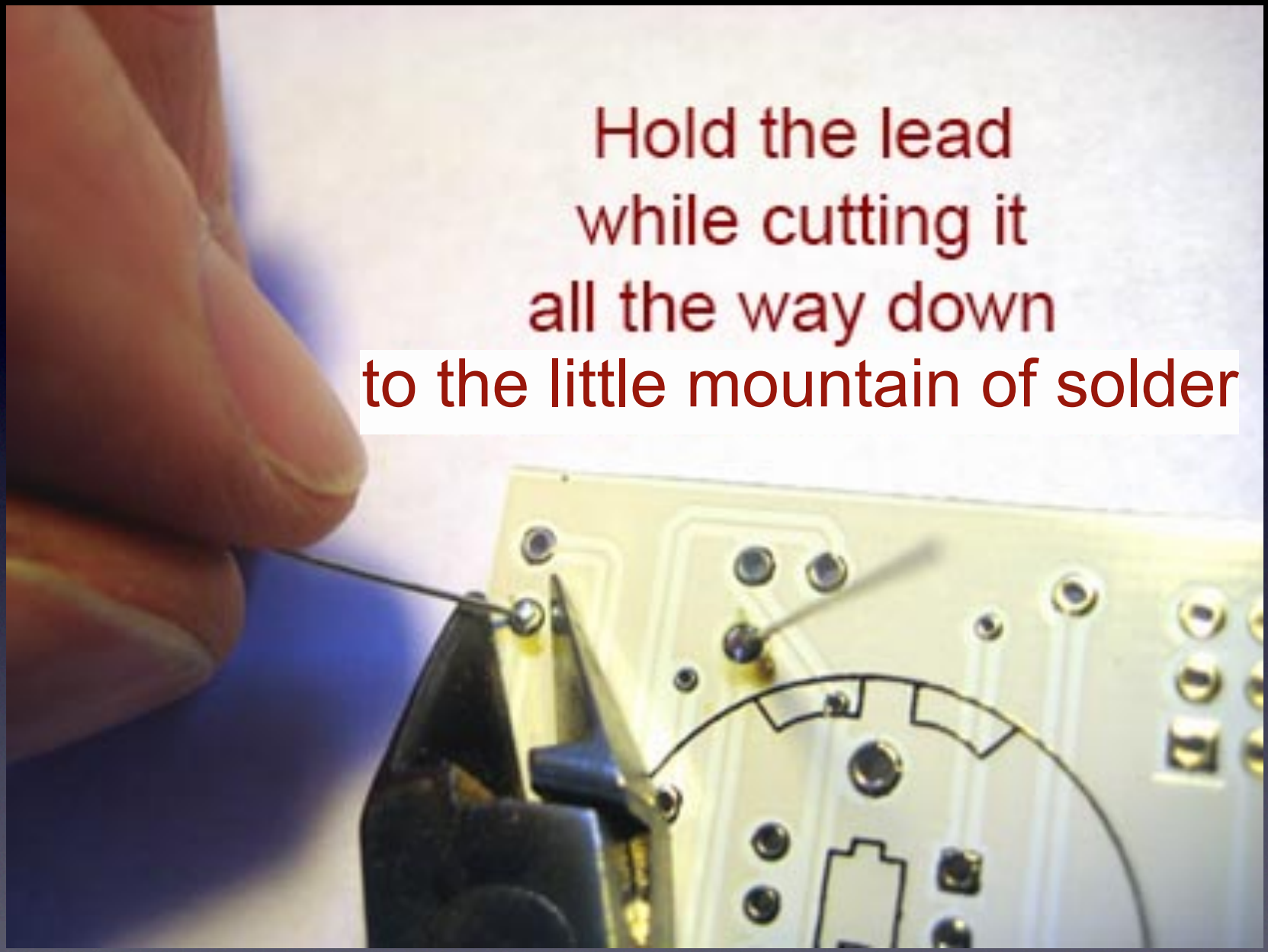
Here you can see two good solder connections

Two good solder connections



- Little mountains (not flat)
- Pads totally covered in solder
- Can’t see the hole
- No connections to other pads

Now cut the leads short



Cutting with the tip of the wire cutter gives you more control

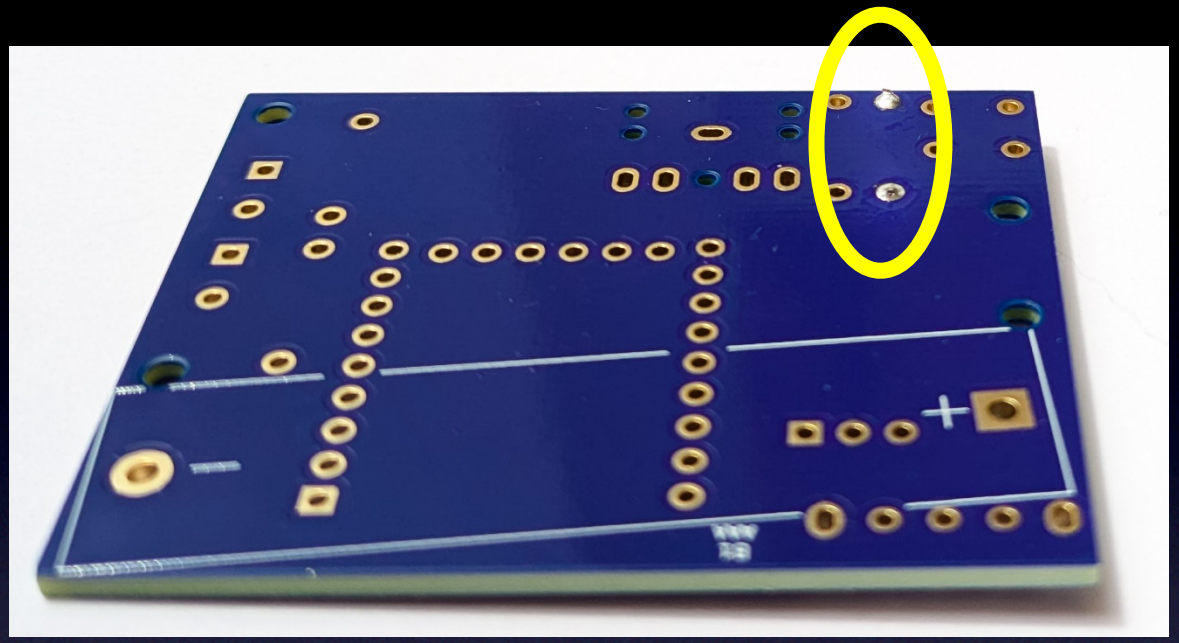
Safety Tip #3:

Hole or cover the lead !

(or it will fly into your eye!)

(They like doing that – so please hold or cover the lead when you cut.)

No wires sticking out



2 good solder connections

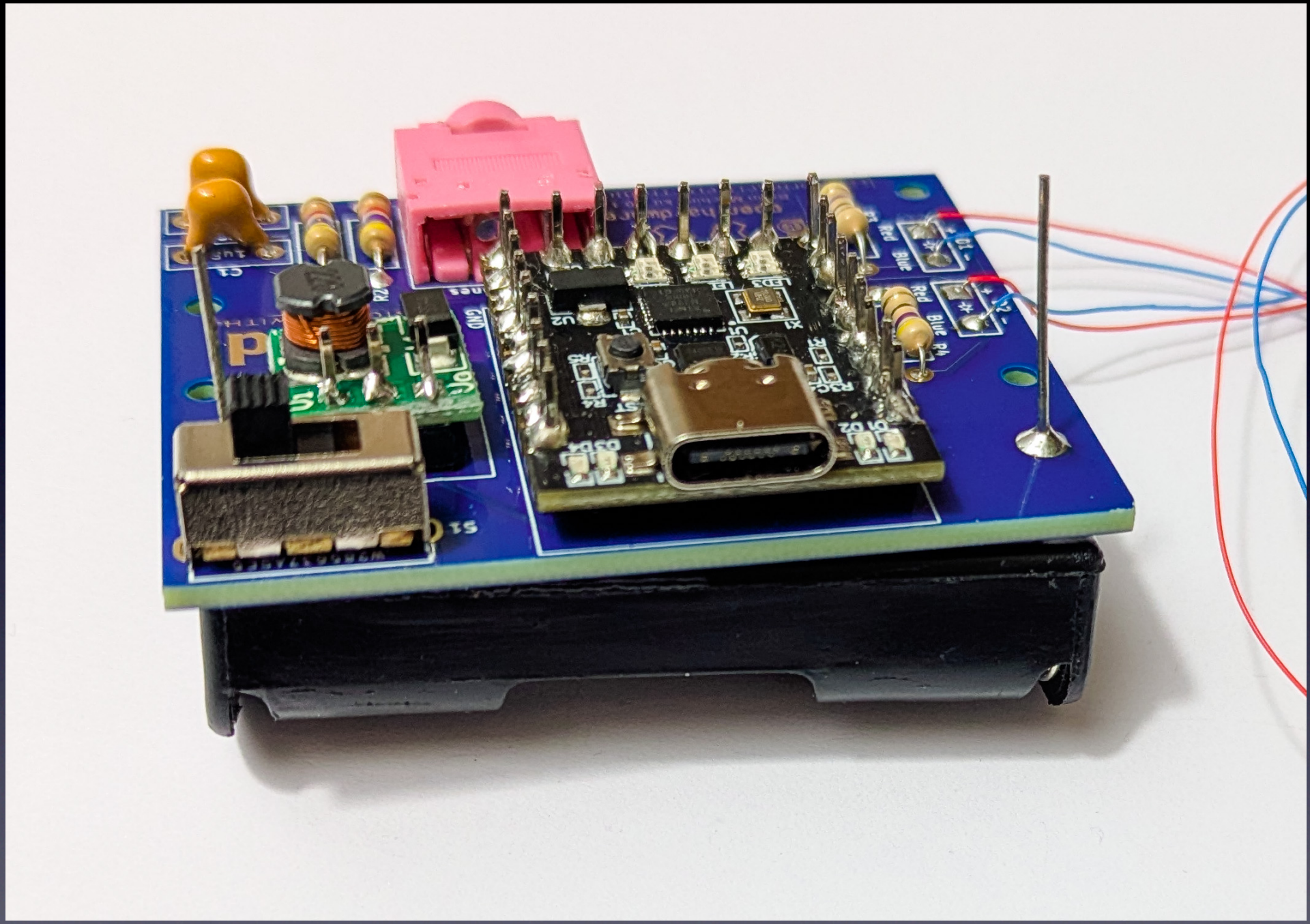
R1 soldered to the board

Notice that:

- Each connection is a small mountain (not flat)
- You cannot see any pad (they're totally covered with solder)
- You cannot see the holes (they're totally covered with solder)
- No connections to other pads

One part at a time

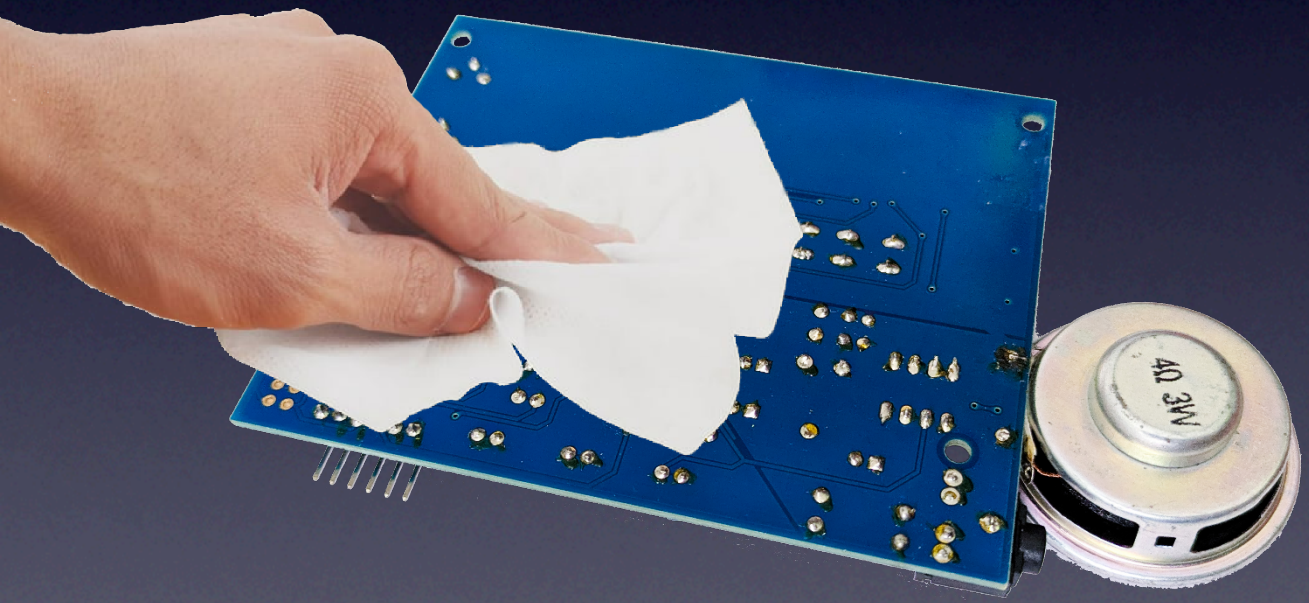
Till all the parts are soldered



And it will look like this when you're done soldering.

If you used any *flux paste for re-working problems*

The bottom of the PCB will be sticky from the flux



You can clean it with a cloth wet with Isopropyl Alcohol

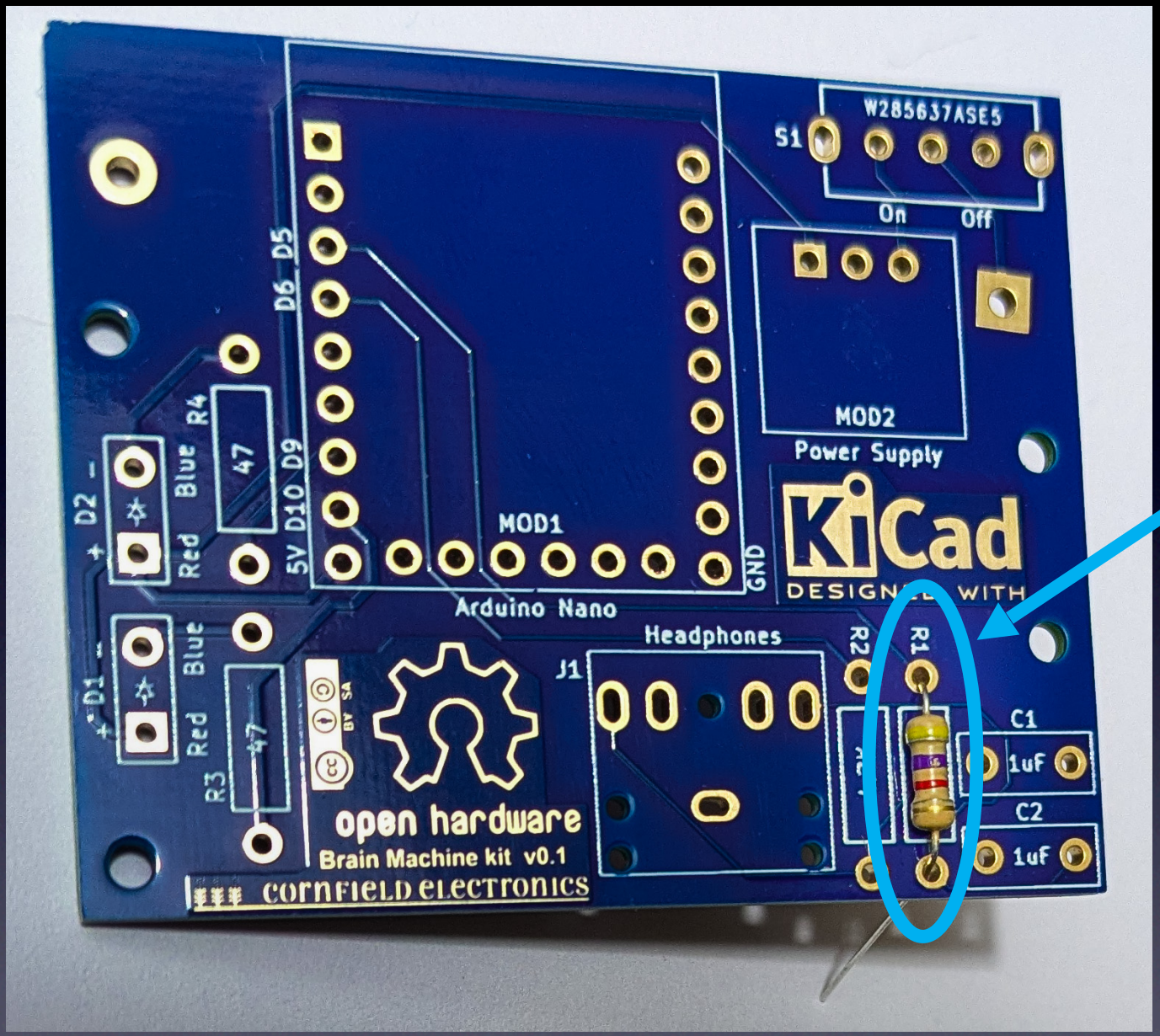
Then put in the batteries,

Turn it on,

And it works!

(Or you start debugging.)

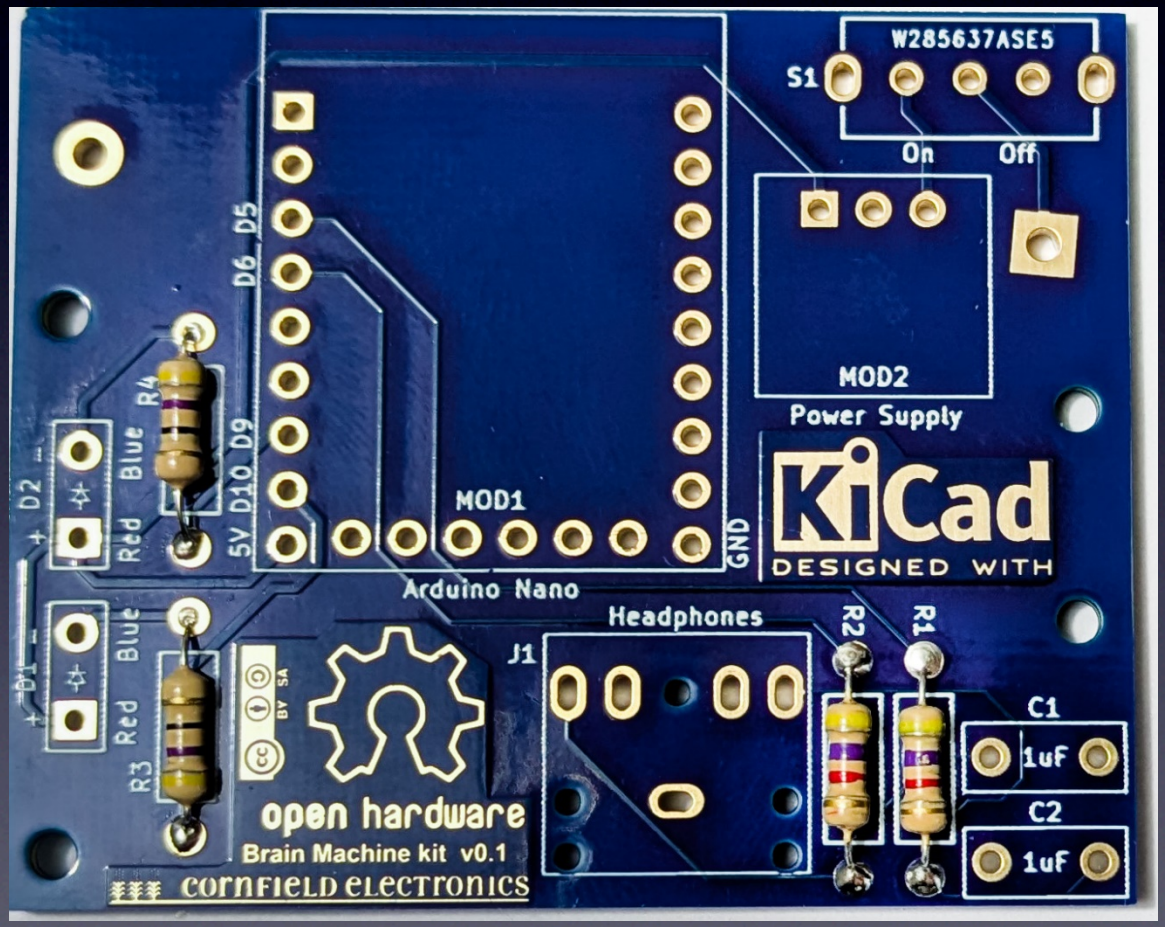
Let’s start!



