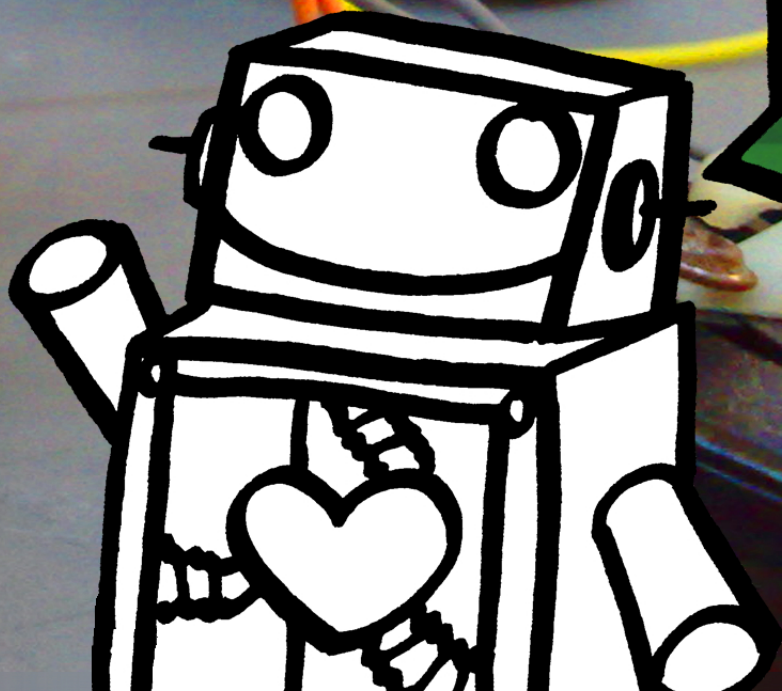


# TOY

## HACKING

AN ELECTRONICS  
**CRASH  
COURSE**

BY THE T.A.C.O. TEAM





## Toy Hacking Handbook

February 2015 Edition

by the Technology and Community Outreach (T.A.C.O.) Team  
Led by Garnet Hertz

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For additional information, see <http://conceptlab.com/circuitbending/>

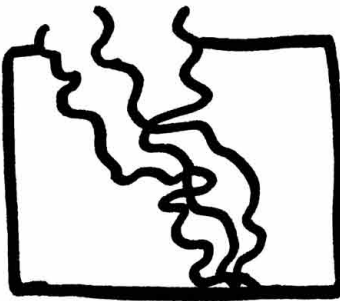


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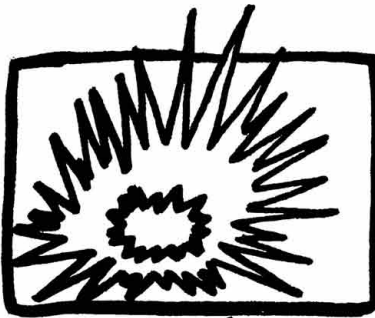
We are not liable for any personal injury, including death, caused by your reliance on or your use or misuse of any information presented or contained herein.

# Warning - Danger!

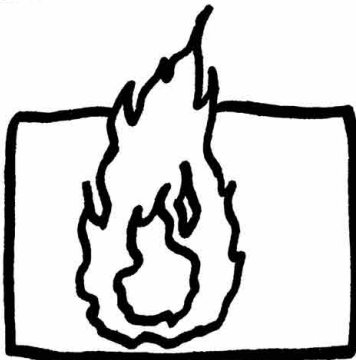
If You See...



Smoke

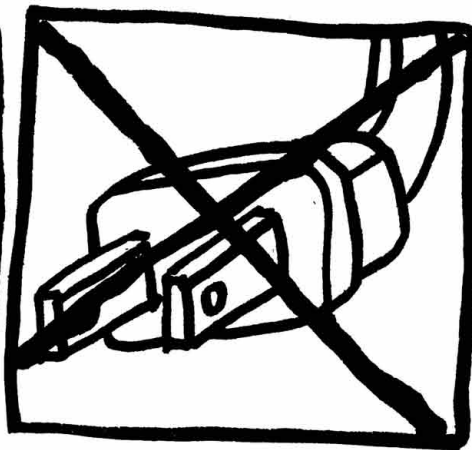
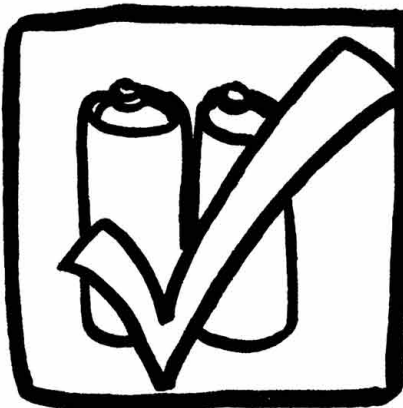


Sparks



Fire

# STOP!



Adult  
Supervision  
Required

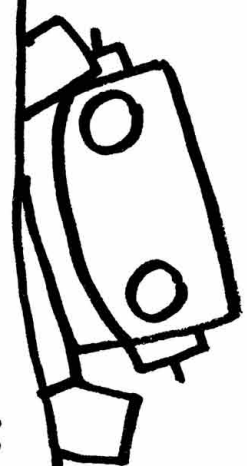
ONLY USE Battery powered toys!  
NO wall plugs!