If you haven't done so already, solder R1: Yellow, Violet, Red

R1, R2:  4.7K: Yellow, Violet, Red

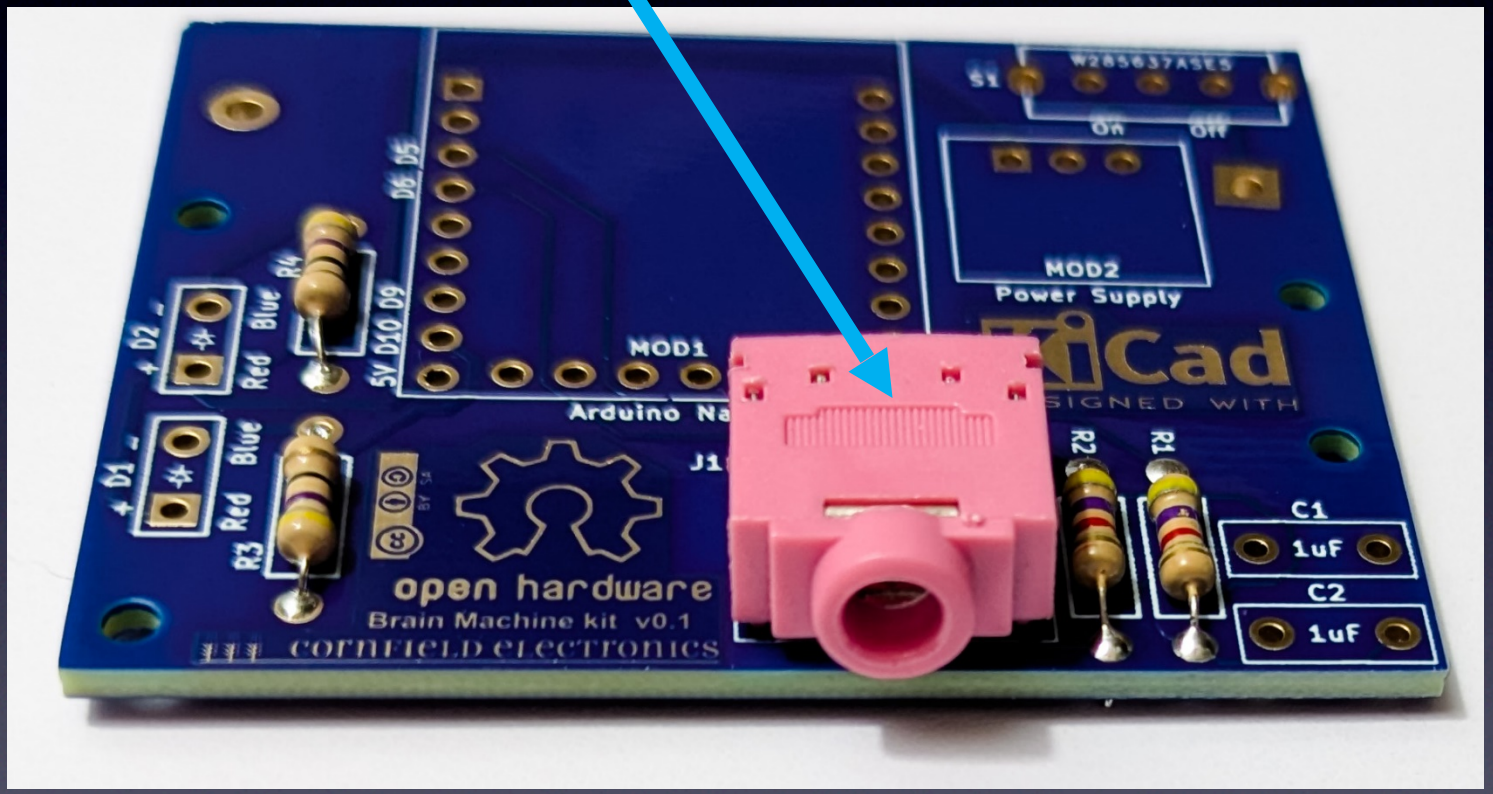
R3, R4:  47: Yellow, Violet, Black



Direction does not matter

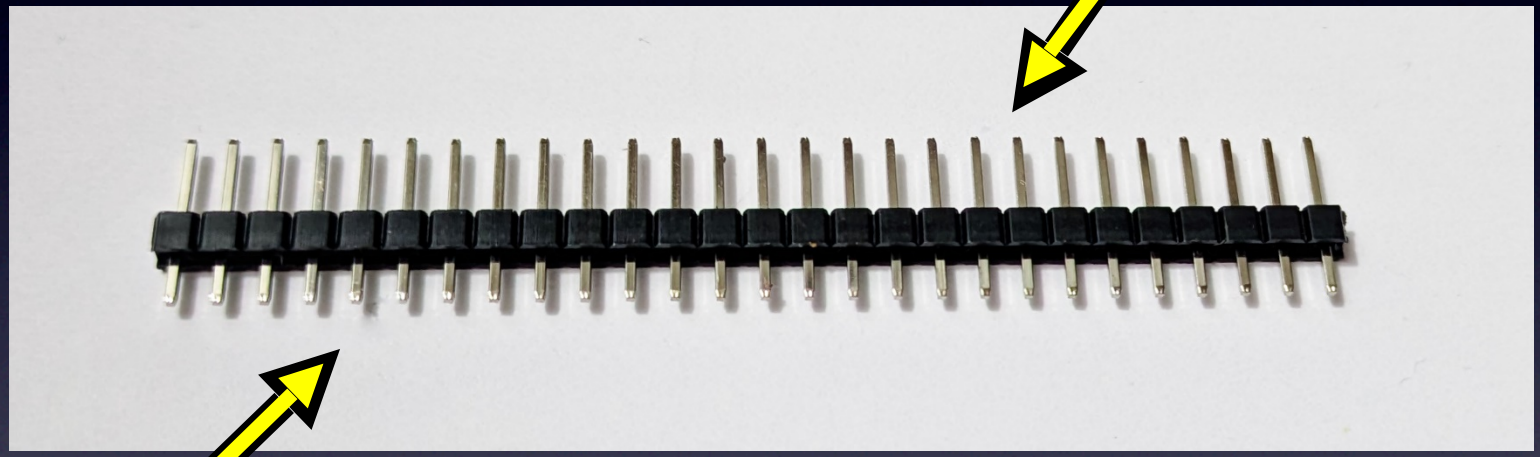
All 4 resistors

J1: Headphone Jack



Pin Headers

long pins



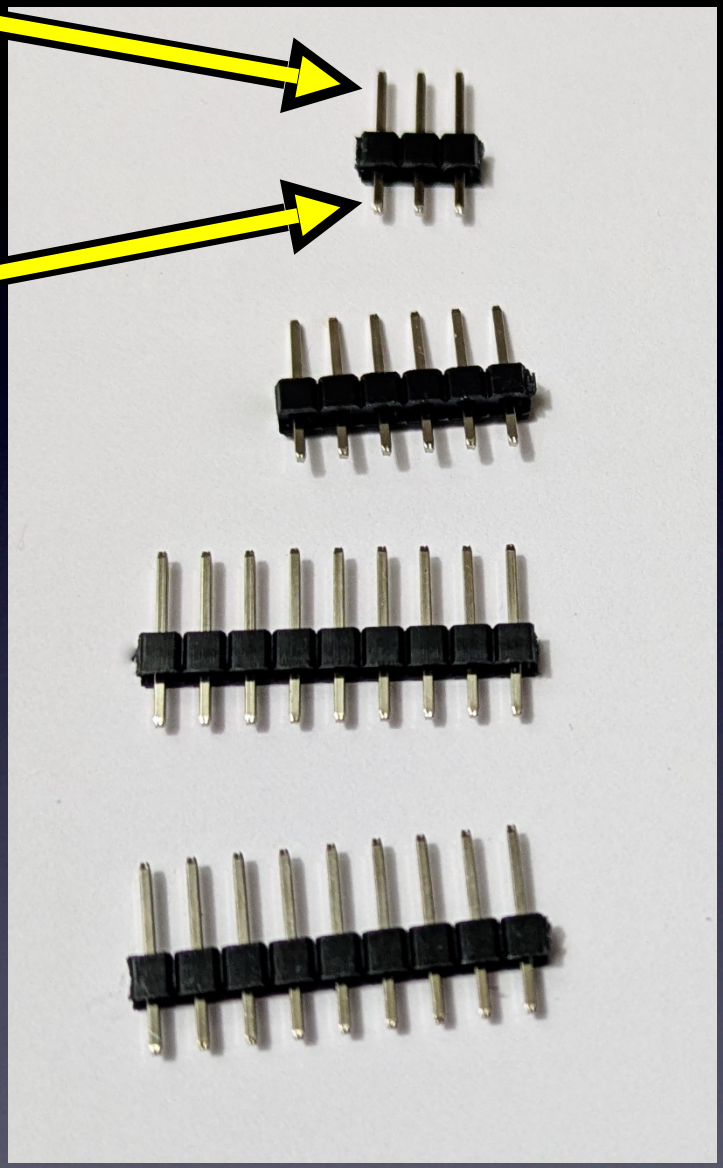
27 pins

short pins

Pin Headers

long pins

short pins



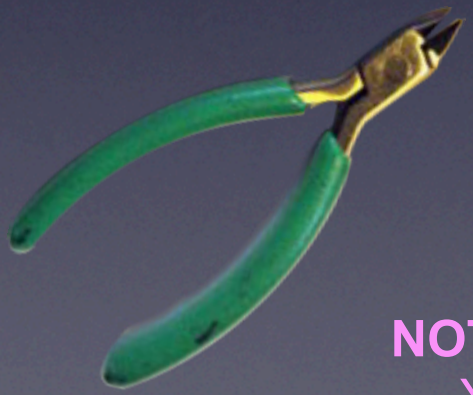
3 pins

6 pins

9 pins

9 pins

Use wire cutters

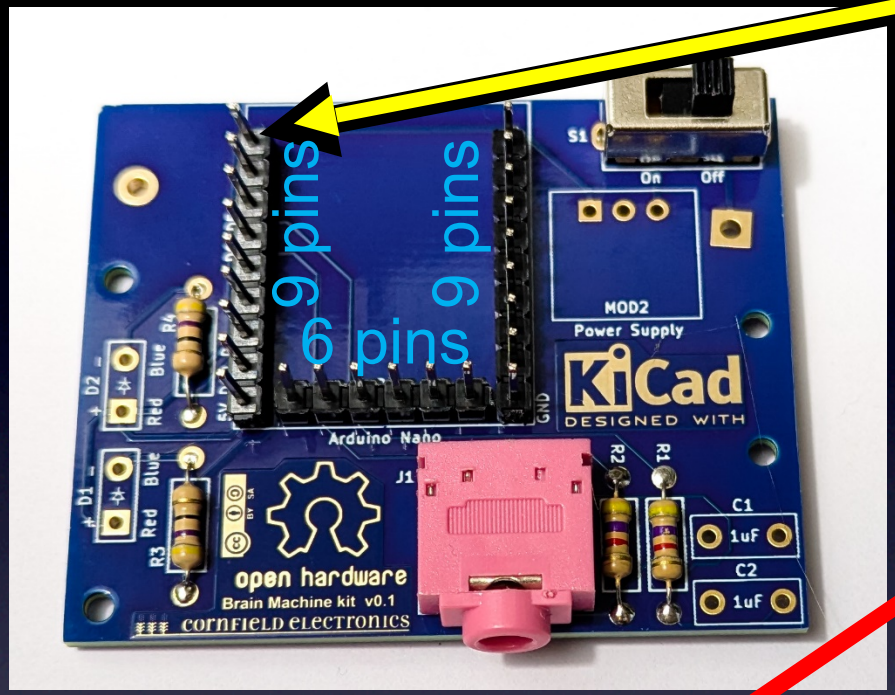


NOTE:

Your kit may have pins headers in the bag with the microcontroller

Pin Headers for Arduino Nano

long pins sticking up



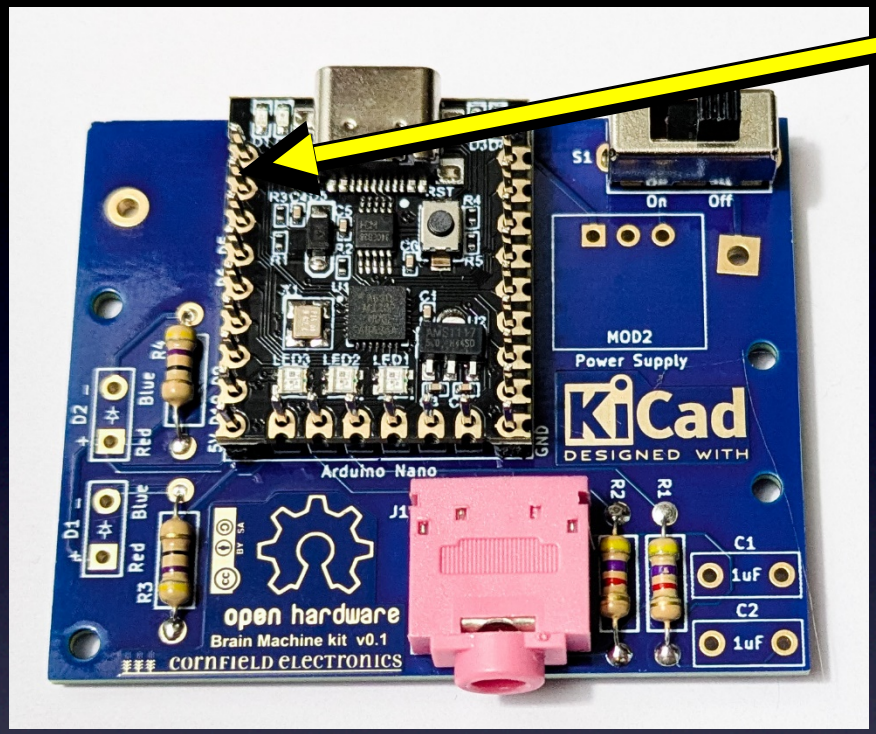
IMPORTANT !

→ **Short pins go into the board !** ←

→ **Do Not solder, yet** ←

NOTE: *The next few photos show the switch soldered in place.*
But it is easier to add it later — you will see the slide for it soon…

Arduino Nano placed on its pins

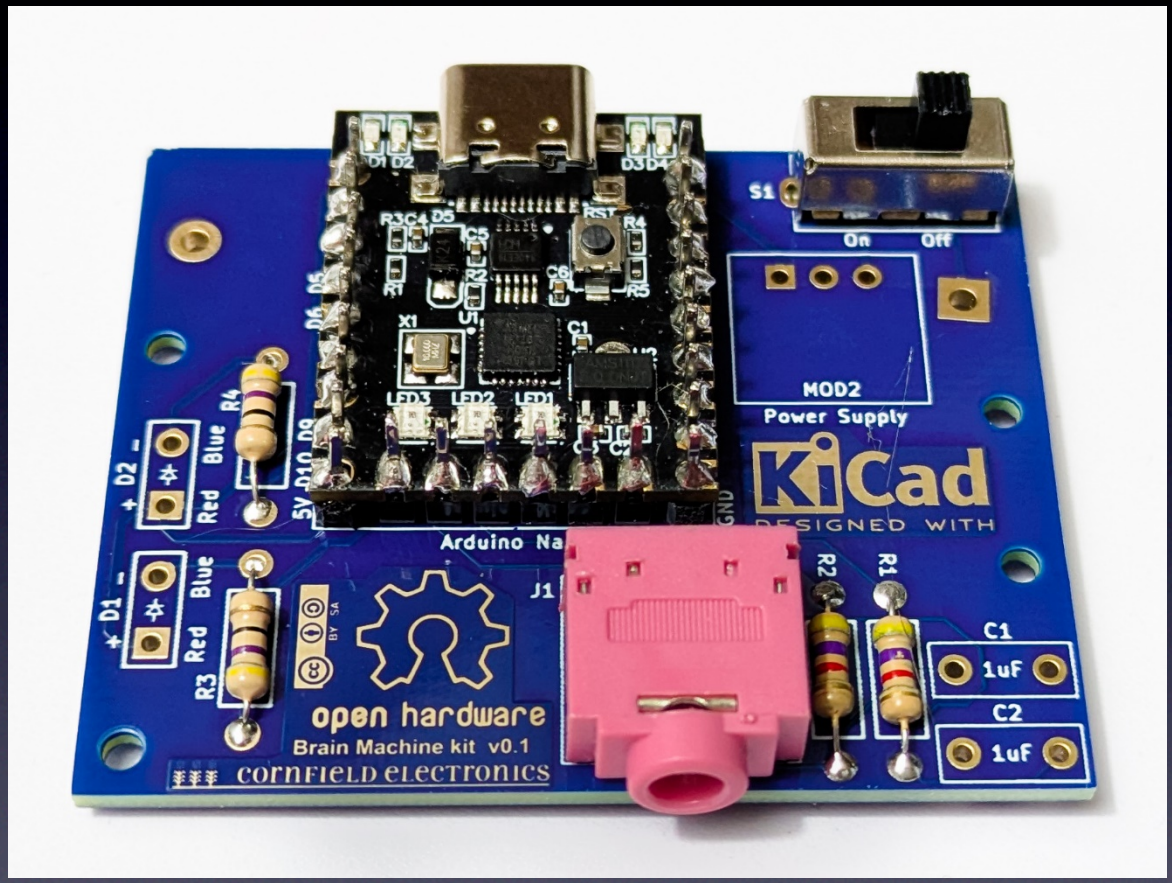


long pins sticking up

→ Short pins go into the board ! ←

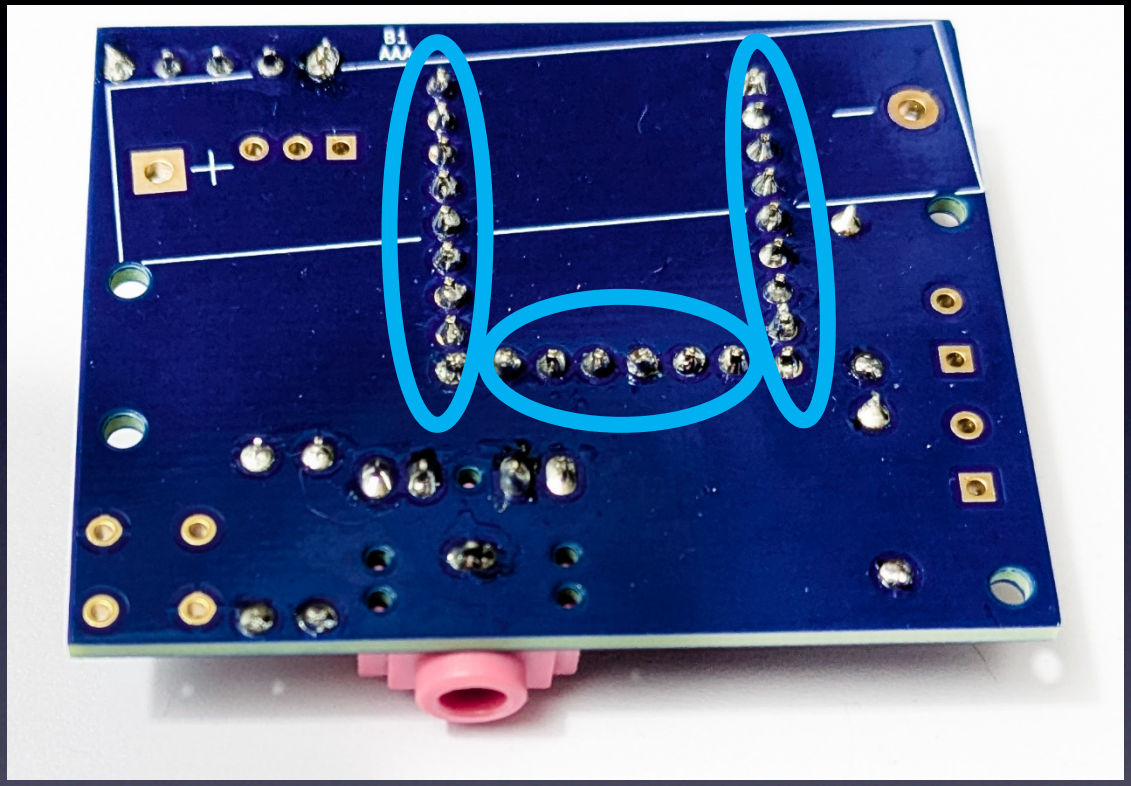
NOTE: *The next few photos show the switch soldered in place.*
But it is easier to add it later — you will see the slide for it soon…

Arduino Nano soldered to its pins



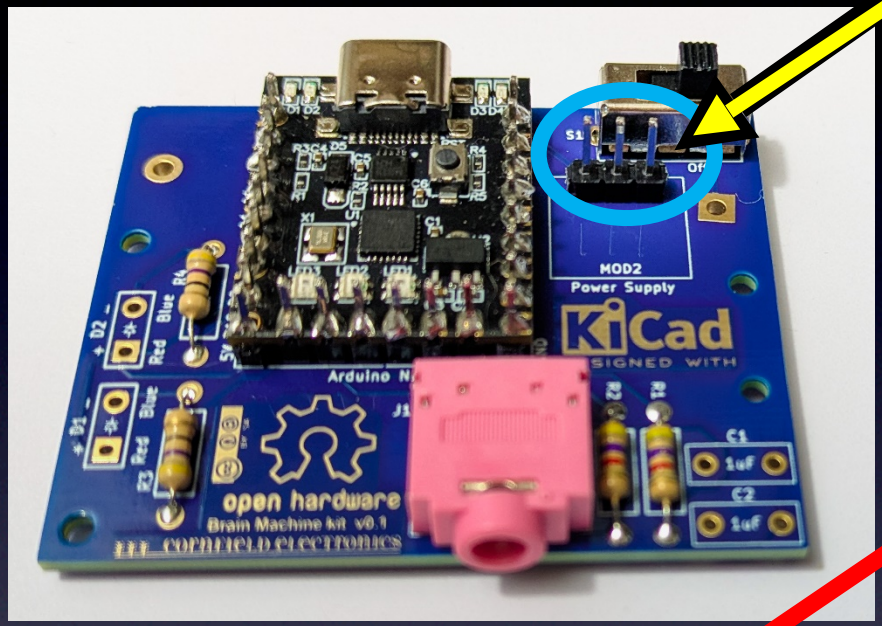
NOTE: *The next few photos show the switch soldered in place.*
But it is easier to add it later — you will see the slide for it soon…

Arduino Nano soldered to board



Pin Headers for Power Supply

long pins sticking up



3 pins

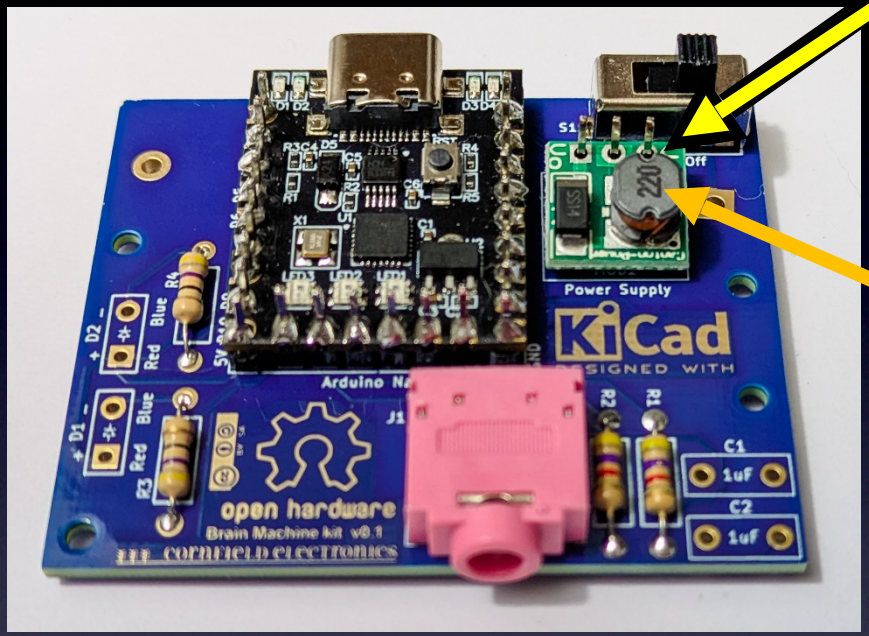
IMPORTANT !

→ **Short pins go into the board !** ←

→ **Do Not solder, yet** ←

NOTE: *The next few photos show the switch soldered in place.*
But it is easier to add it later — you will see the slide for it soon…

Power Supply placed on its pins

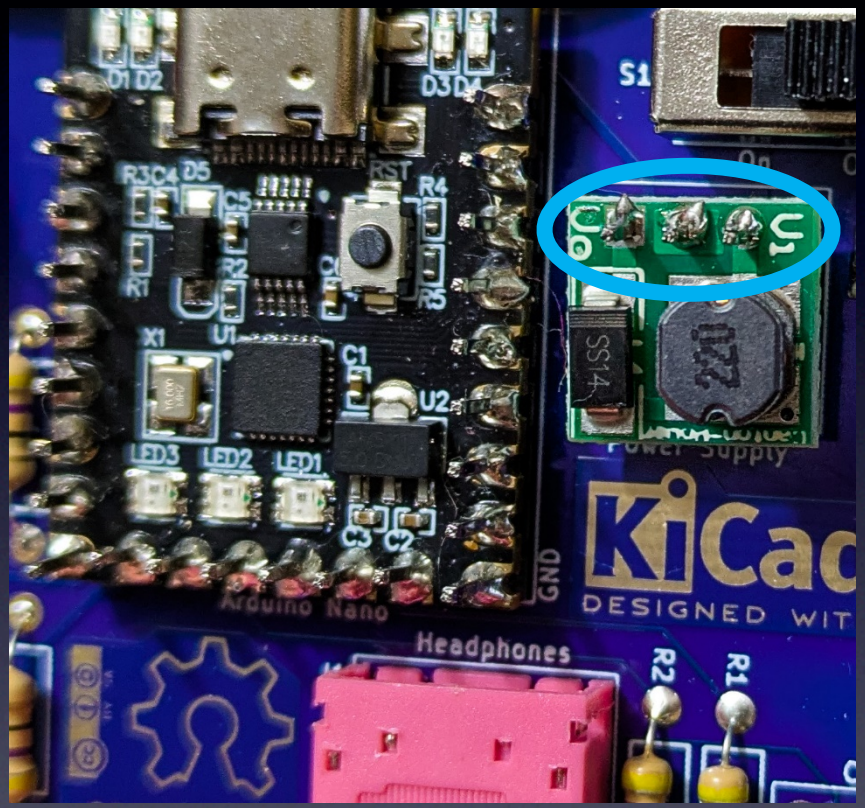


→ IMPORTANT: Power Supply ***must*** go in this way ! ←

(coil is facing up)

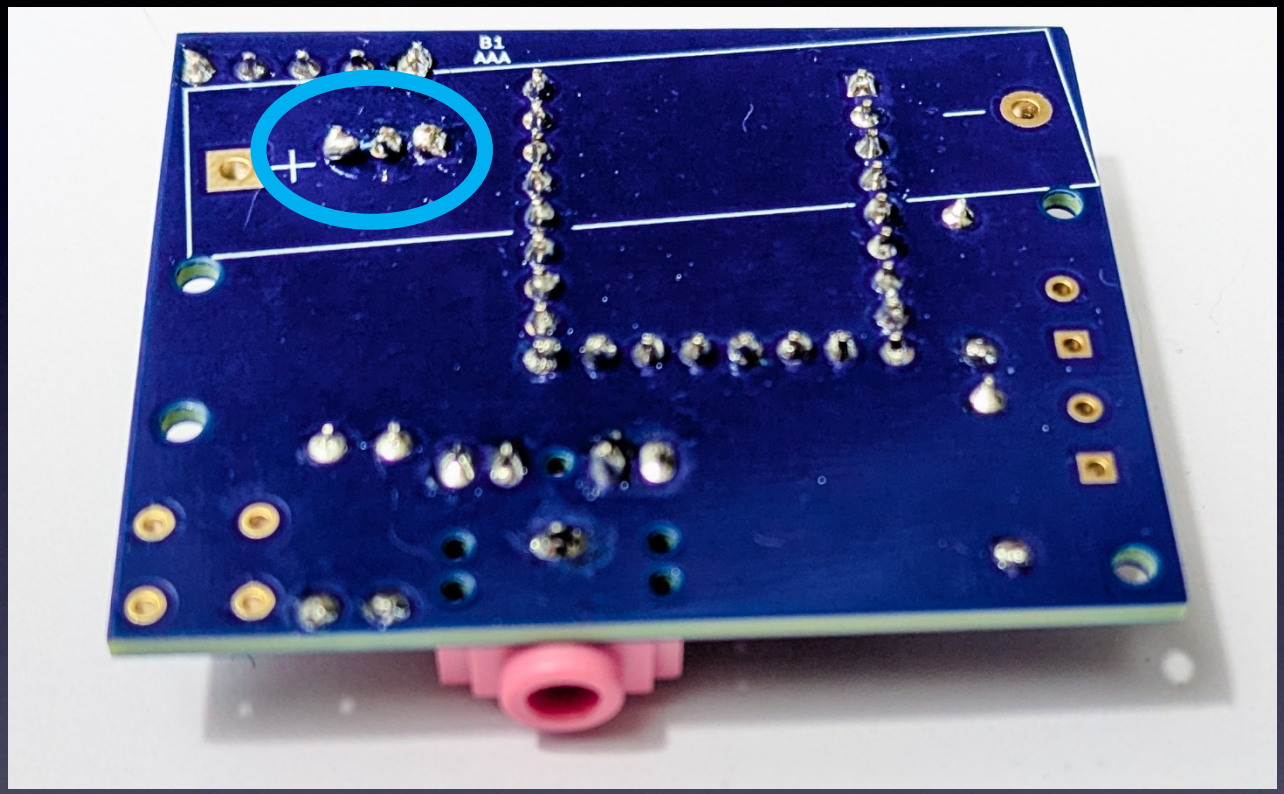
NOTE: *The next few photos show the switch soldered in place.*
But it is easier to add it later — you will see the slide for it soon…

Power Supply soldered to its pins



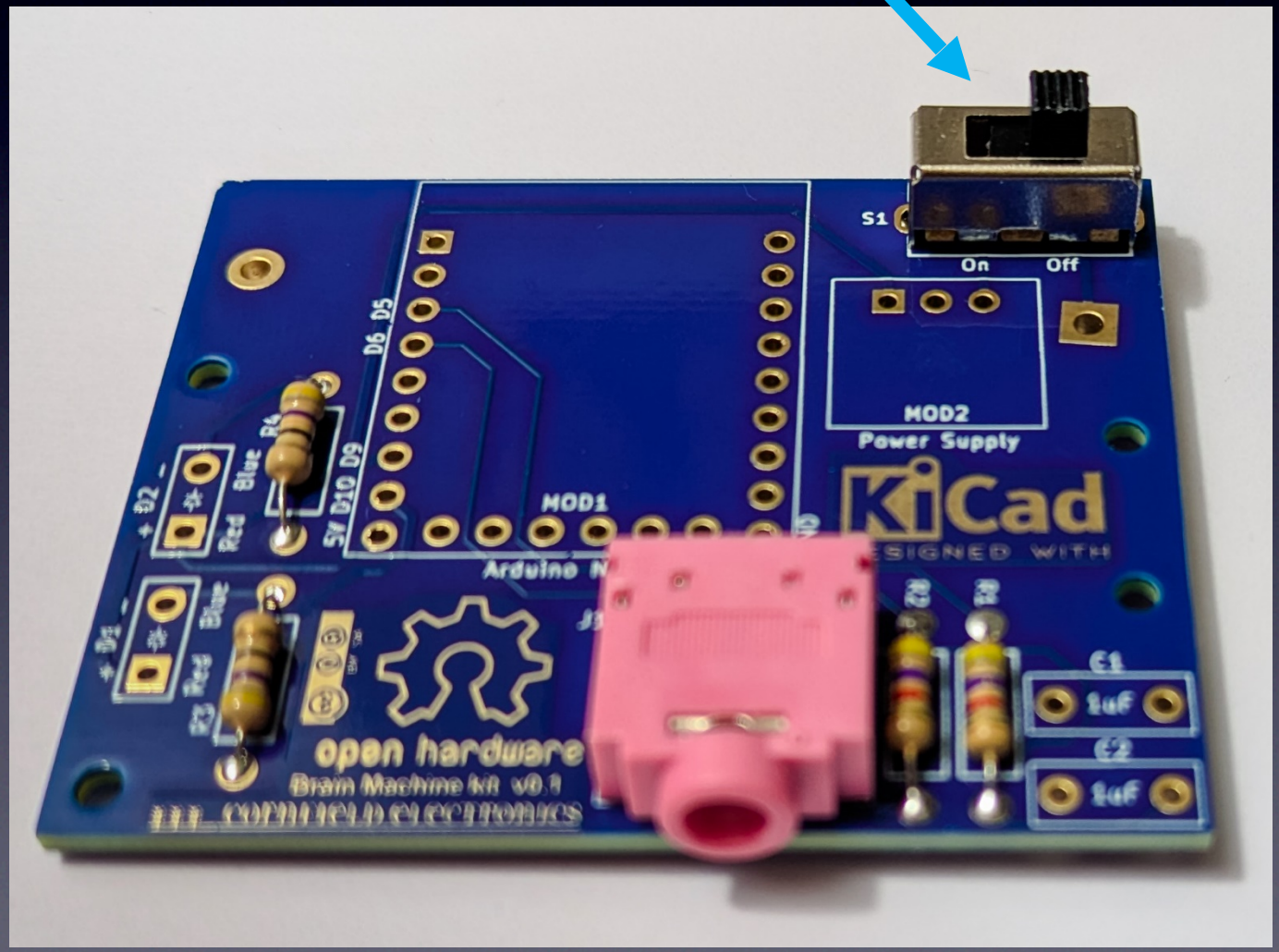
NOTE: *The next few photos show the switch soldered in place.*
But it is easier to add it later — you will see the slide for it soon…

Power Supply soldered to board

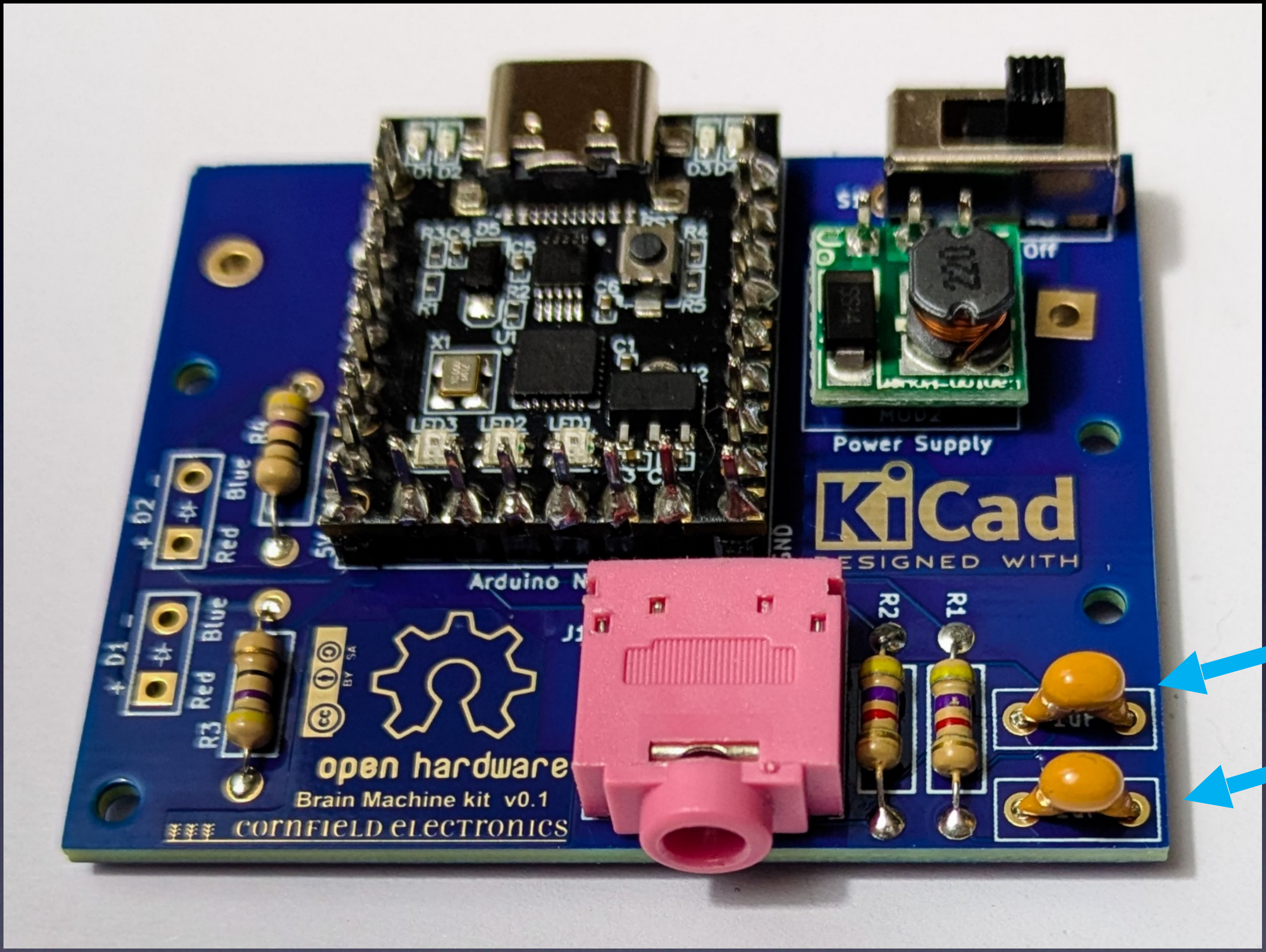


S1: On/Off switch

Now is the best time to solder in the switch



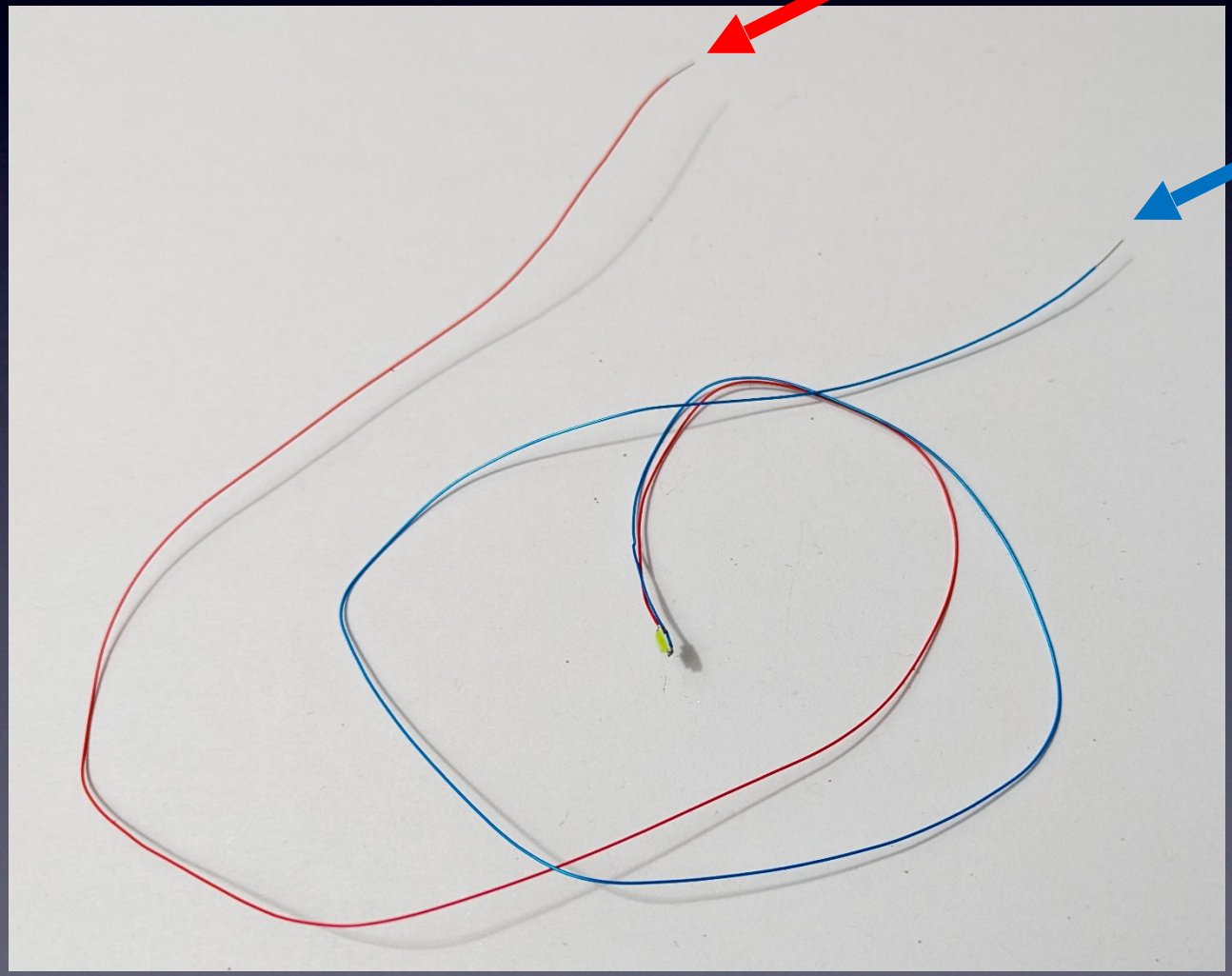
Direction does not matter



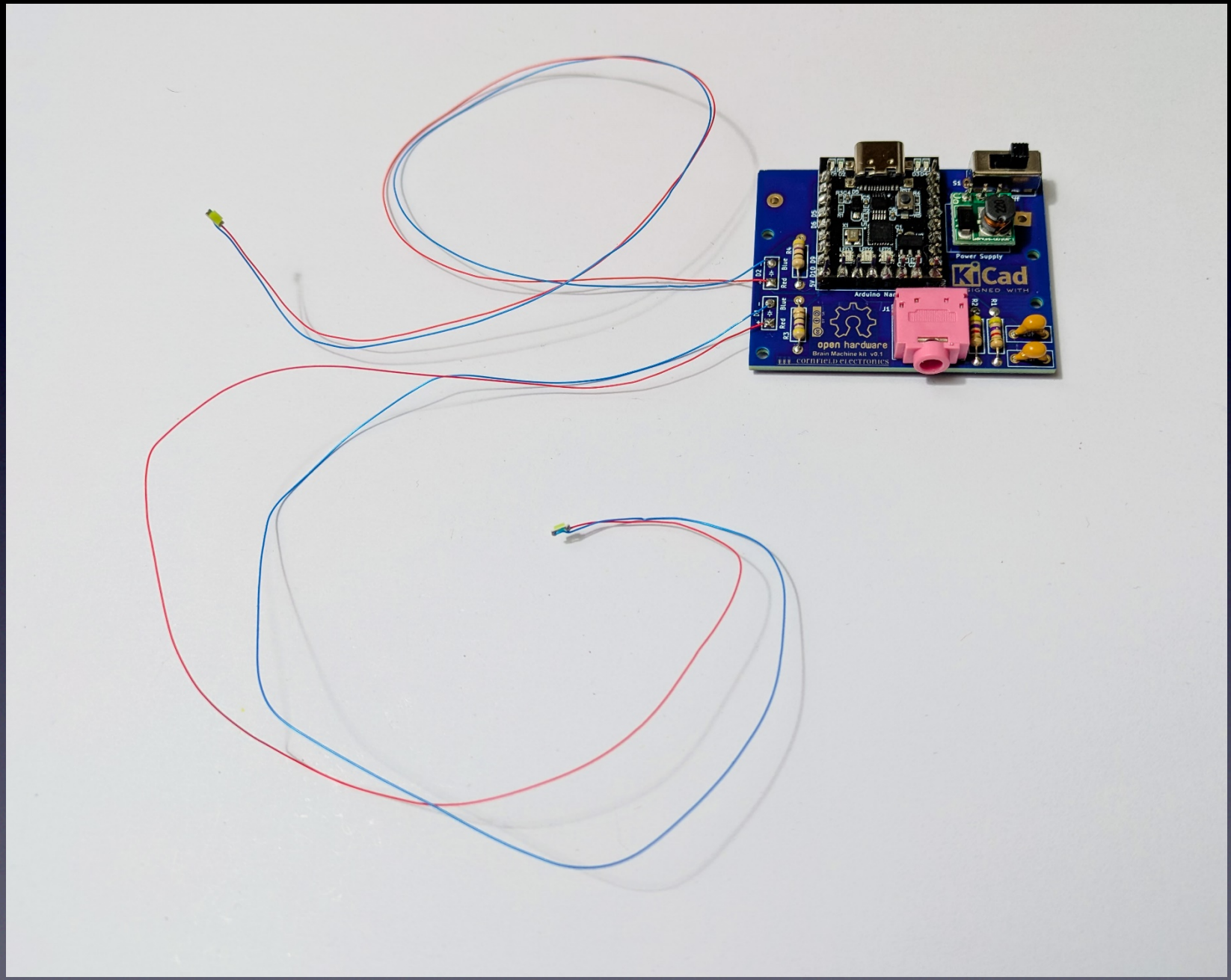
Direction does not matter

C1, C2

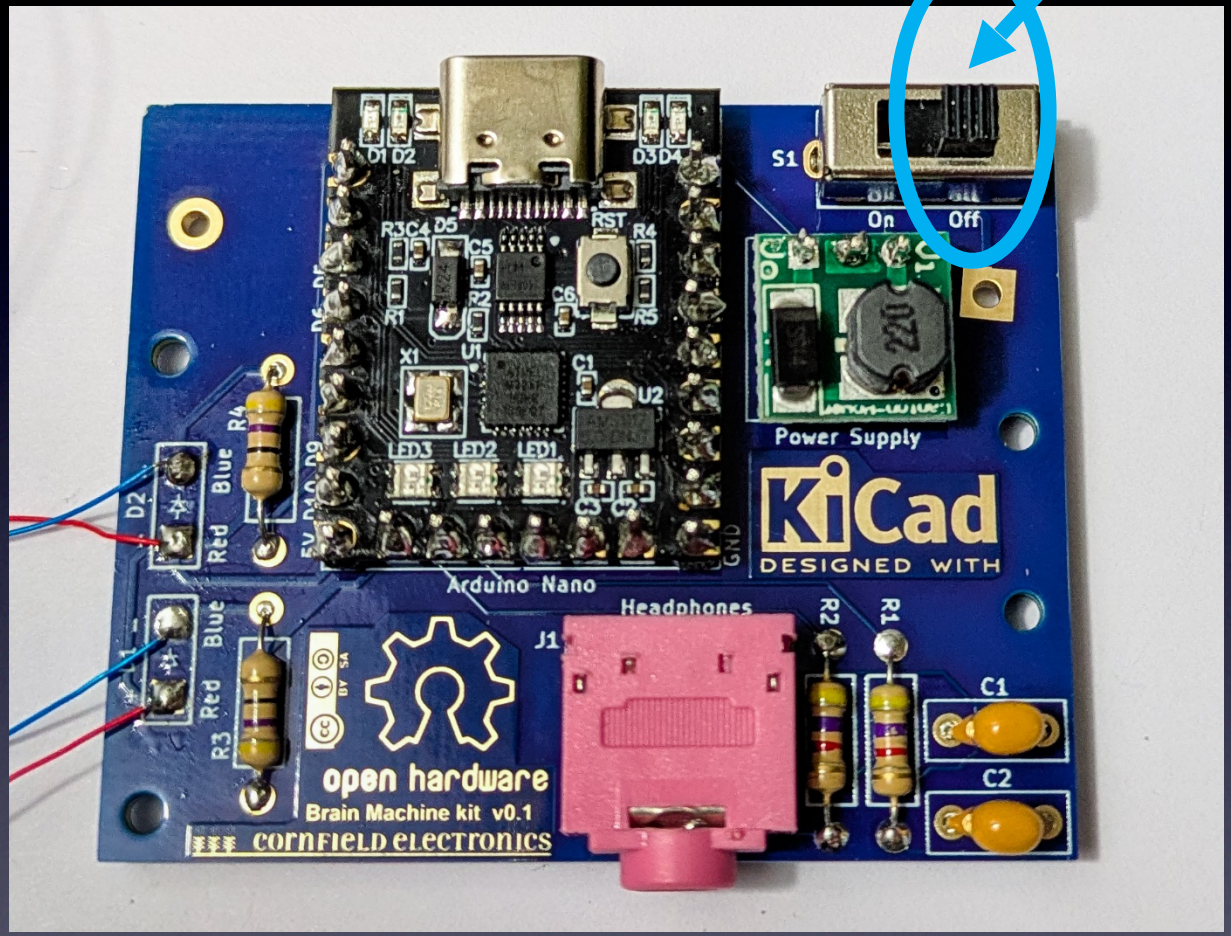
LED1 and LED2:
Red wire
and
Blue wire



LED1, LED2 soldered to board



Let’s Test !



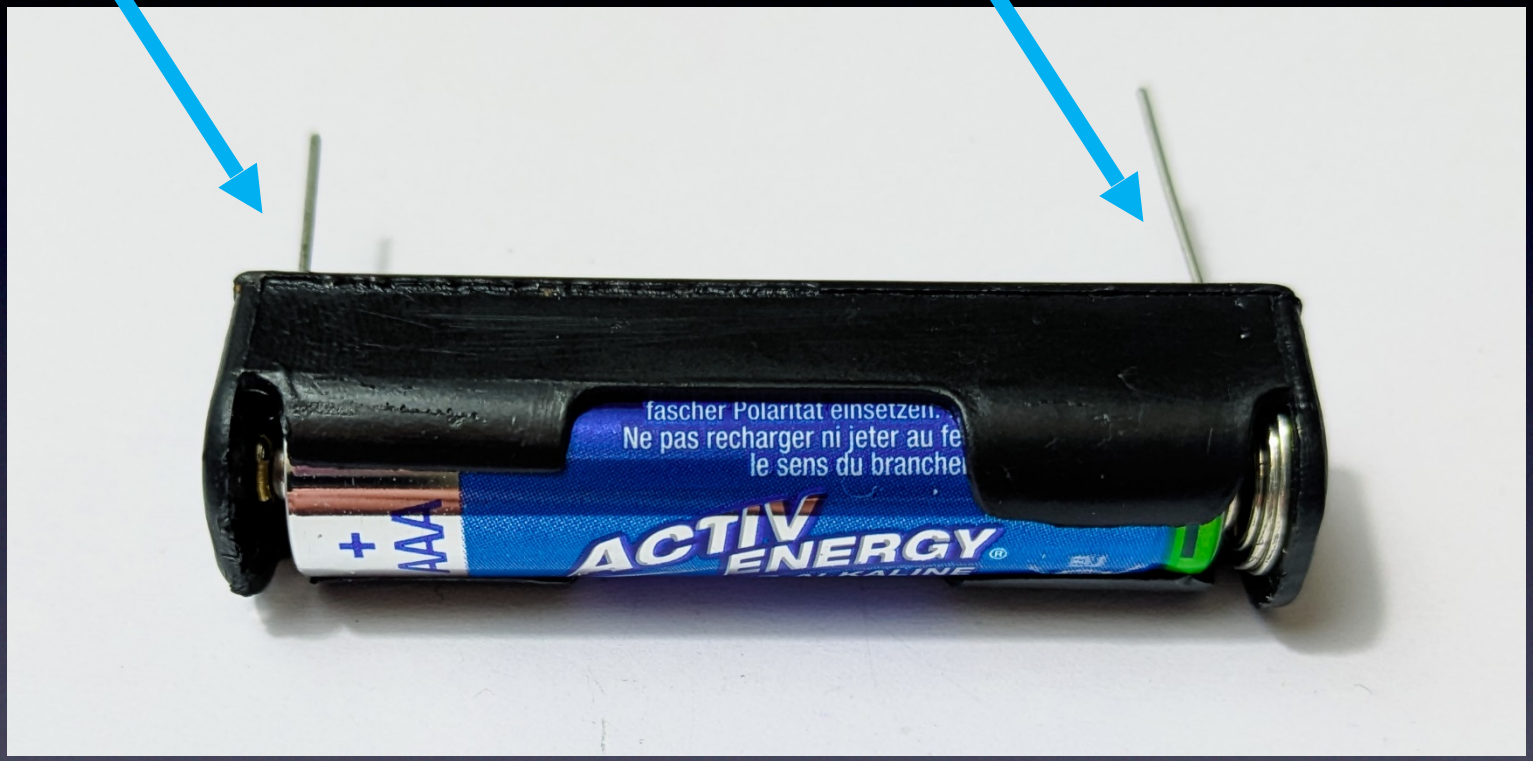
S1 in OFF position

Let's Test !

"+"

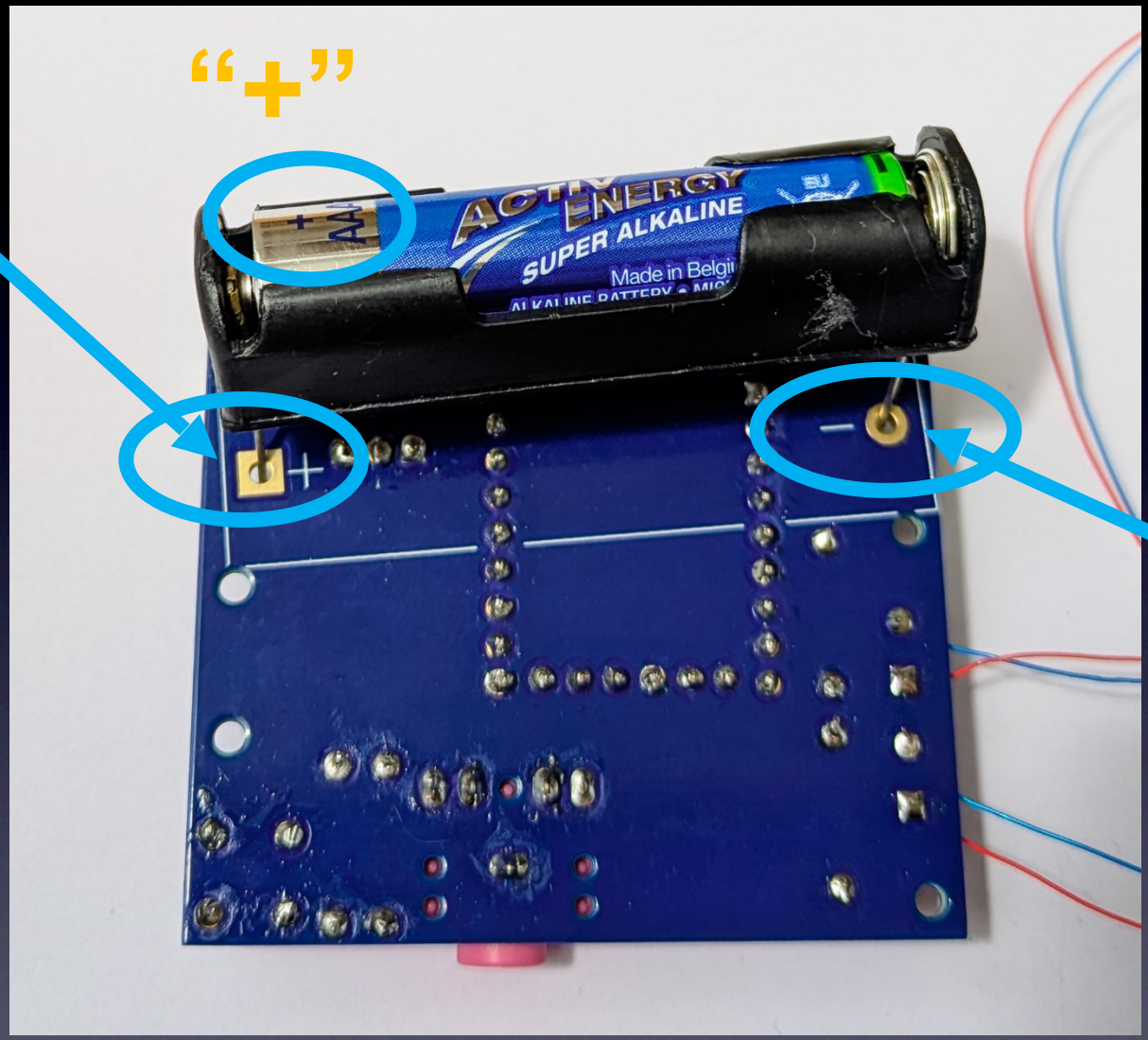
"-"

(spring)



AAA Battery in its holder

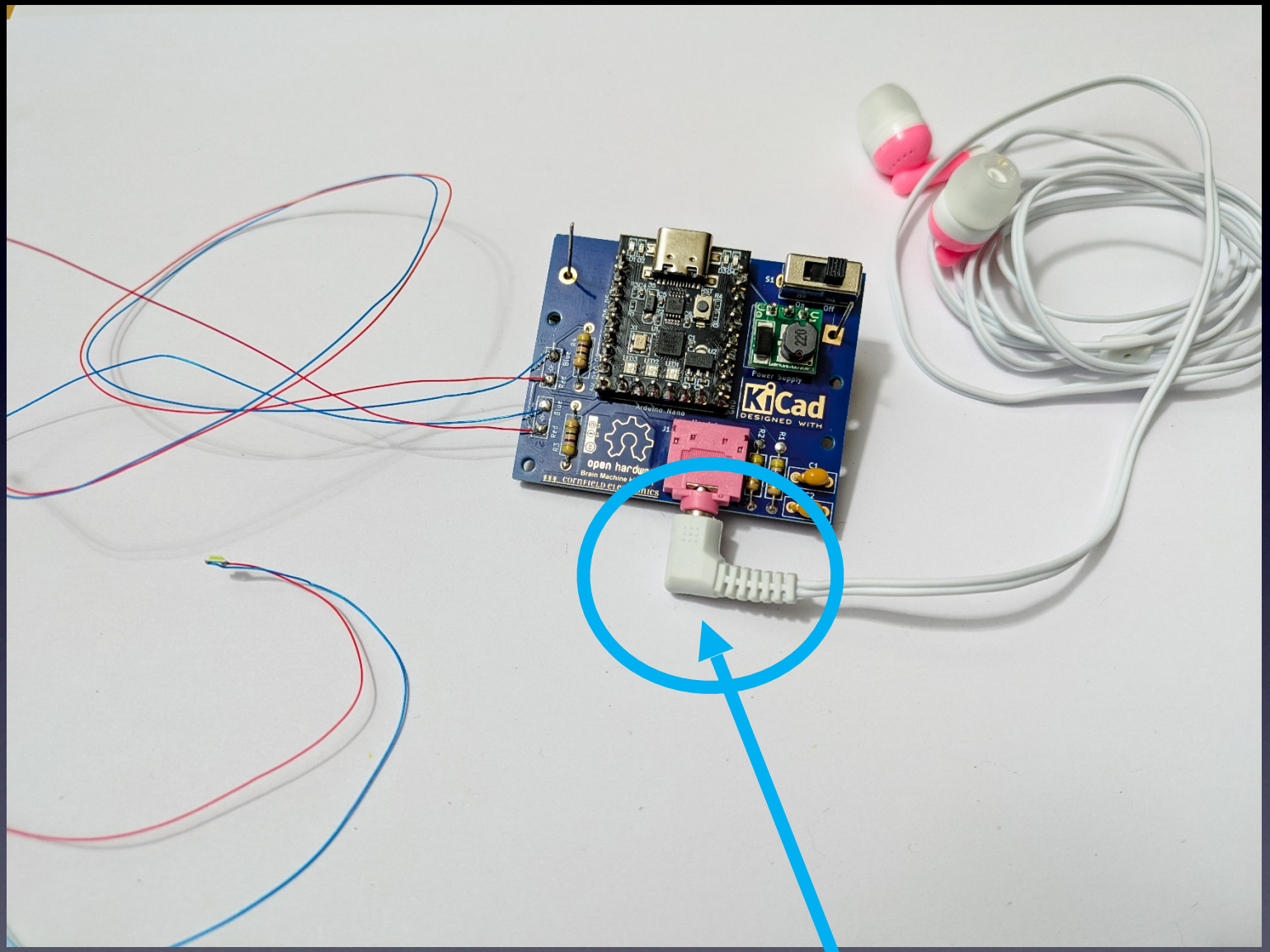
Let's Test !



Place AAA Battery holder in place

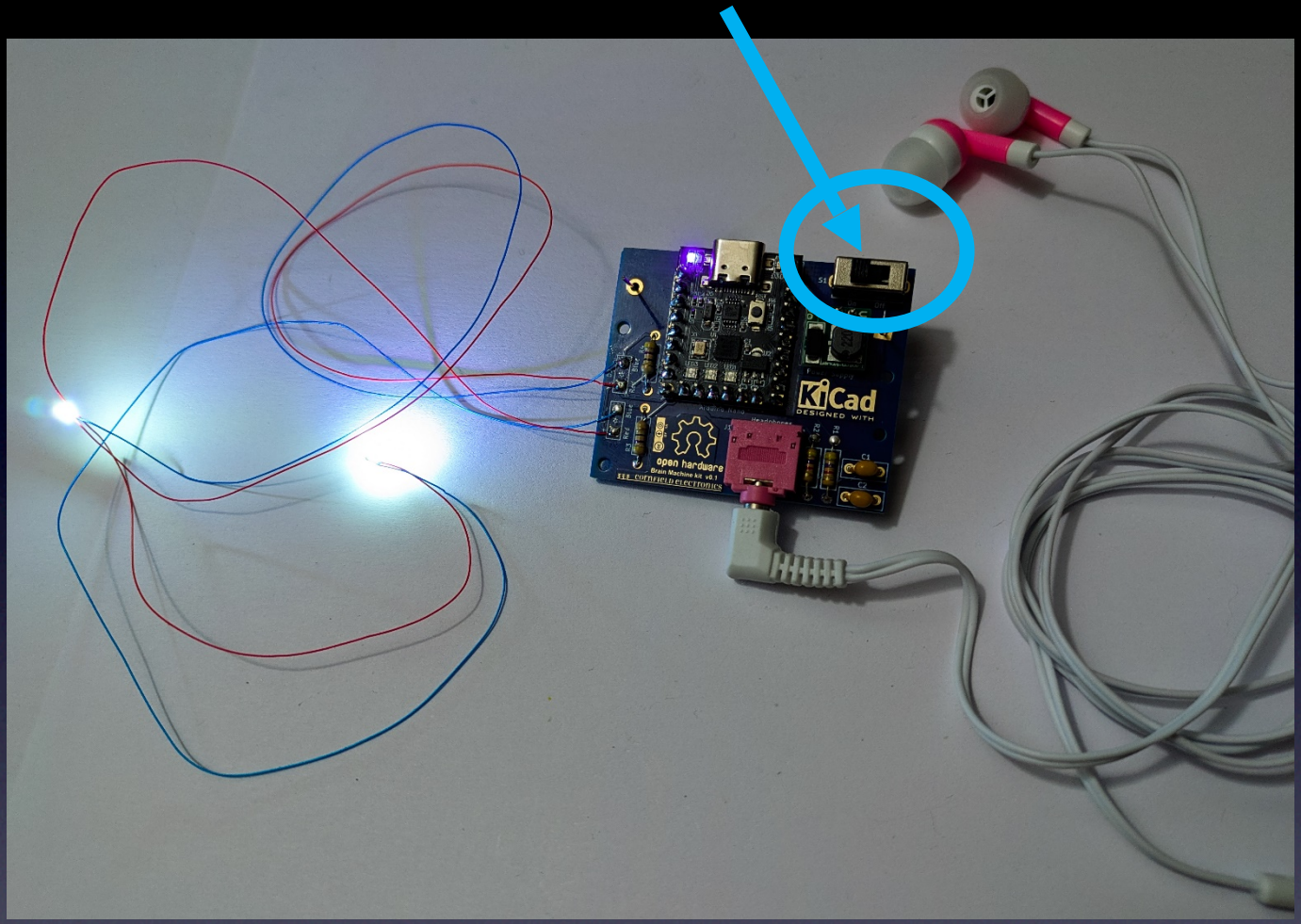
→ Do Not solder, yet ←

Let’s Test !



Insert Earbuds

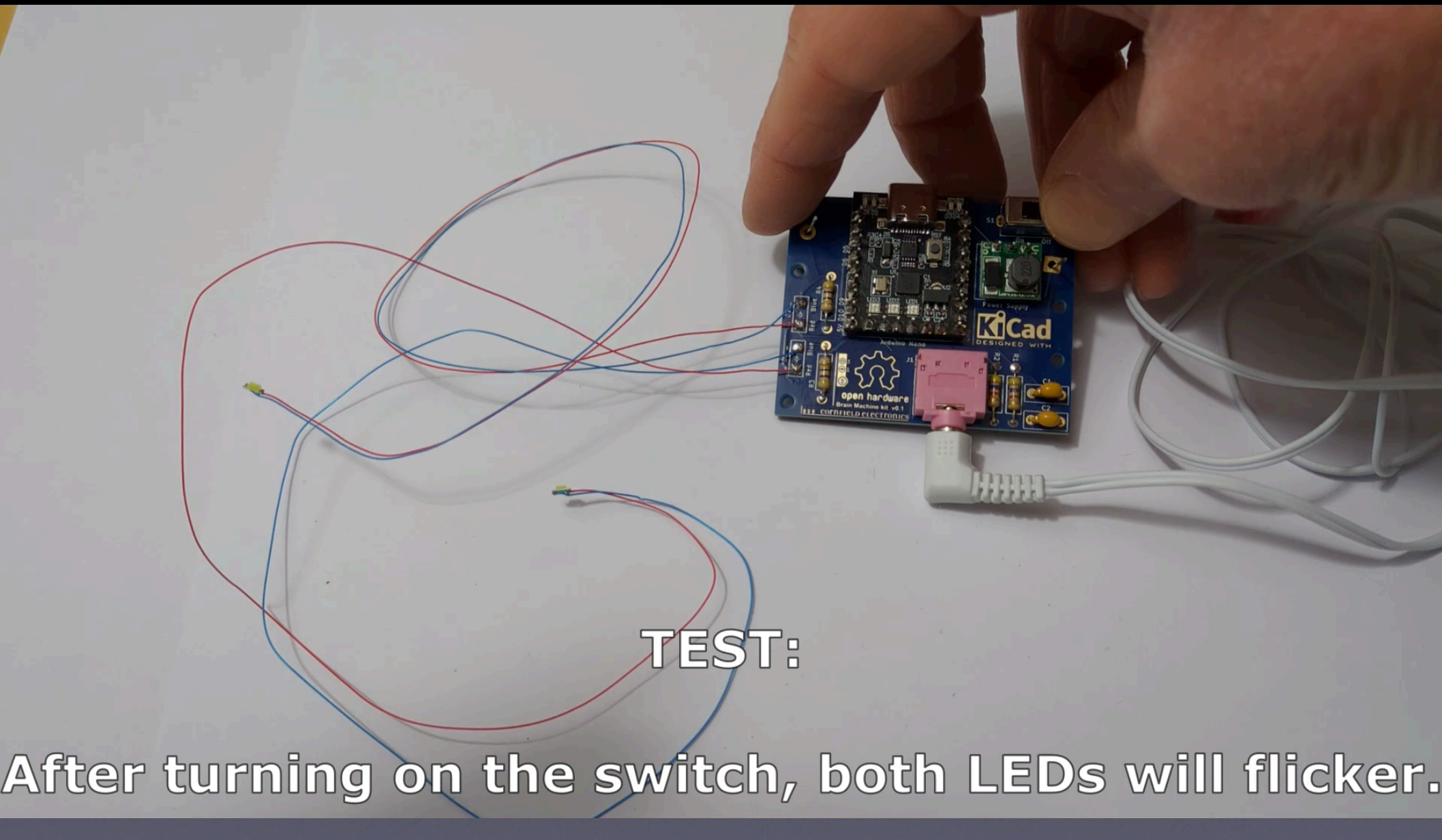
Let’s Test !



Turn ON

* LEDs flicker
* Each ear has a different pitch

Let’s Test !



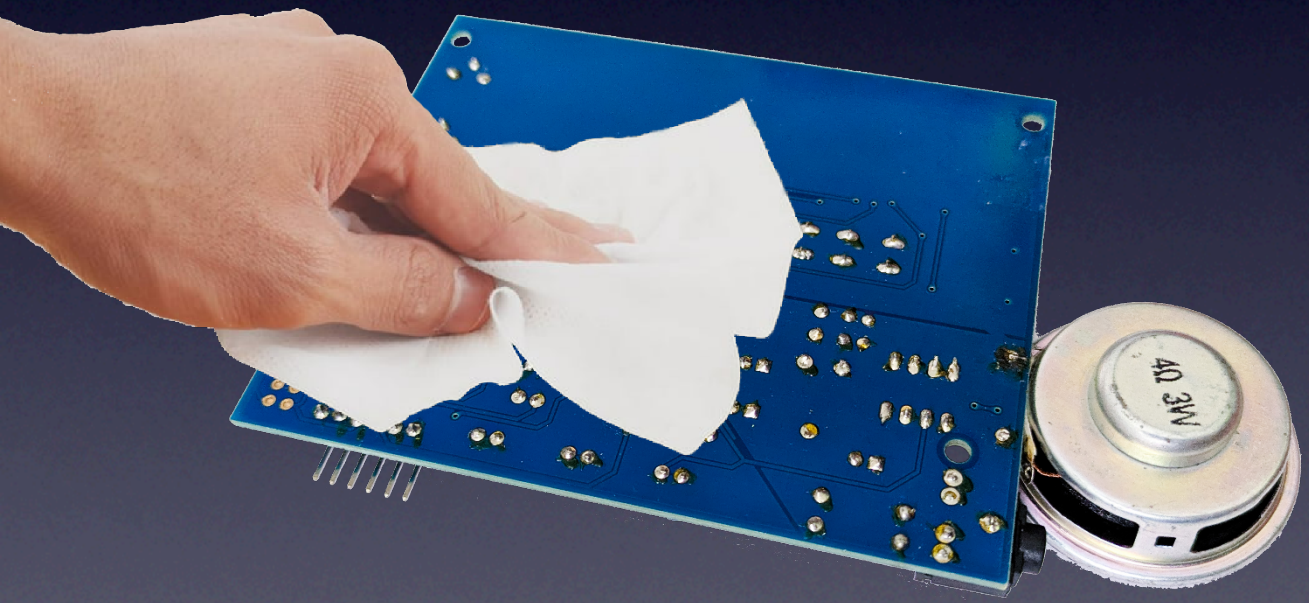
TEST:

After turning on the switch, both LEDs will flicker.

Video

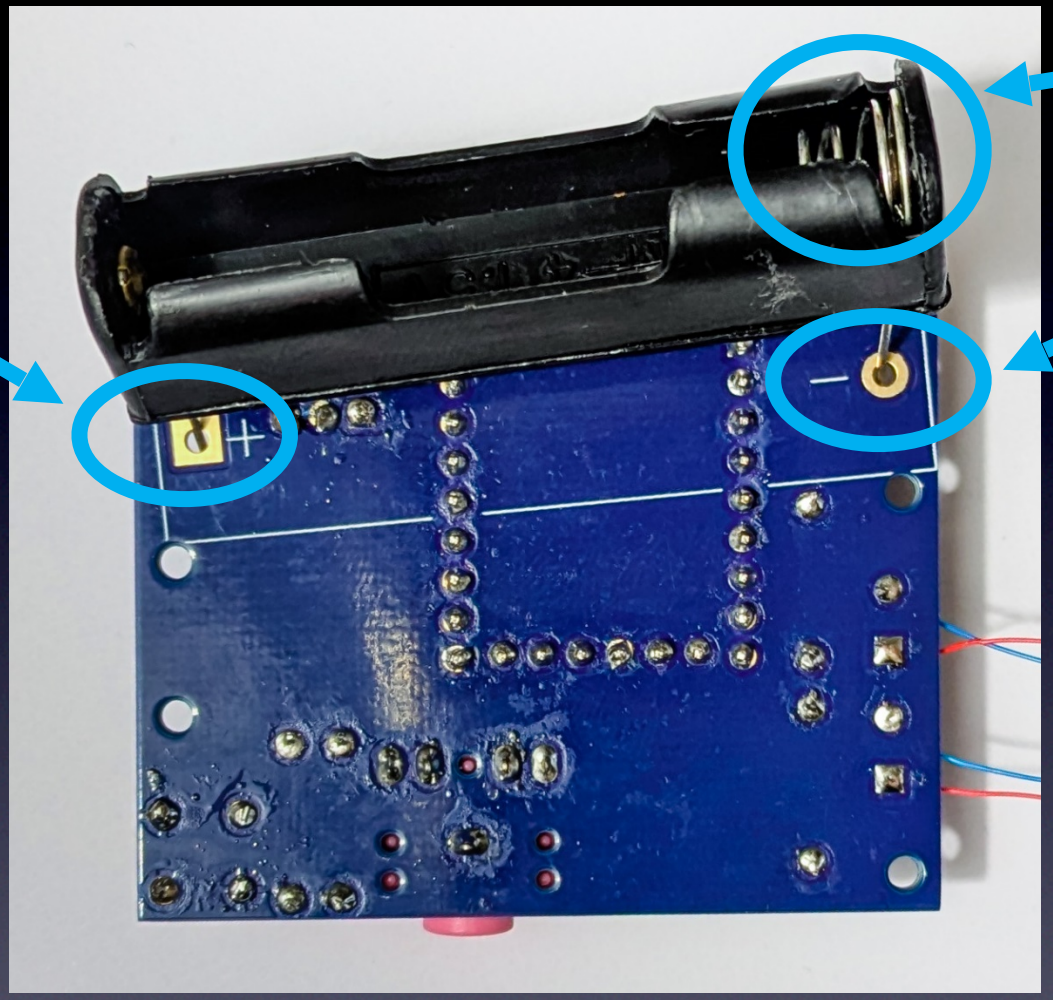
If you used any *flux paste for re-working problems*

The bottom of the PCB will be sticky from the flux

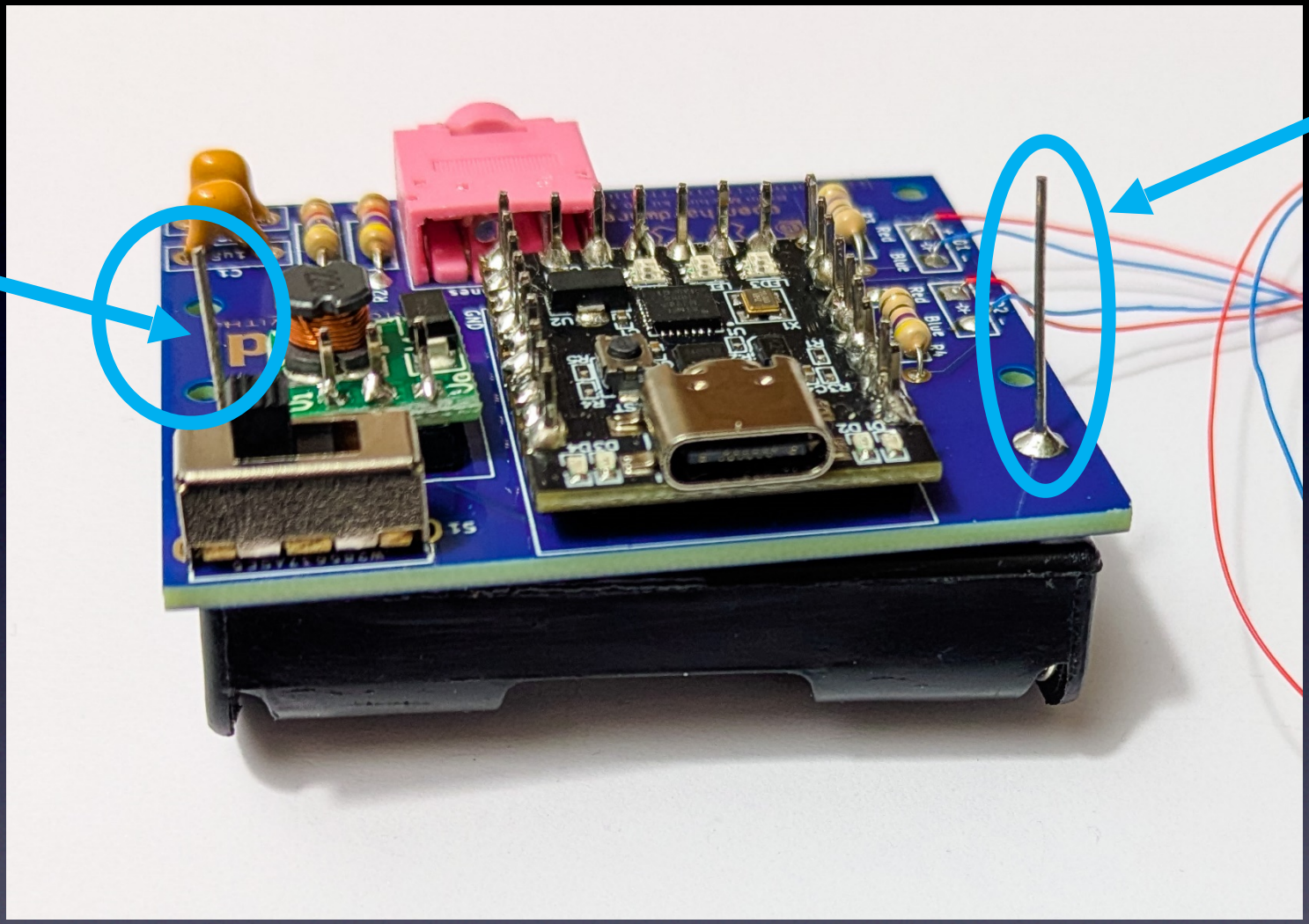


You can clean it with a cloth wet with Isopropyl Alcohol

Insert Battery Holder



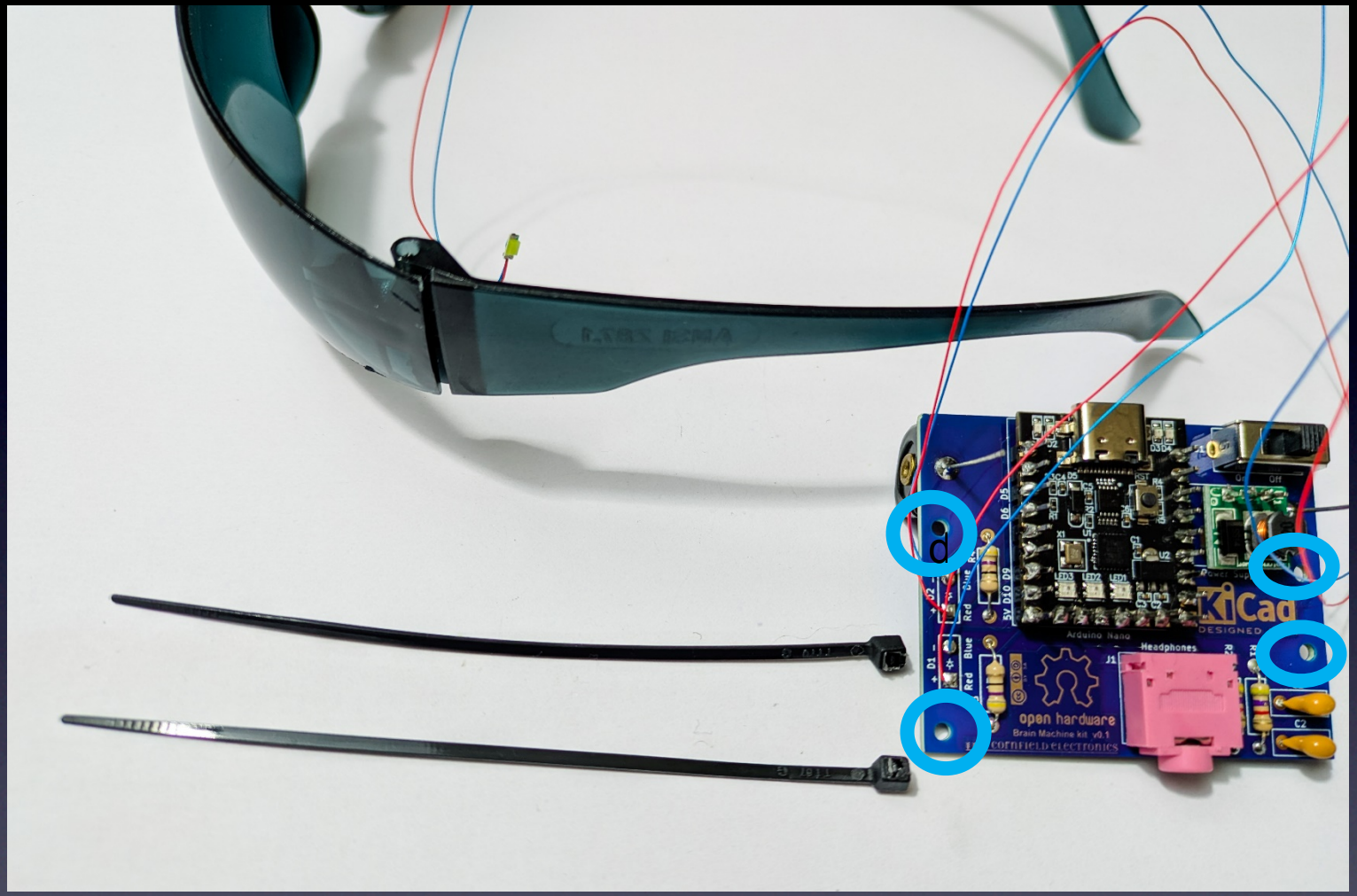
Battery Holder Soldered



→ ***DO NOT*** **cut battery holder leads !** ←

(That will destroy the wire cutters)

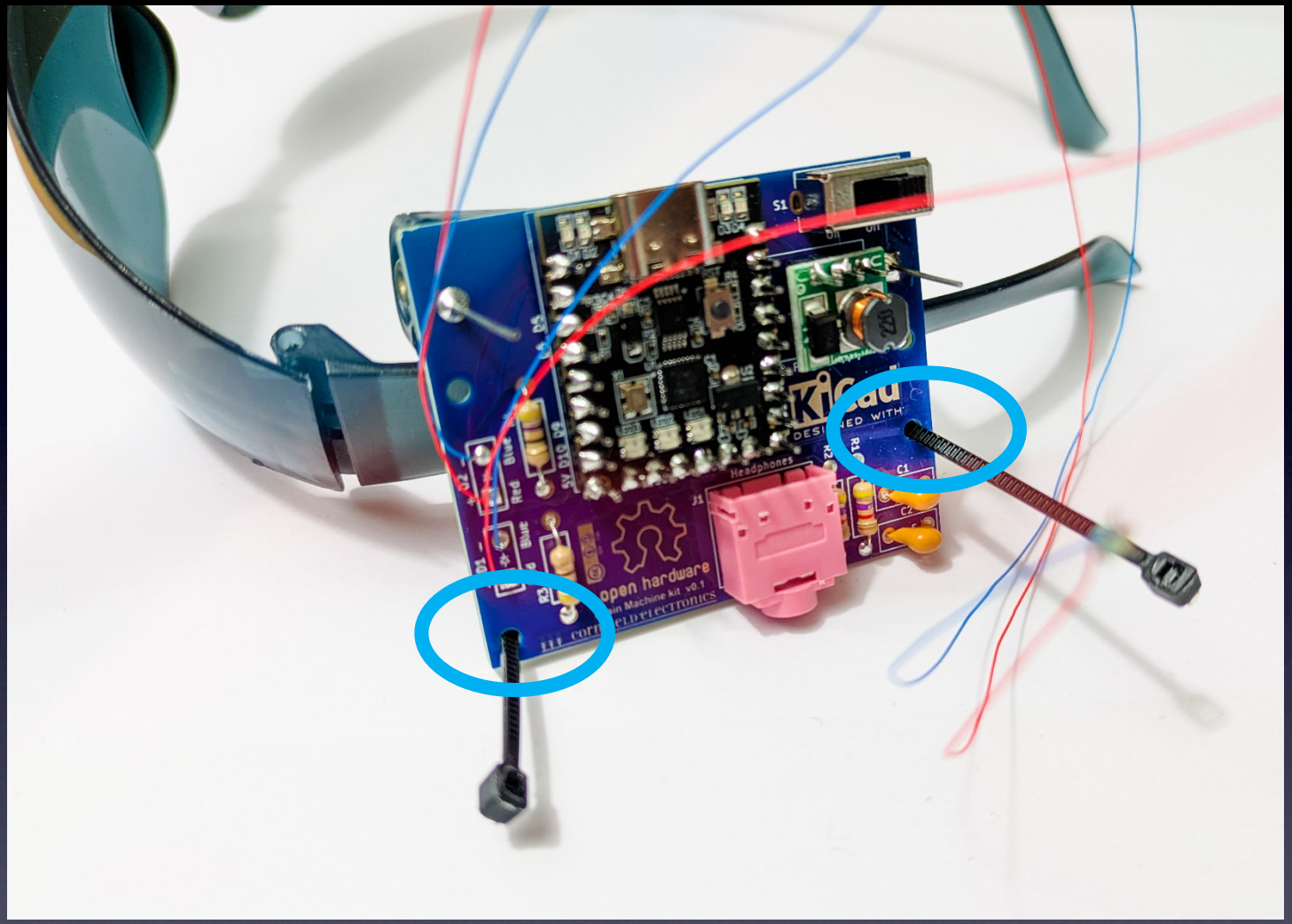
Attach Board to Glasses



Notice the 4 holes in the board for the zip ties

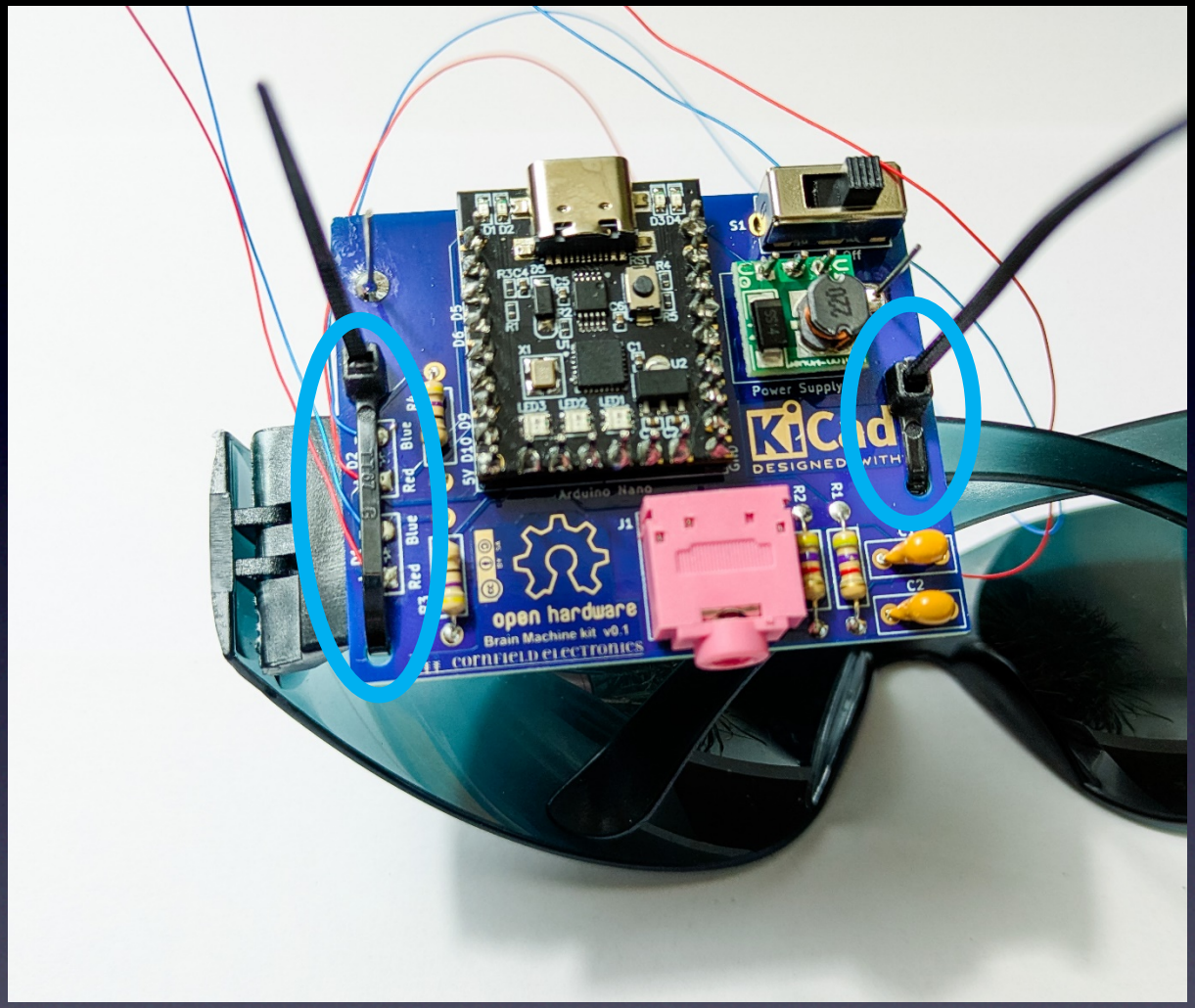
→ Use left side of glasses ←

Attach Board to Glasses



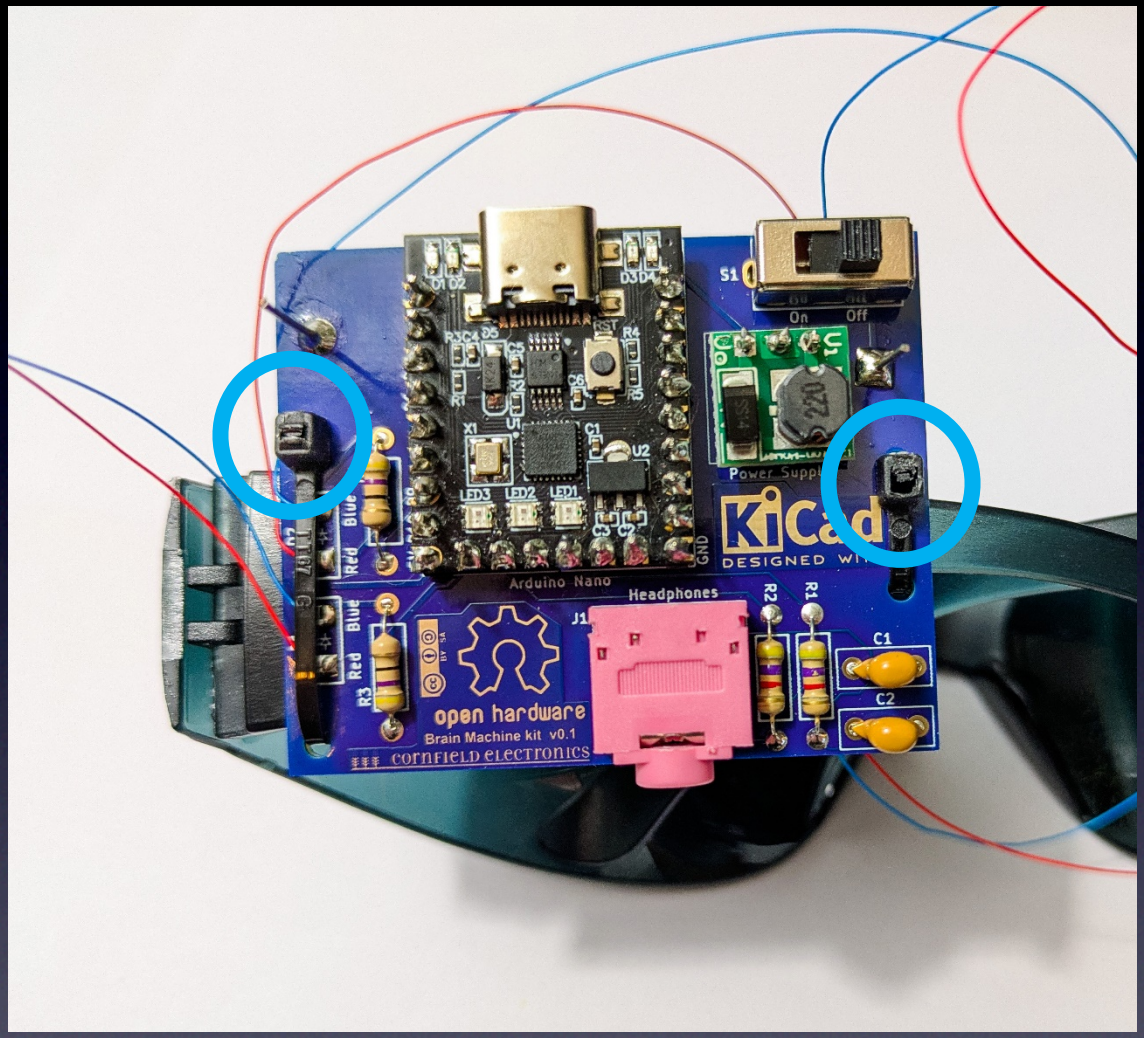
Insert zip-ties into lower mounting holes

Attach Board to Glasses



Wrap zip-ties around, and secure

Attach Board to Glasses



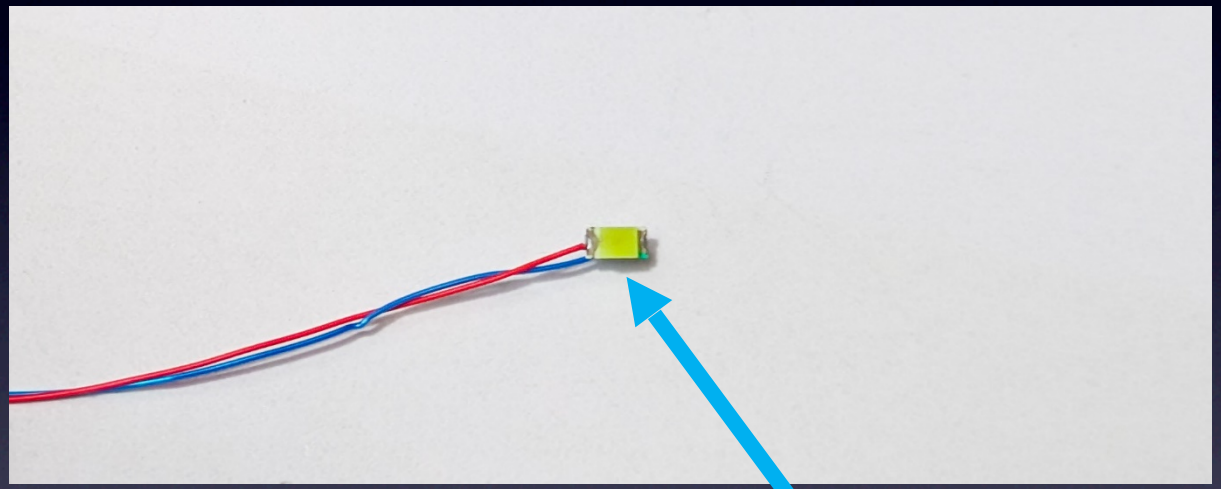
Cut zip-ties short

Mark where LEDs will go

For each eye:

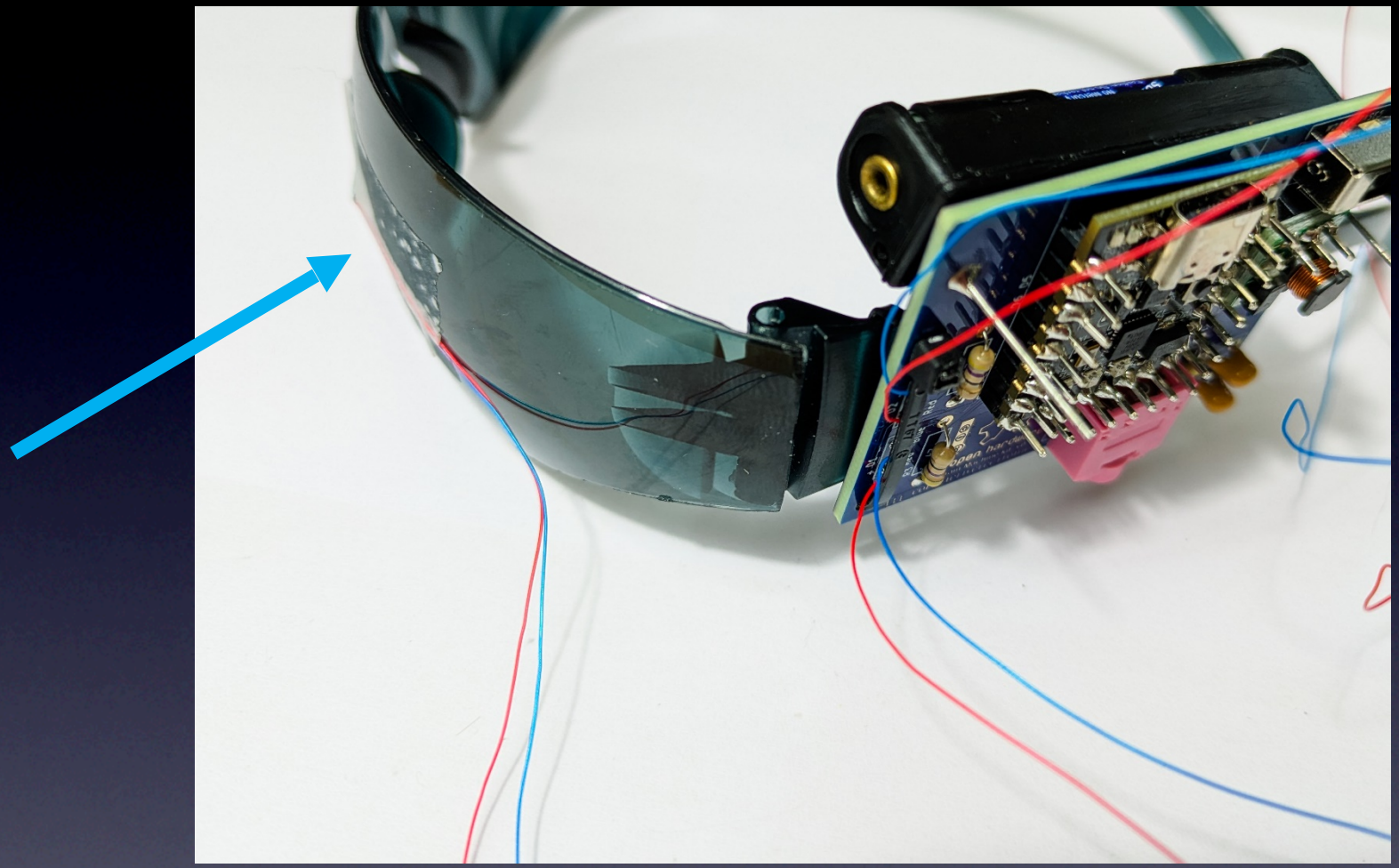
Slowly move the marker toward your eye
to make a mark directly in front of your eye.

LEDs light up on one side



The LEDs light up on the flat white side

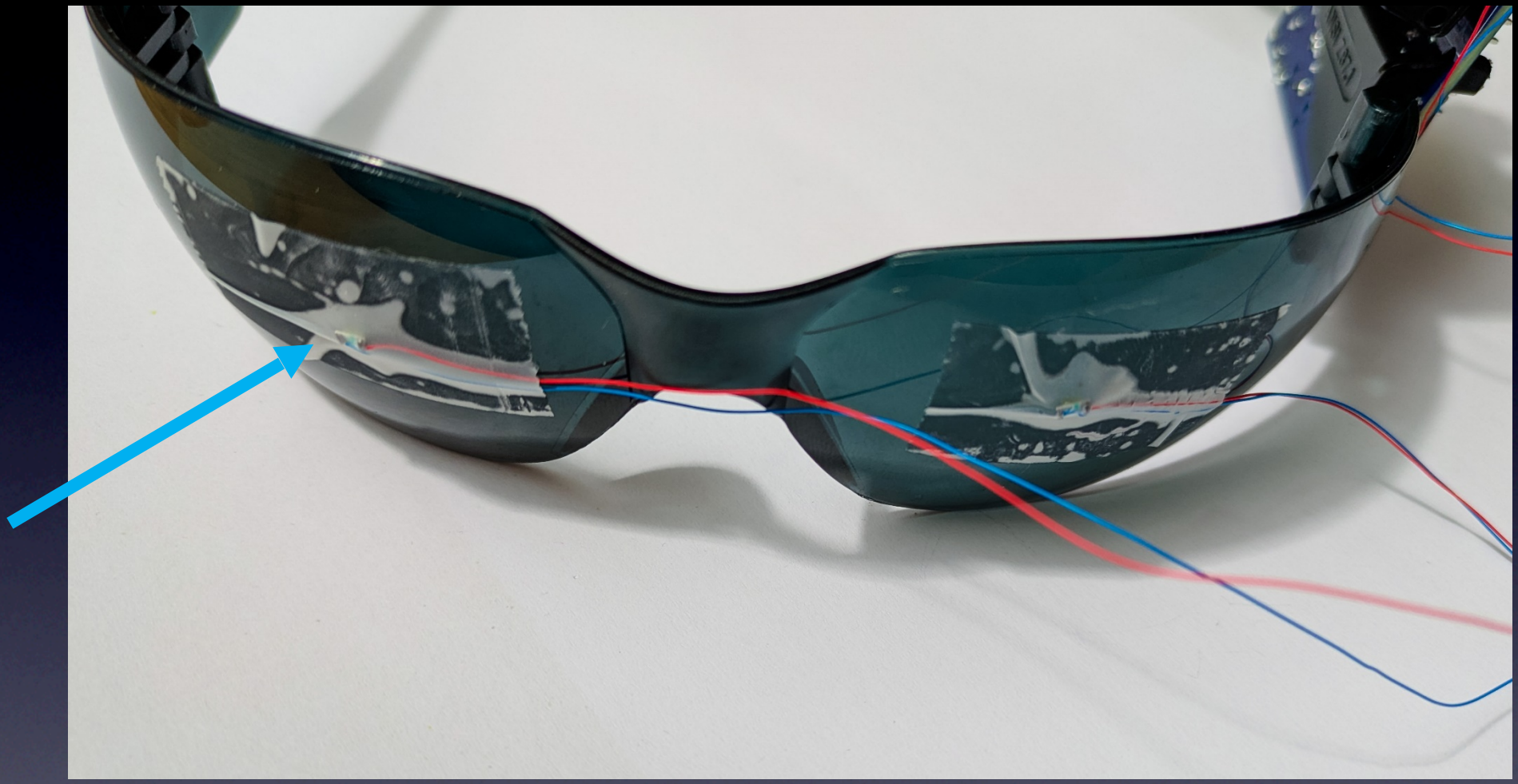
Tape Left LED to Glasses



Tape the flat white side of D1 over the left mark

(so the light will strike on your eye)

Tape Right LED to Glasses



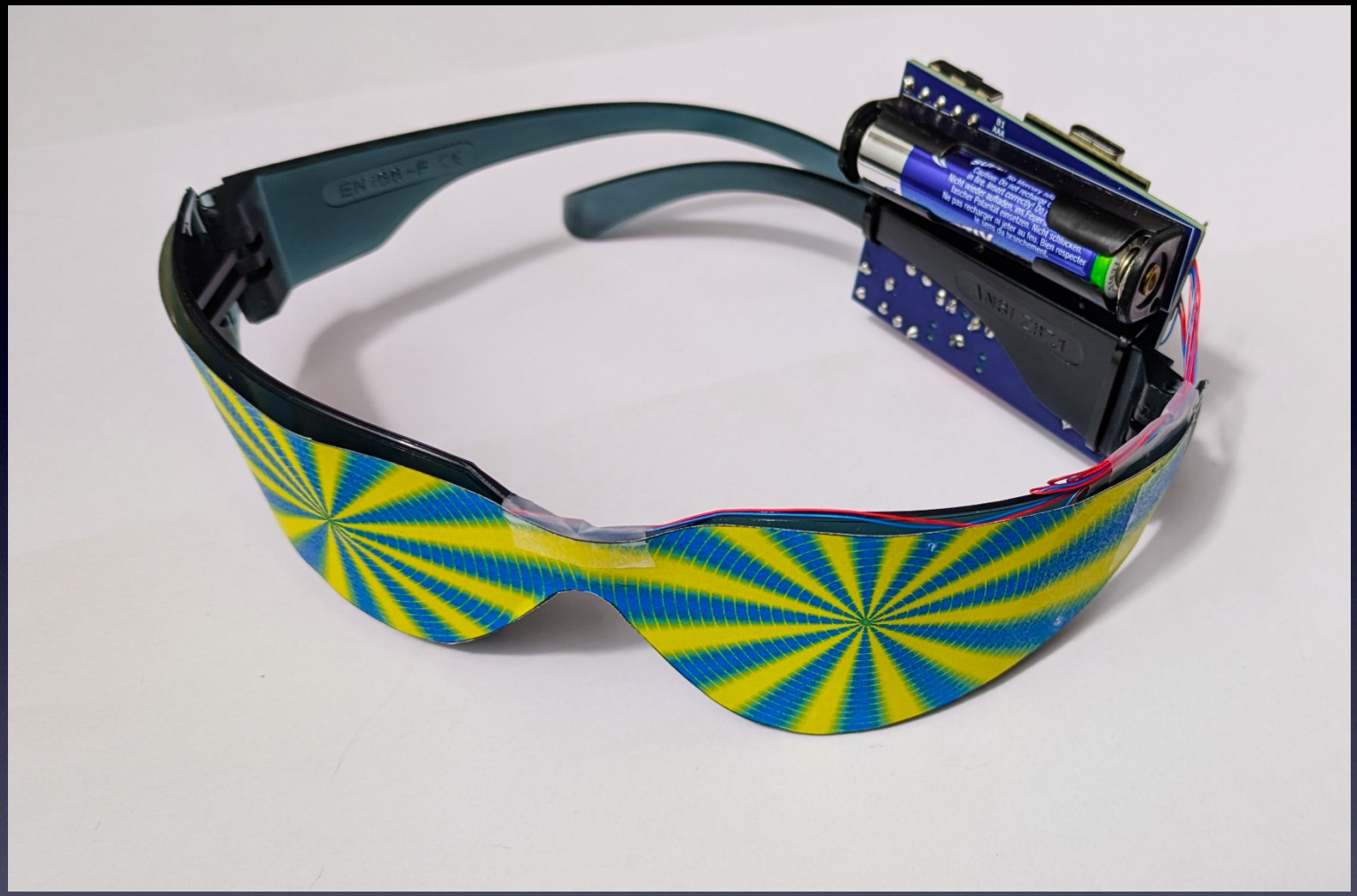
Tape the flat white side of D2 over the right mark

(so the light will shine on your eye)

Secure LED wires on Glasses

Use tape to clean up and secure the LED wires

Add Trippy Graphics !



Cut out the Trippy Graphics
and tape them over the glasses

Done!

Enjoy (with your eyes closed)

Meditate, Hallucinate, Trip Out !

Please Remember:

to

Wash your hands

after soldering

Let's Meditate

Your Brain Machine comes pre-programmed with a really nice 14-minute Meditation.

And, along the way you will hallucinate beautiful colors and patterns from your imagination.

Re-Programming

Your Brain Machine comes pre-programmed with a really nice 14-minute Meditation.

If you are happy with this meditation sequence then no need to re-program your Brain Machine.

But if you want to program other brainwave sequences the next pages show you how…

Re-programming the Brain Machine

We have two other sequences ready for you to use.

*** 30-minute Sleep sequence**

*** 1 hour of 40 Hz Gamma Waves**

The following slides show you how to program this sequence into your Brain Machine…

Re-programming the Brain Machine

We have two other sequences ready for you to use.

<u>To program in a new sequence into your Brain Machine, you will need</u>:

- the Arduino software
  <http://arduino.cc>
- a USB-C cable
- the “sketch” for the other brainwave sequence
  <http://cornfieldelectronics.com/cfe/projects.php#brainmachine>

The following slides show you how to do the above, in detail.

Arduino

Arduino is a very powerful tool!
But it is very easy to use.
It was designed for total beginners to use successfully.

I won't give a complete tutorial here – just some basics.
For more info, there are many good Arduino tutorials online.
A good place to start is:
<https://www.arduino.cc/en/Tutorial/HomePage>

Arduino

First:

Download and install the Arduino software
< http://arduino.cc >

Any version is OK

Re-programming the Brain Machine

Second:

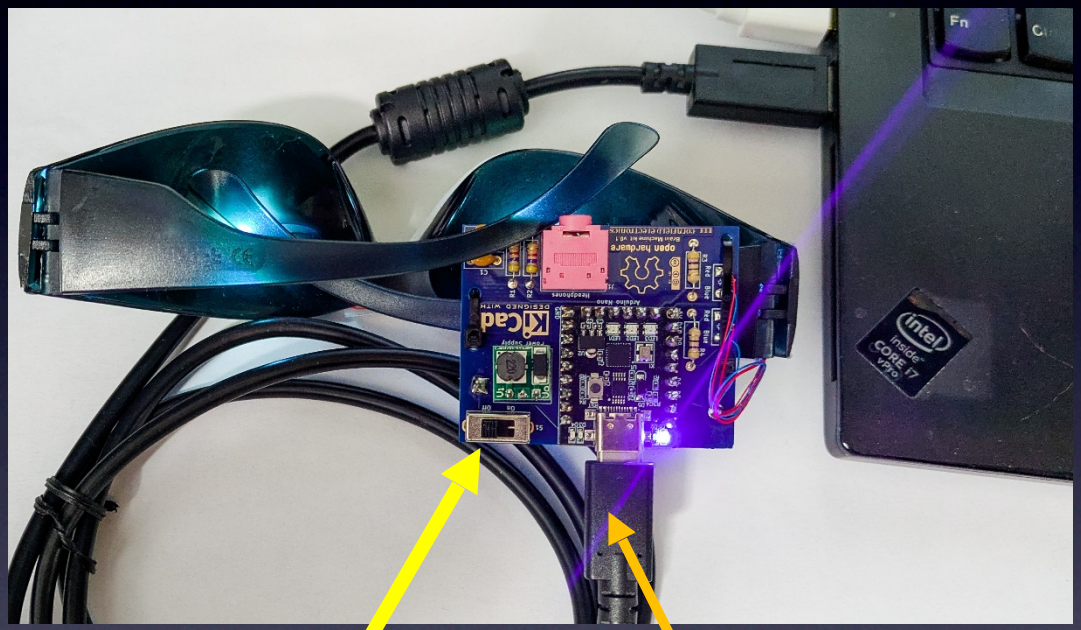
Download a Brain Machine brainwave sequence sketch
<http://cornfieldelectronics.com/cfe/projects.php#brainmachine>

Store it on your computer anywhere you like.

(details on this soon)

Connecting your Brain Machine to your computer

USB-C cable

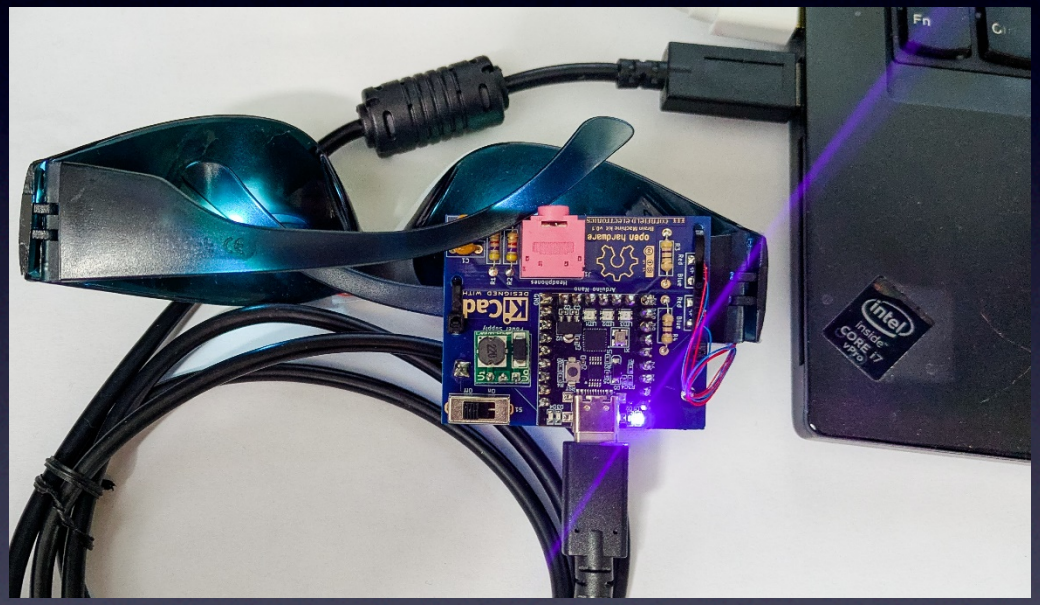


<u>IMPORTANT</u>: Make sure the Switch on your Brain Machine is *OFF*

to computer's USB

Connecting your Brain Machine to your computer

USB-C cable



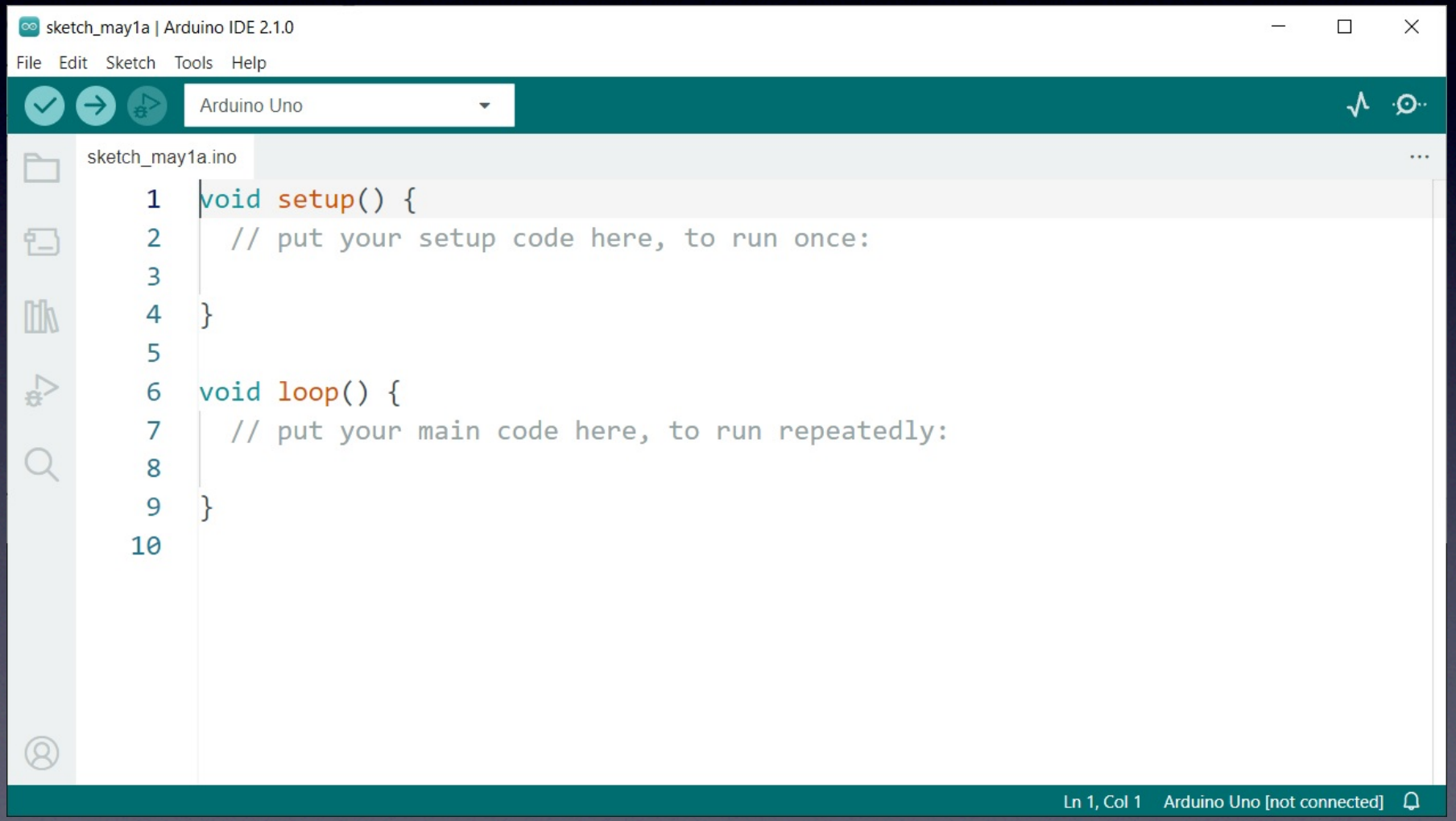
You may need to download and install a driver for your Operating System (Windows, MacOS, or Linux):

<https://learn.sparkfun.com/tutorials/how-to-install-ch340-drivers/all>

Or search for: "CH340 driver"

Arduino

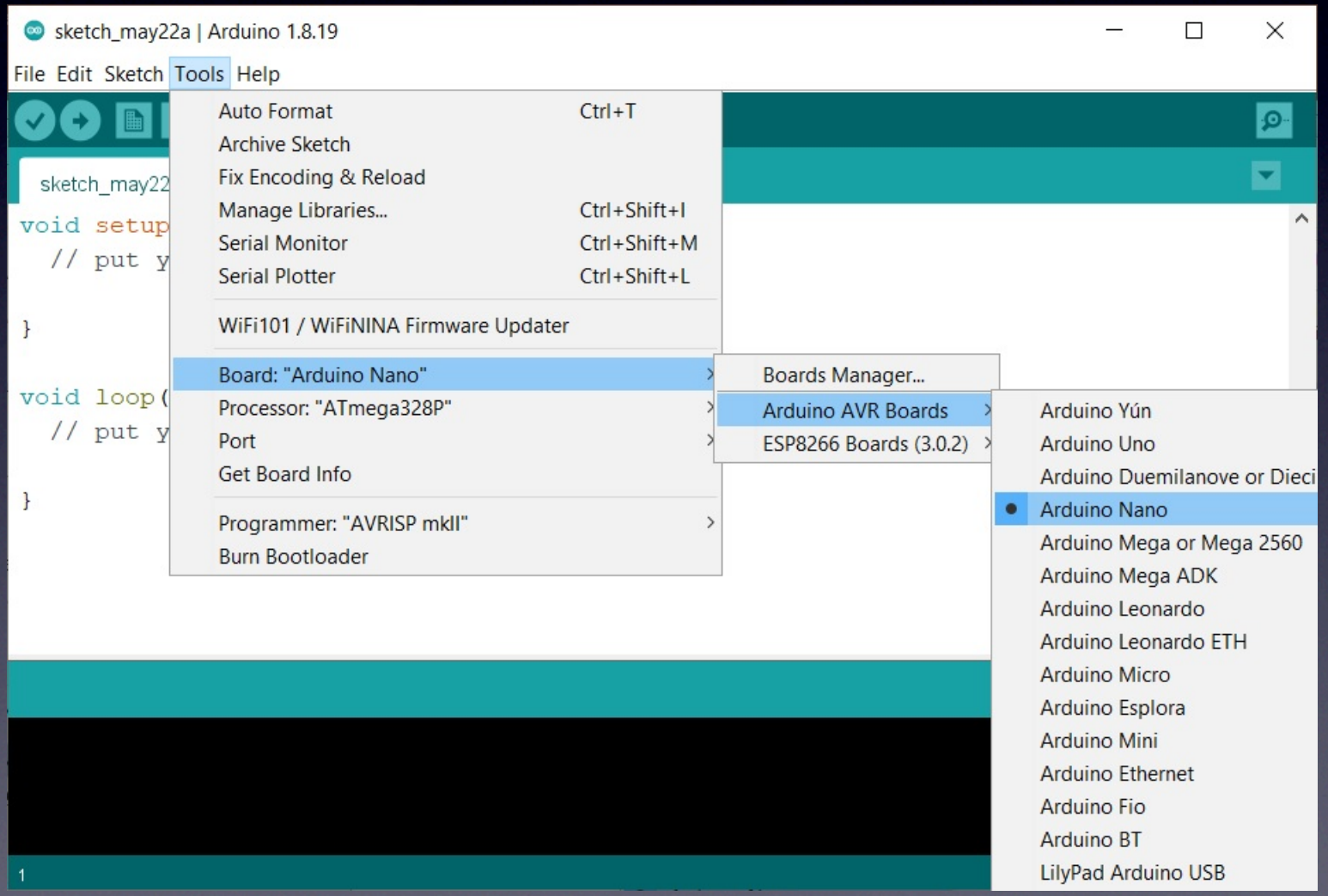
After you download and install the Arduino software start it, and you will see a screen that looks like this:



Arduino

The first time you start your Arduino software you need to set things up

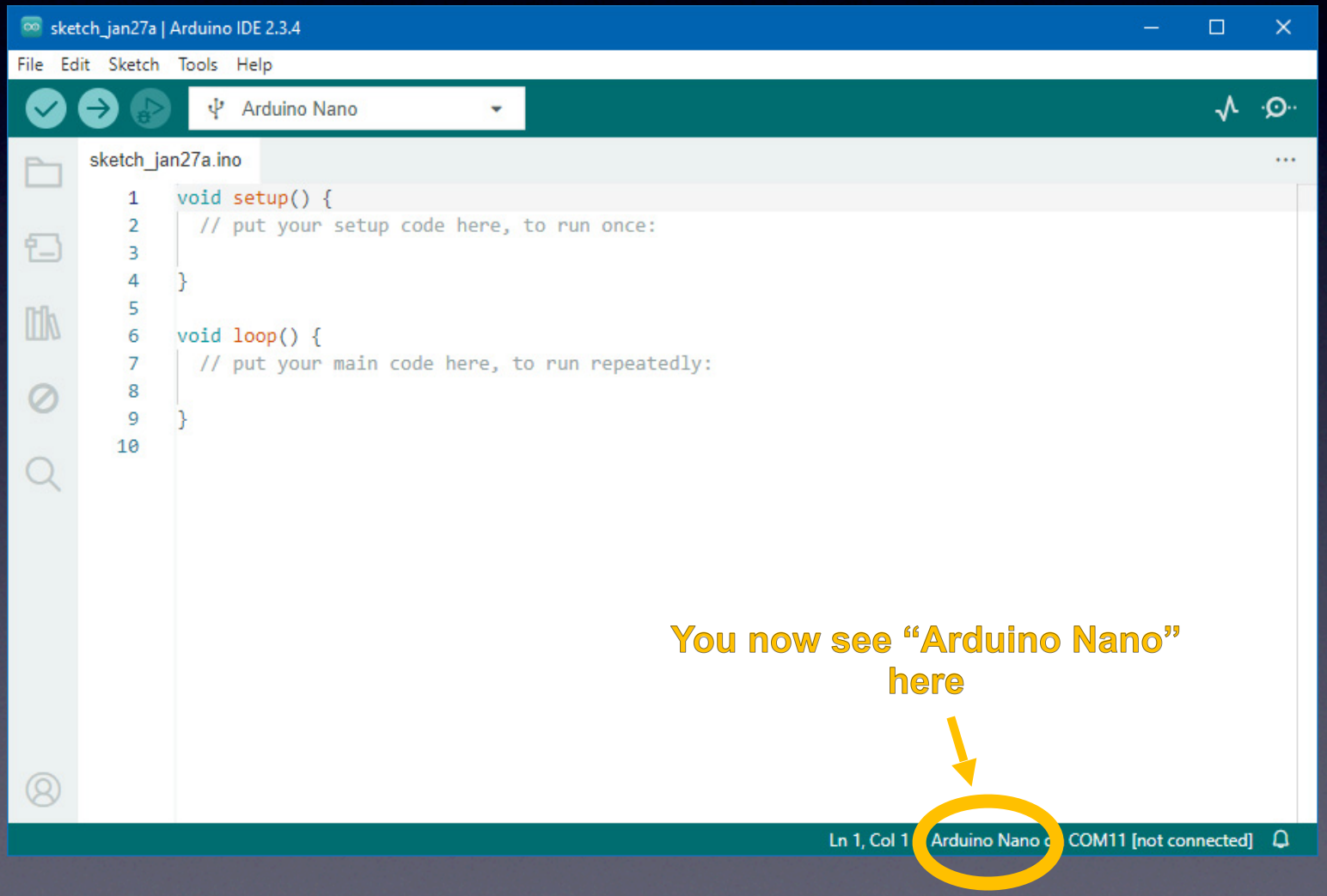
(1) Choose "Arduino Nano" as the Board



Arduino

The first time you start your Arduino software you need to set things up

(1) Choose “Arduino Nano” as the Board

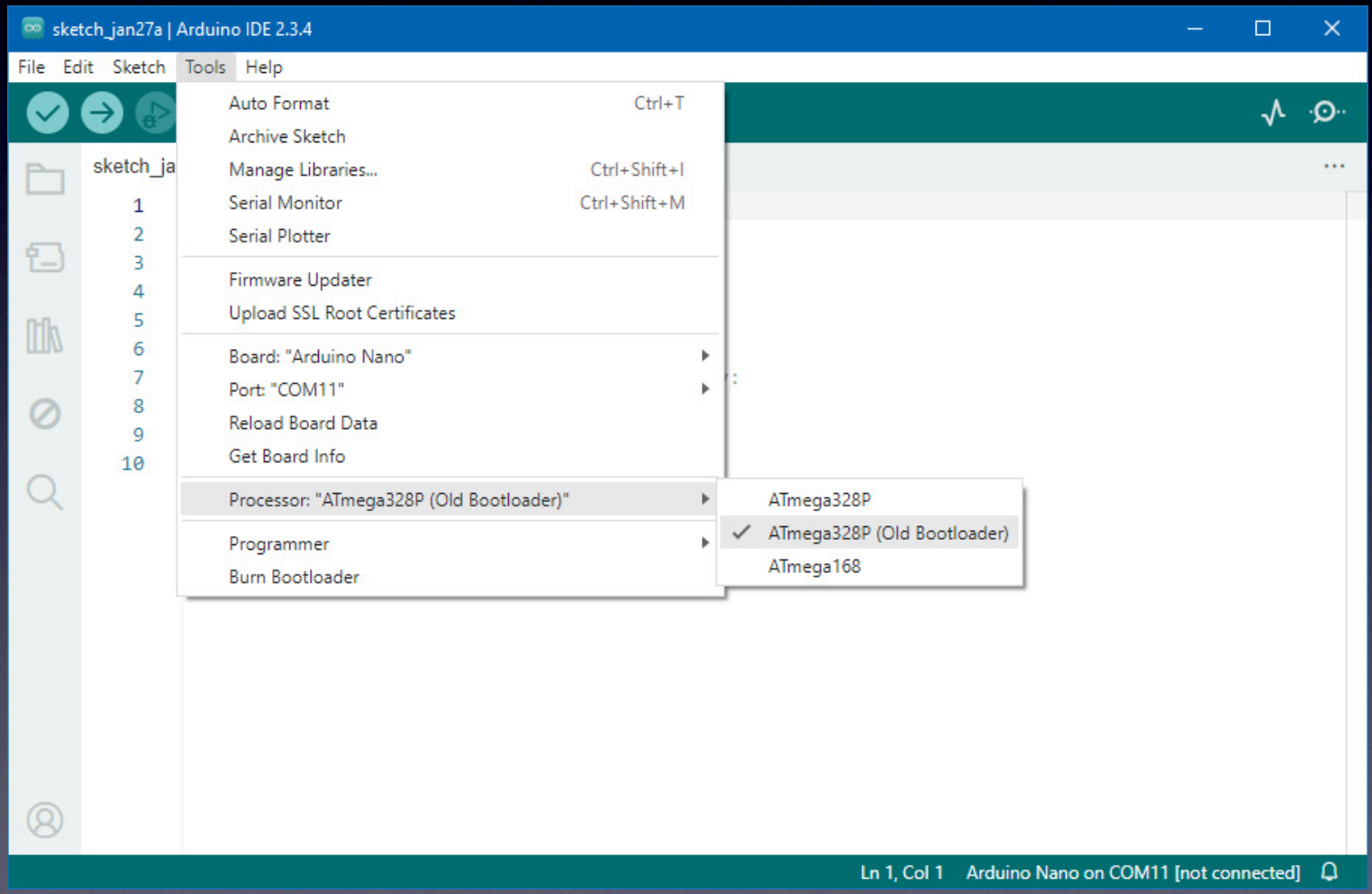


Arduino

The first time you start your Arduino software you need to set things up

(2) Choose your Processor

“ATmega328P (Old Bootloader)”

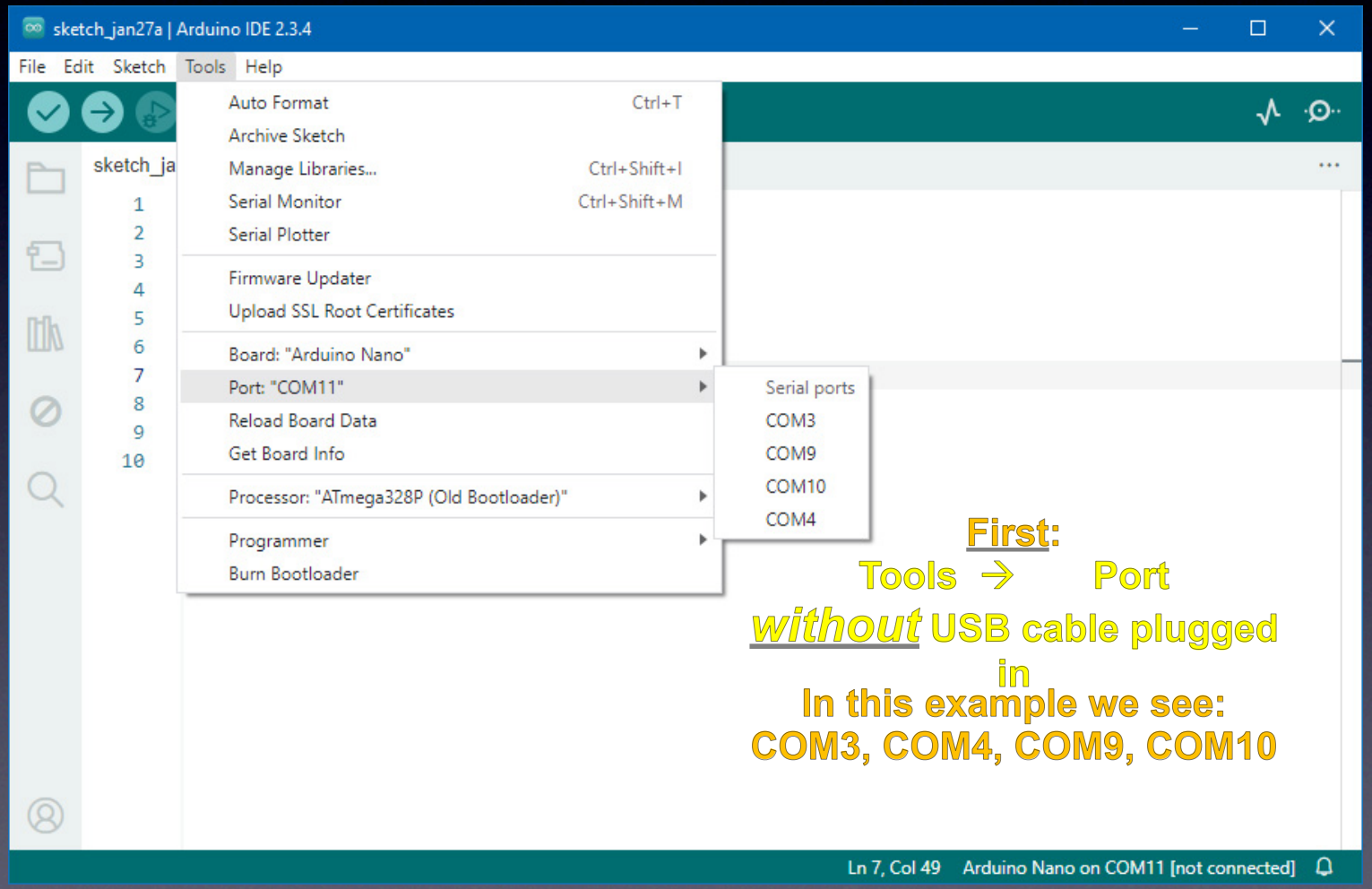


If this one doesn’t work, then choose “ATmega328P”

Arduino

The first time you start your Arduino software you need to set things up

(3) Choose the Port (this will be different depending on your Operating System)

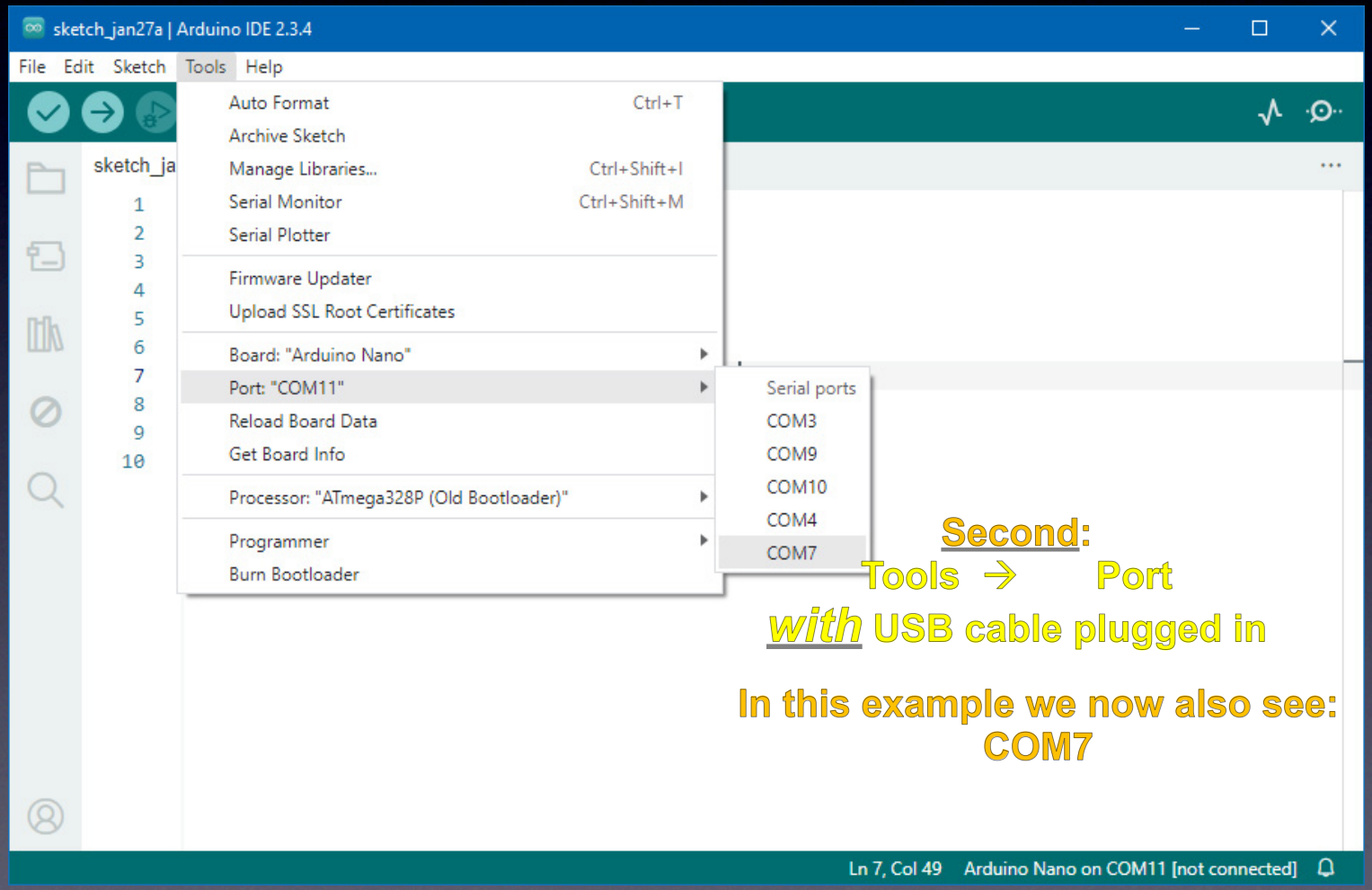


Arduino

The first time you start your Arduino software you need to set things up

(3) Choose the Port (this will be different depending on your Operating System)

(After installing the driver for your Arduino (USB-Serial adapter), with your Arduino plugged in, your operating system will see a serial port and it appears here.)



Second:
Tools → Port
with **USB cable plugged in**

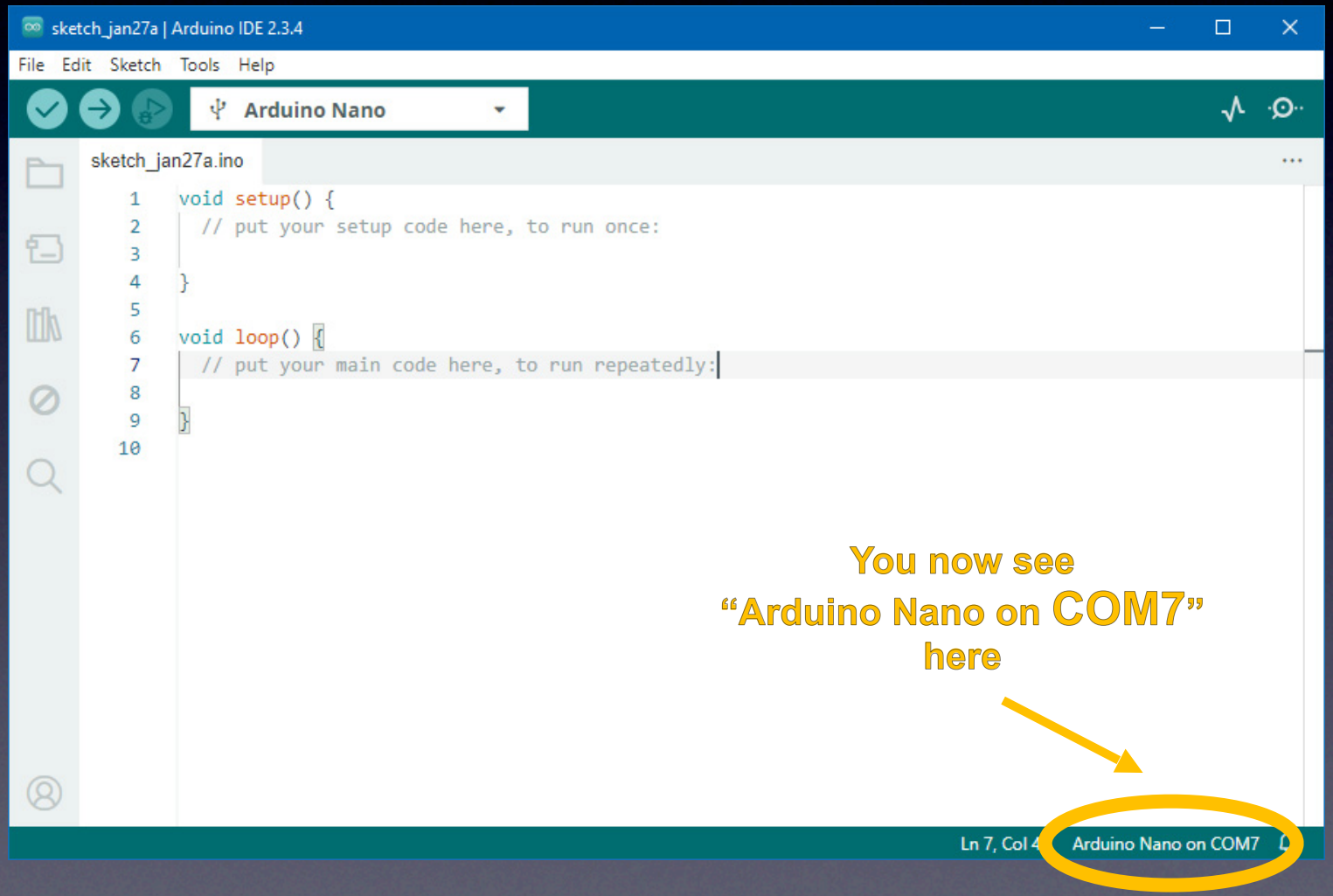
In this example we now also see: COM7

(Driver: search for: "CH340 Driver")

Arduino

The first time you start your Arduino software you need to set things up

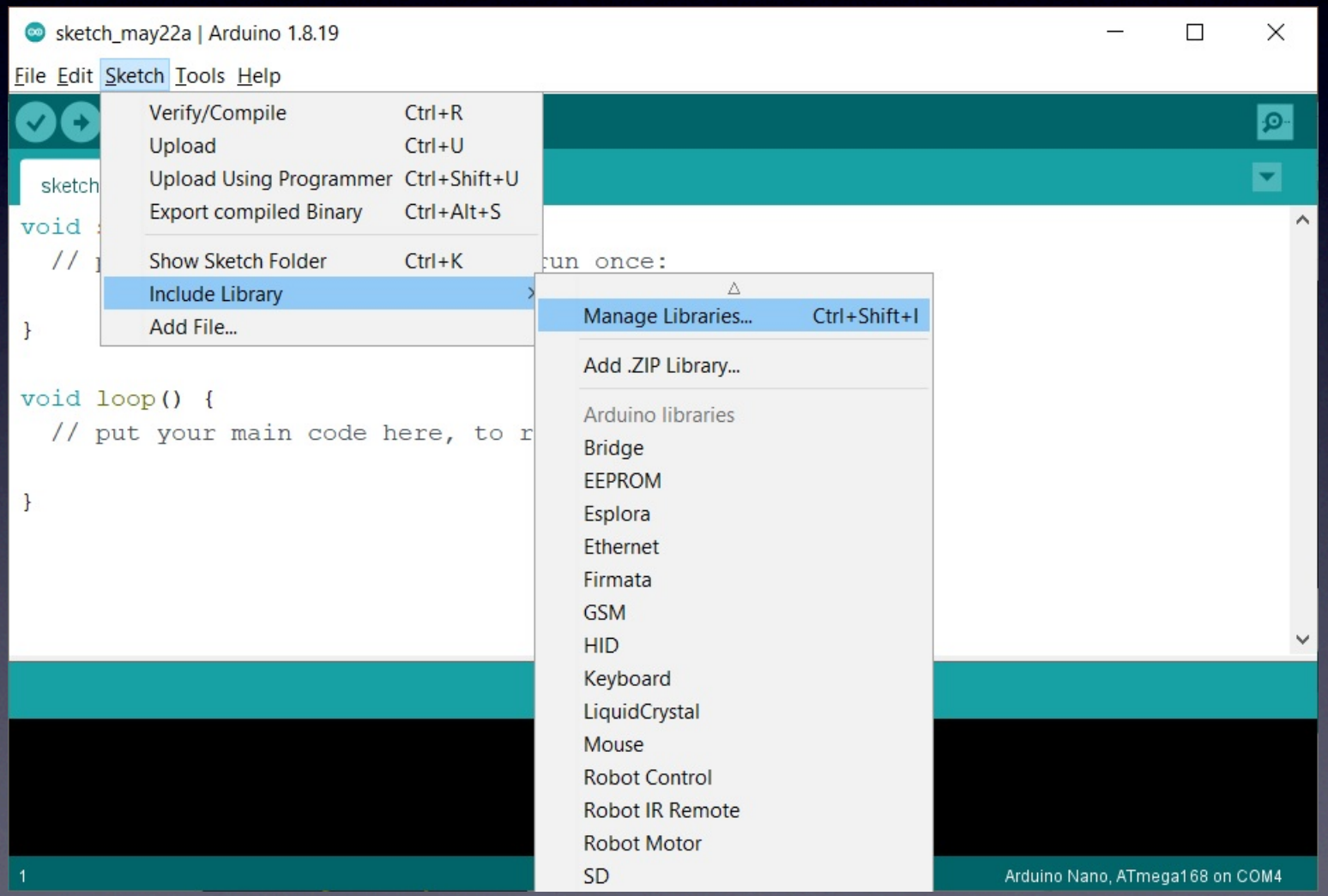
(3) Choose the Port (this will be different depending on your Operating System)



Arduino

The first time you start your Arduino software you need to set things up

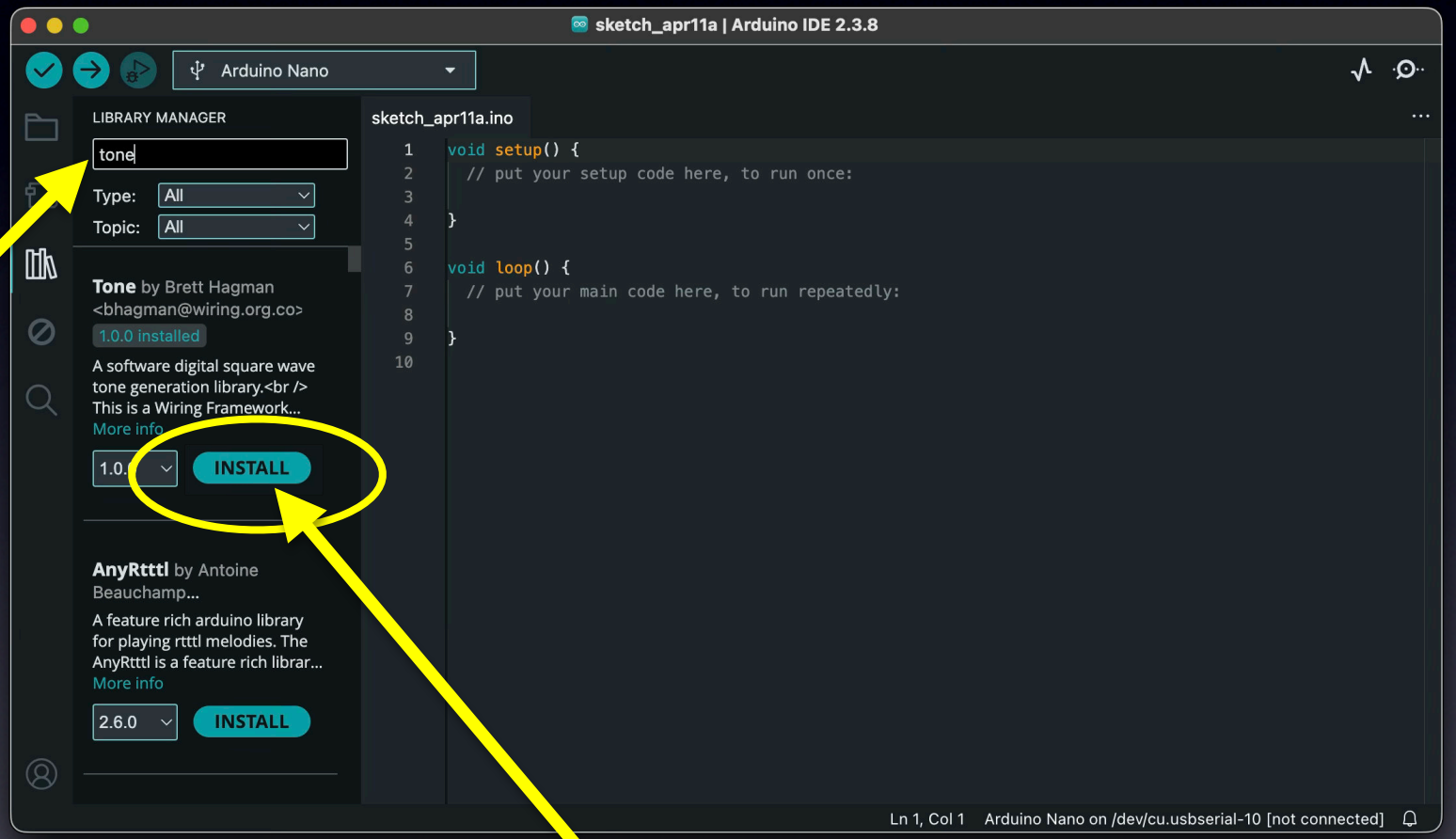
(4a) Install the Tone library



Arduino

The first time you start your Arduino software you need to set things up

(4b) Install the Tone library



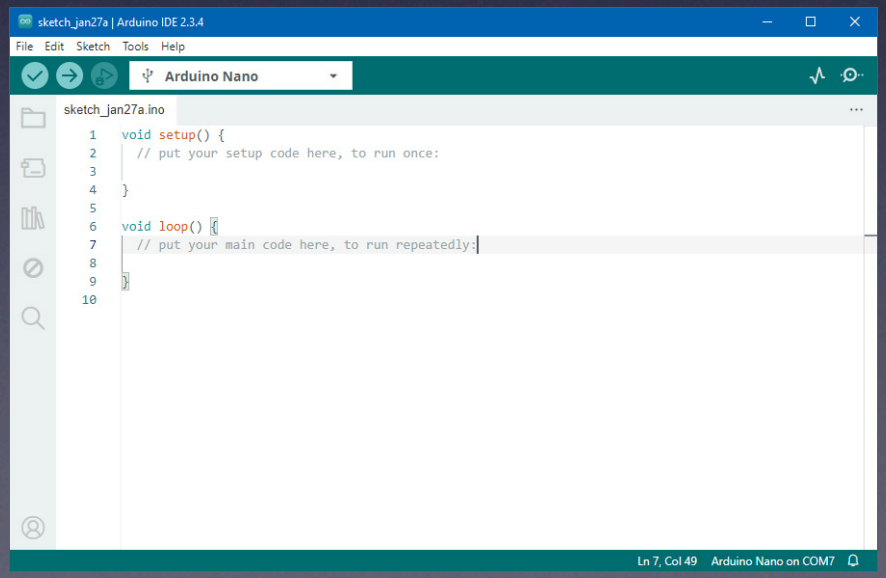
type: “tone” in the search bar

click the INSTALL button
for **“Tone** by Brett Hagman”

Arduino

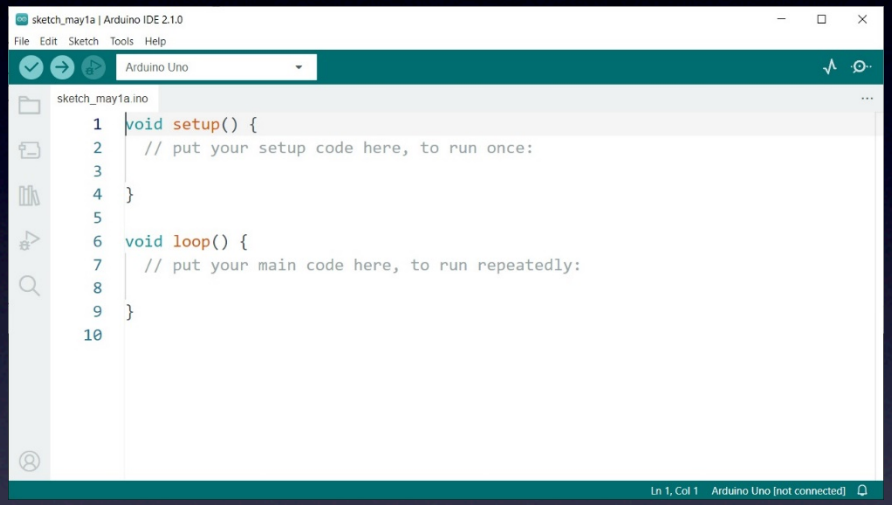
Your Arduino software is now ready

to program a new brainwave sequence sketch into your Brain Machine !



Arduino

Designed for non-geeky artists



Definition of

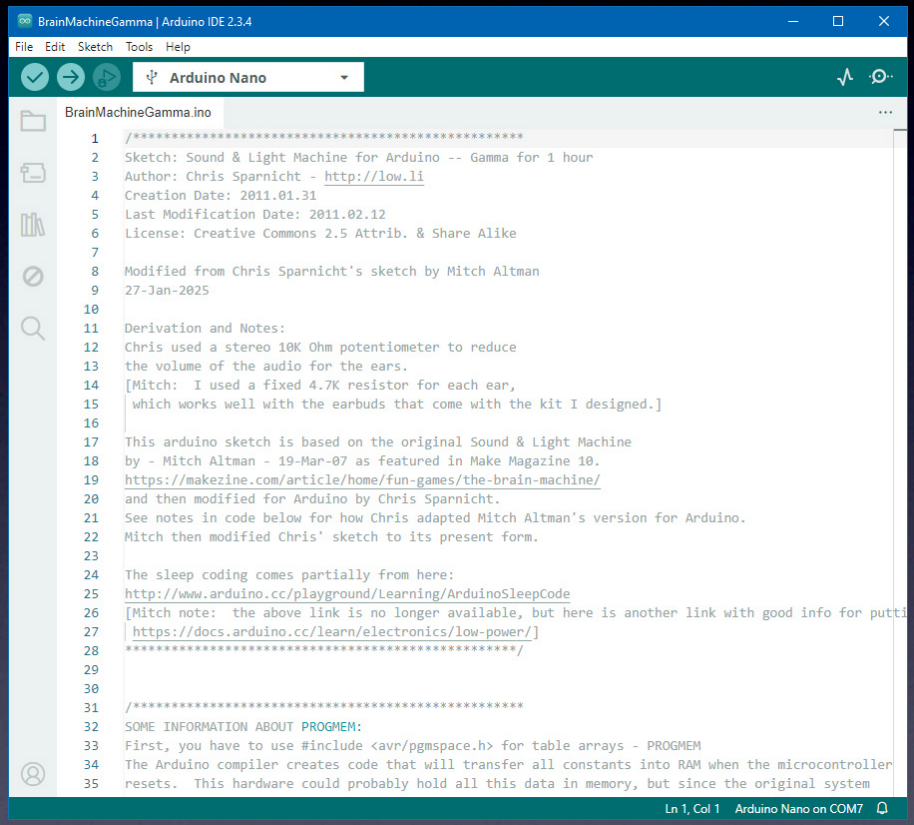
“Sketch” :

an Arduino program

Arduino

Designed for non-geeky artists

Download the new Gamma "sketch"



"Sketch" :

an Arduino program

The following slides show where to find this sketch…

Arduino

Download a new brainwave sequence “sketch”

https://CornfieldElectronics.com

Arduino

Download a new brainwave sequence “sketch”

“Projects” tab

Arduino

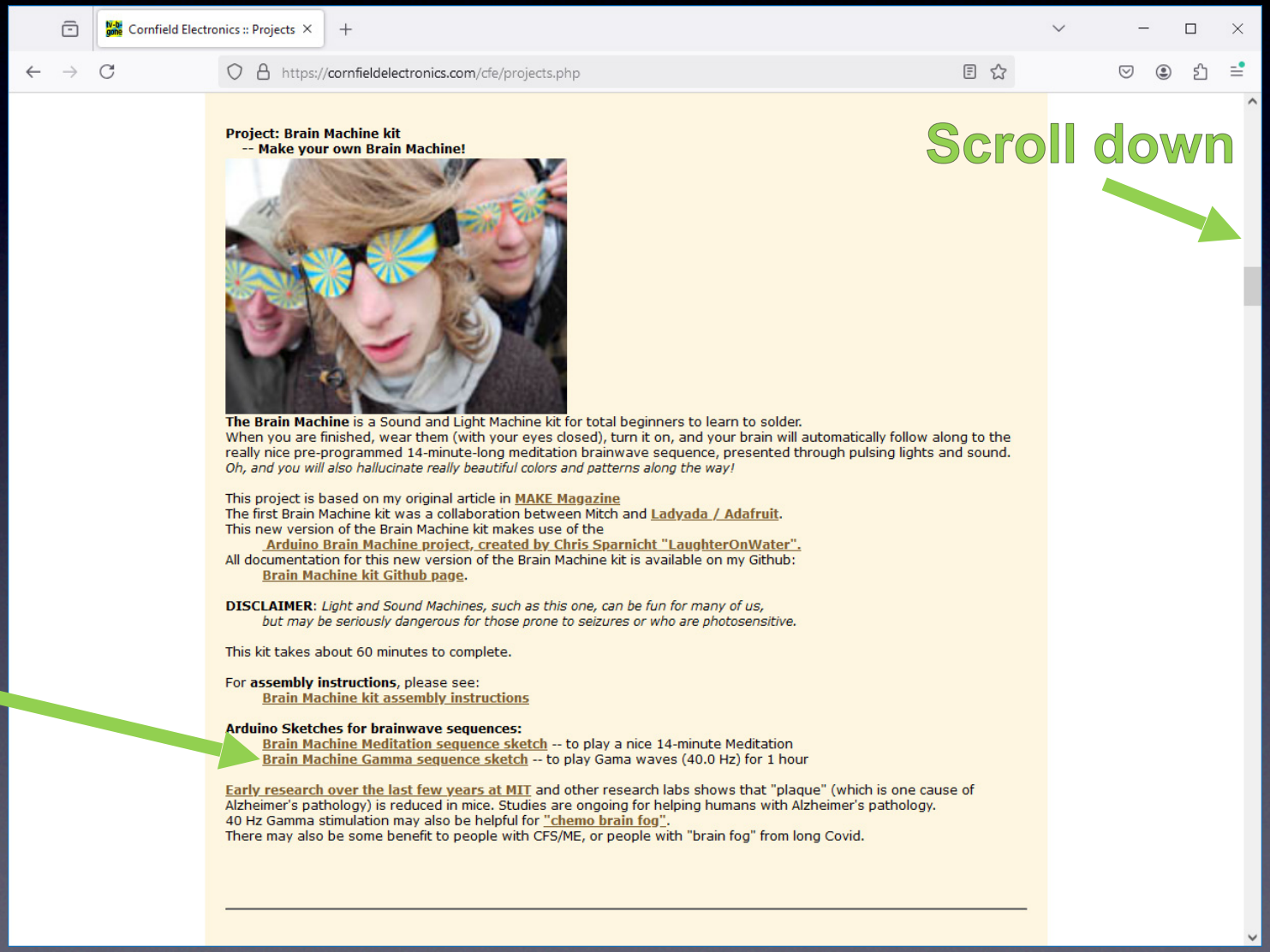
Download a new brainwave sequence “sketch”

“Projects” tab

Arduino

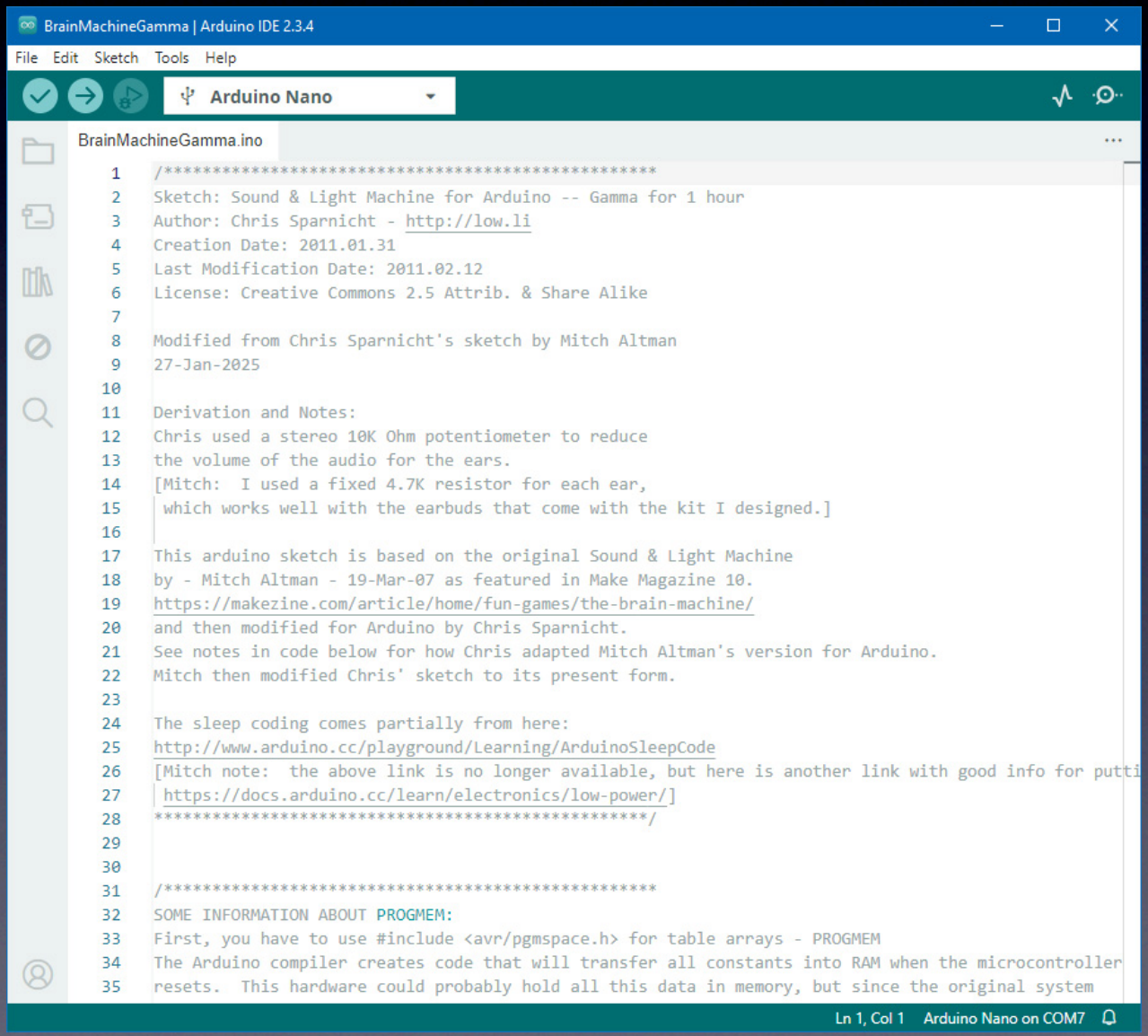
Download a new brainwave sequence “sketch”

Click here to download the Gamma wave sequence sketch



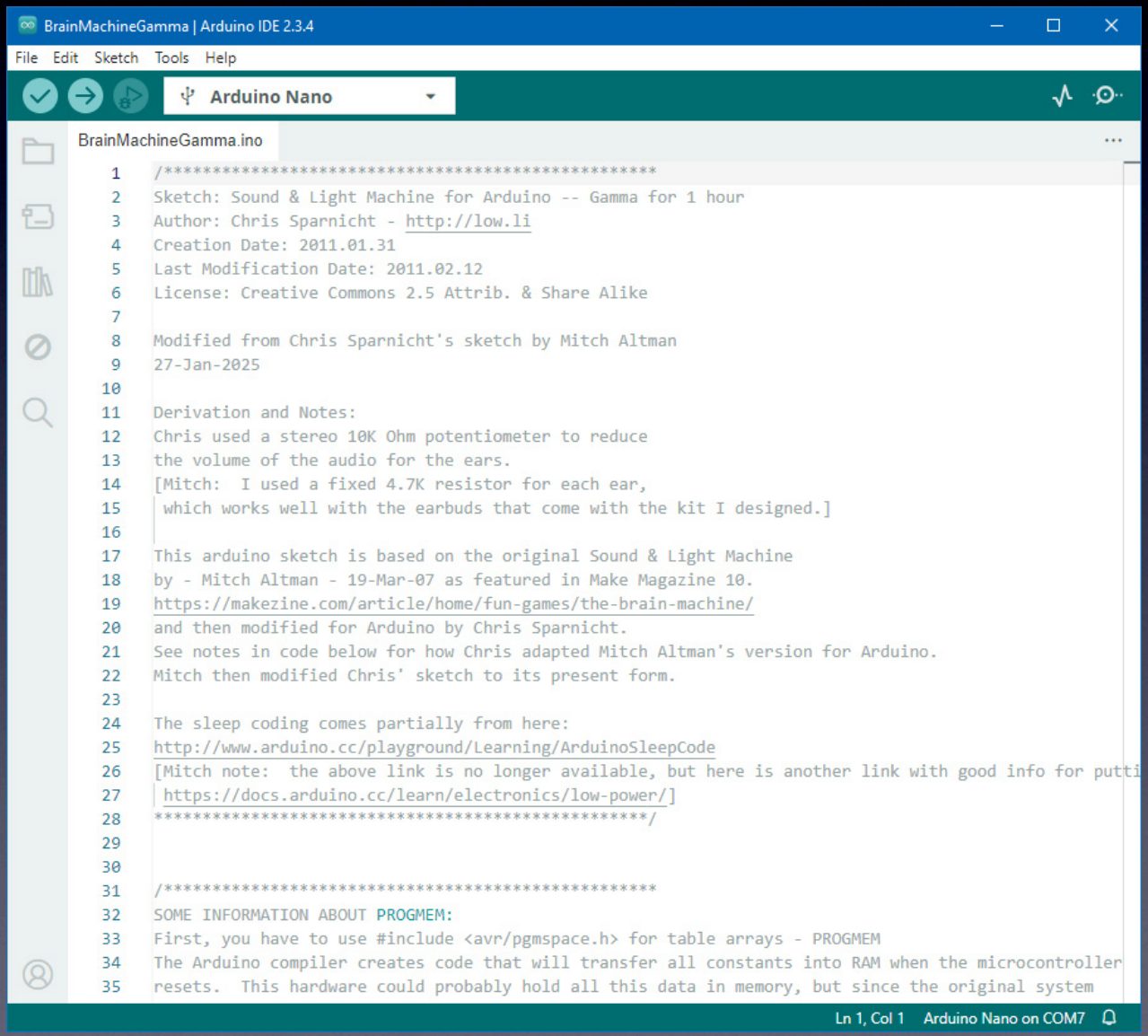
Arduino

You can now open the brainwave sequence sketch:
File → Open…



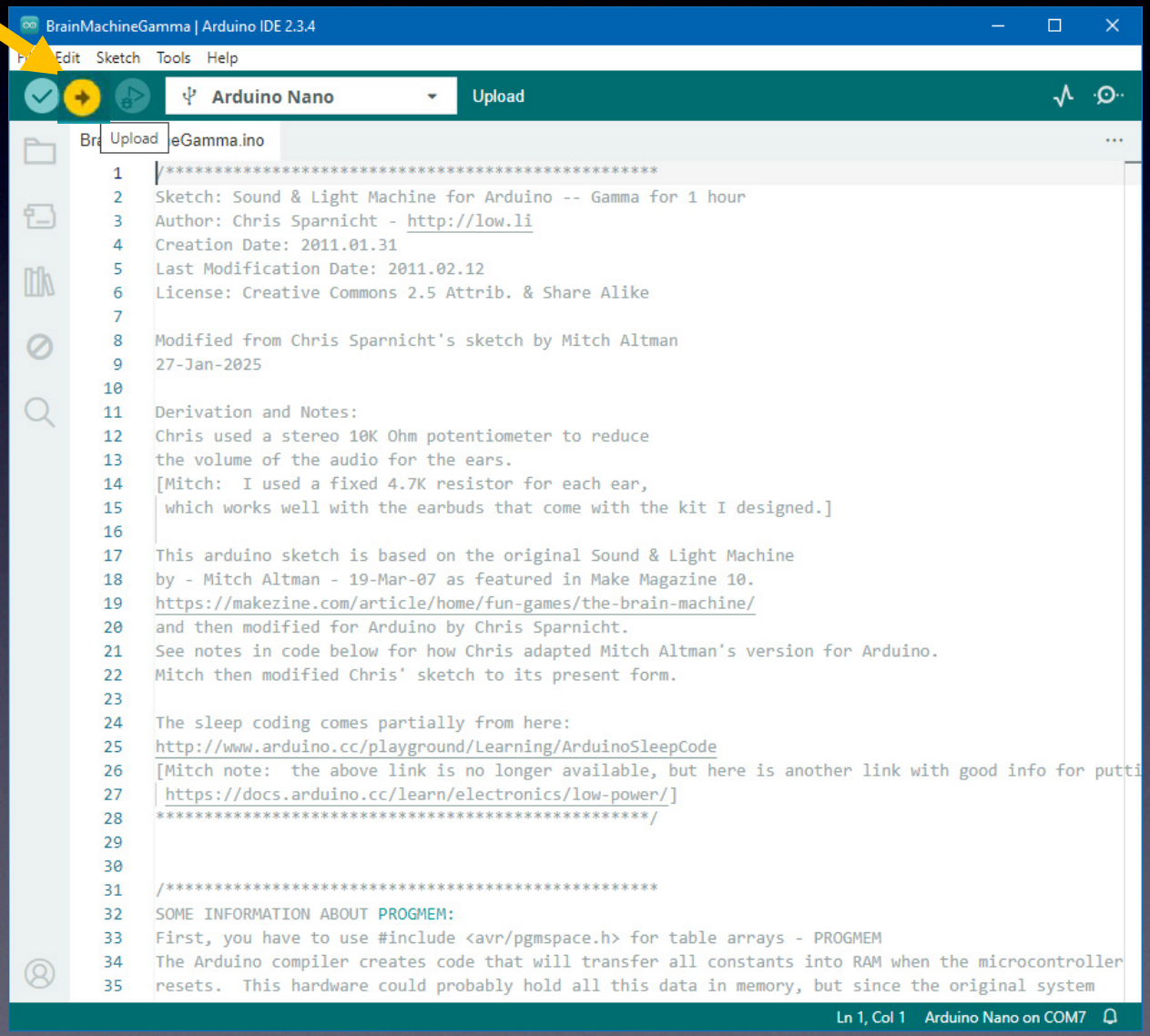
Arduino

You can now program your Brain Machine with a new synth sketch !



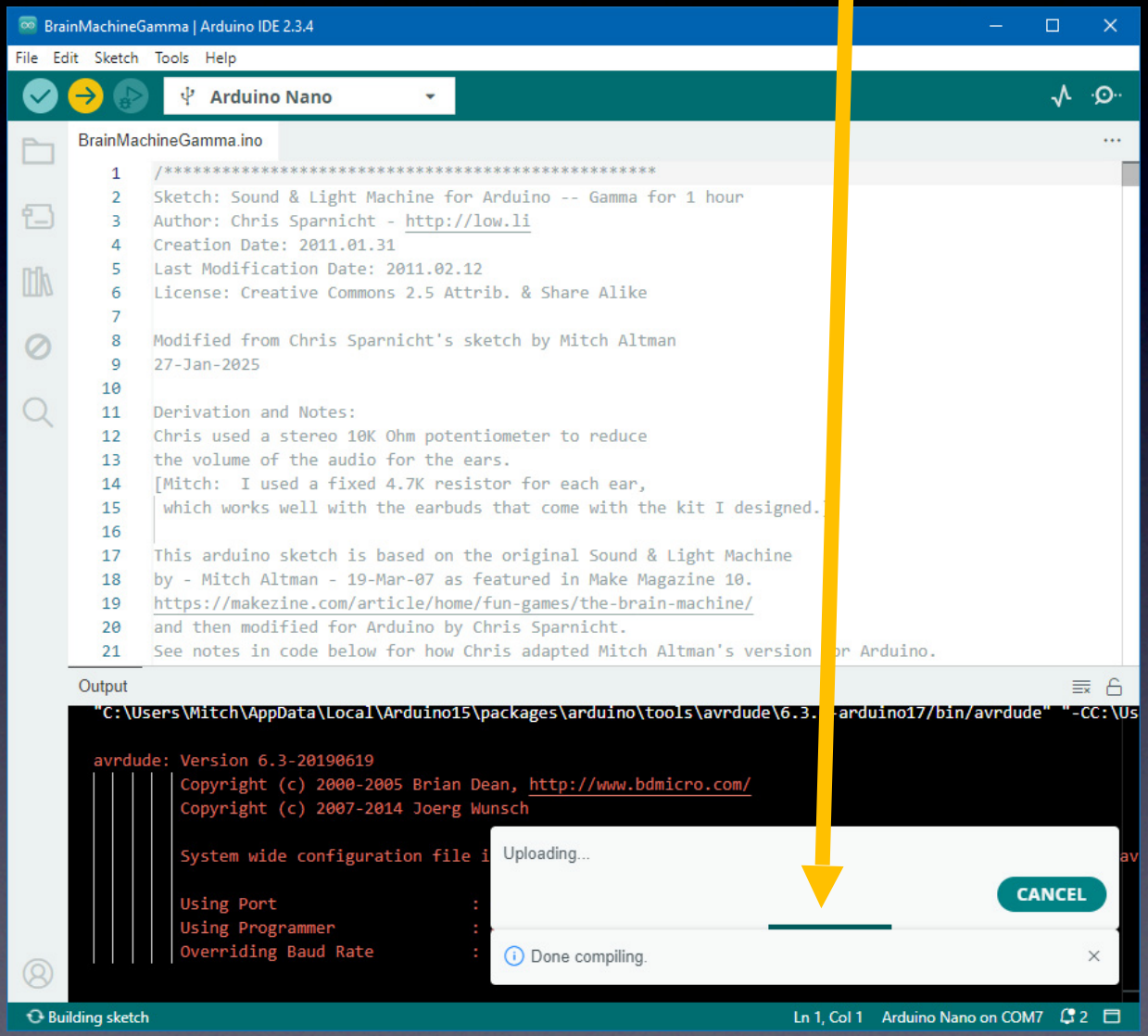
Arduino

With the USB-C cable connected to your Brain Machine press the *"Upload"* button



Arduino

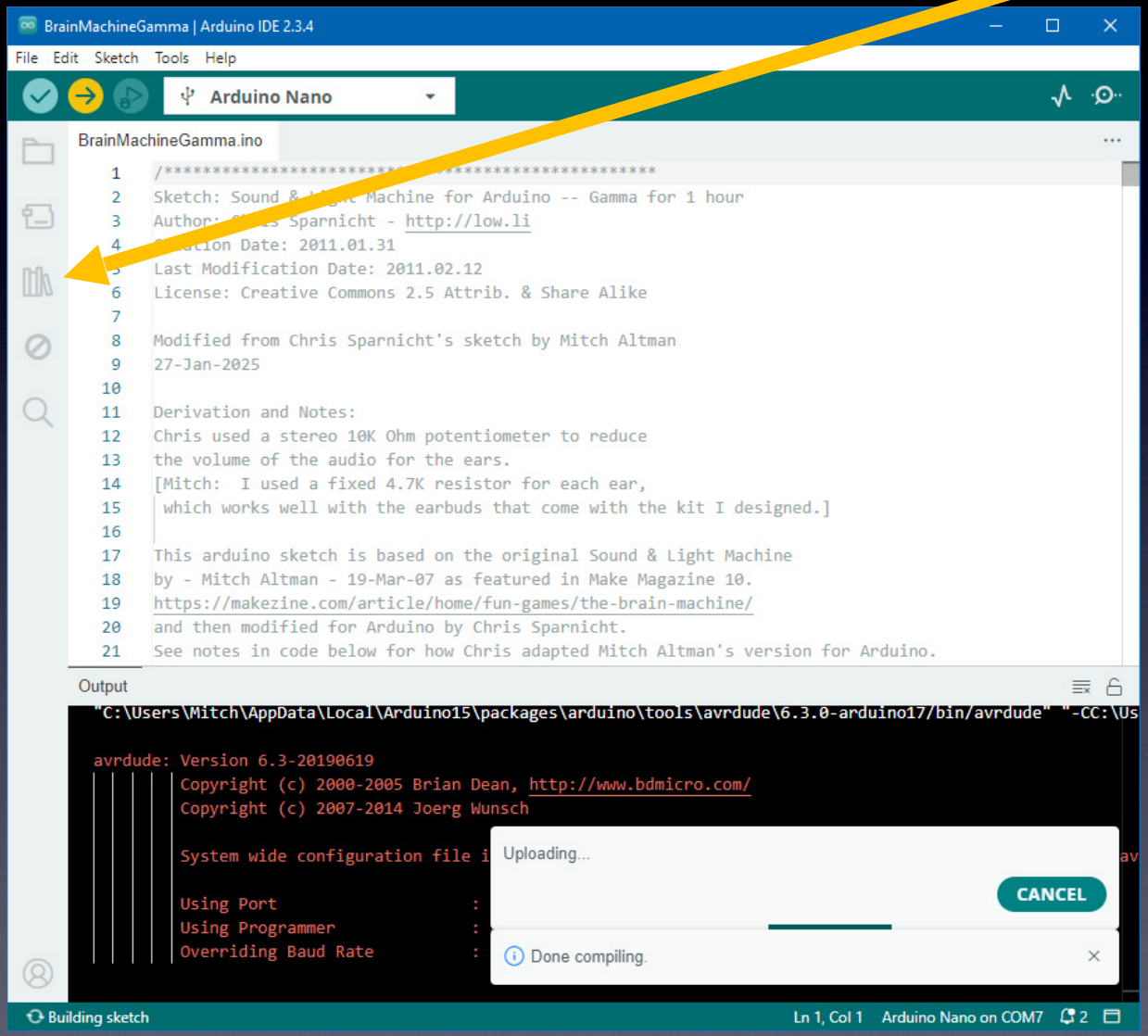
While uploading, you will see a progress bar…



…and when it's completed successfully, it says: "Upload done"

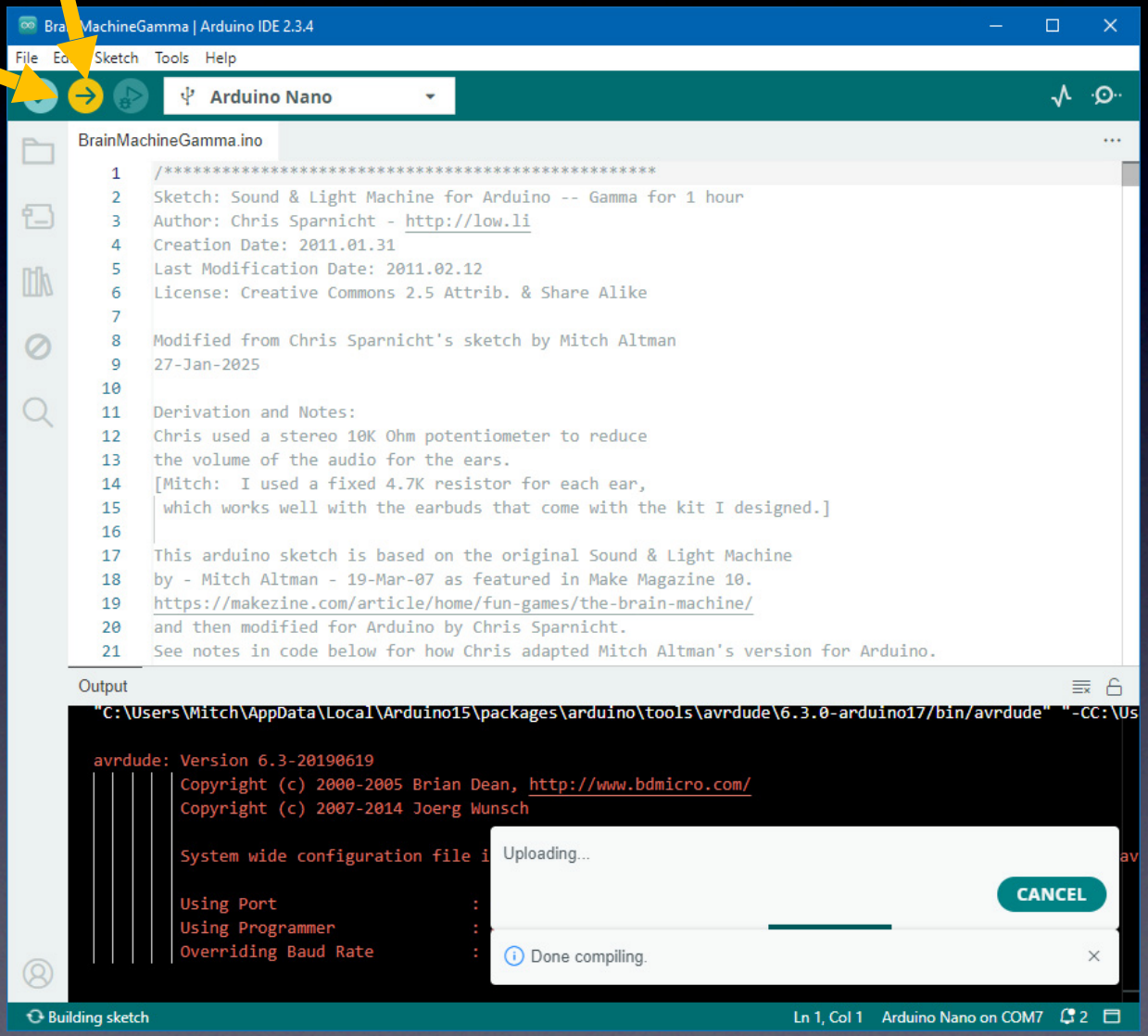
Arduino

If you get an error, please search for “tone” after clicking here:



Arduino

…then try again if you needed to download the “tone” library:



…and when it’s completed successfully, it says: “Upload done”

Brain Machine

Disconnect your Brain Machine board from the USB-C cable,

turn on your Brain Machine,

And…

Let’s Trip Out in New Ways !

Please Remember:

to

Wash your hands

after soldering

Brain Machine kit

Hack Your Brain With Sound & Light

open source hardware

CORNFIELD ELECTRONICS

Brain Machine kit

Hack Your Brain With Sound & Light

Mitch Altman

Chief Scientist, **Cornfield Electronics**, San Francisco, CA
Inventor of **TV-B-Gone** universal remote controls
Co-founder of **3Ware** (successful Silicon Valley startup)
Pioneer of **VR** (in the mid-1980s)
Founding mentor at **HAX** (1st and biggest hardware accelerator)
Co-founder of **Noisebridge** (San Francisco hackerspace)
email: **mitch@CornfieldElectronics.com**
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flickr: **maltman23**
WeChat: **mitchaltman**
Fediverse: **@maltman23@mastodon.social**
Patreon: mitchaltman

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