## General Overview

1. Get a toy that makes sound.
2. Find a friend to work with.
3. Take the toy Carefully apart.
4. Mess around with the electronics to make cool sounds.
5. Add your own stuff to the toy electronics.

Now You have your own  
**HACKED TOY!**





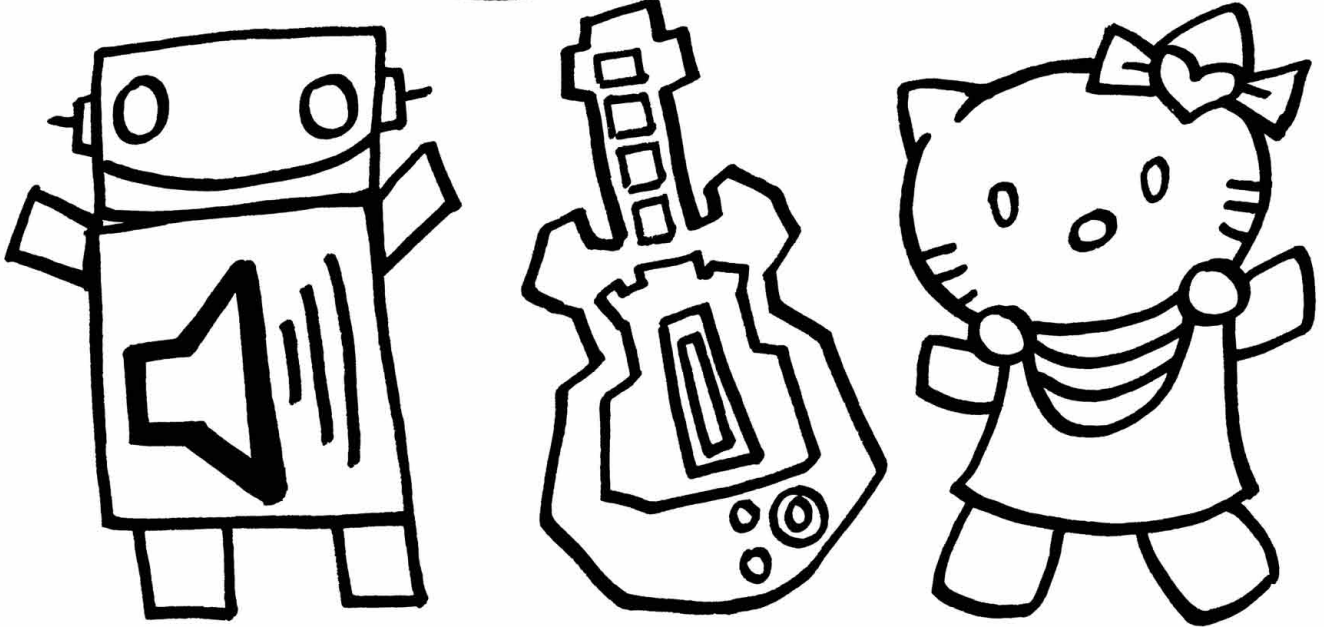
# How to select a good toy :

- ①. Try to find a toy at home.  
(one not used any more)

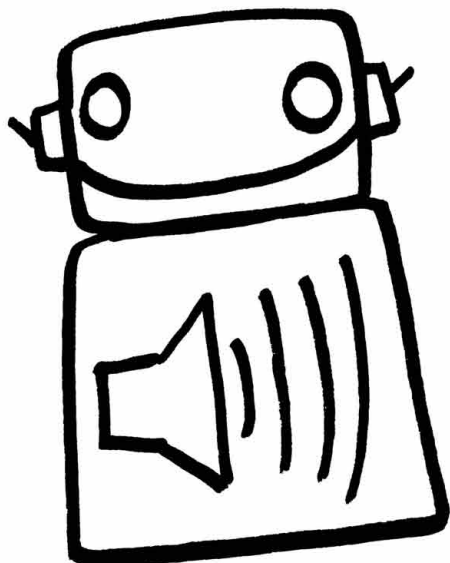


- ②. Go to a second hand or dollar store to find a toy.

Test your toy to  
make sure it makes  
Sound

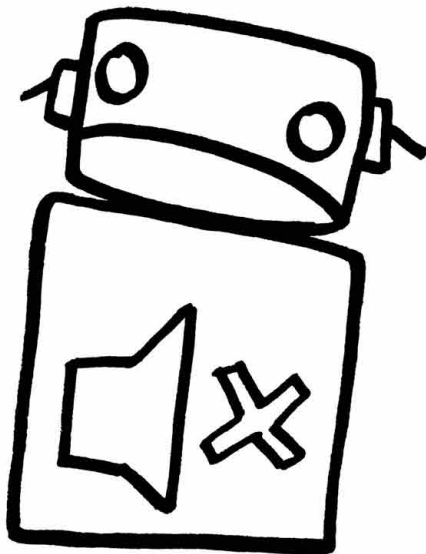


Does your toy make sound?



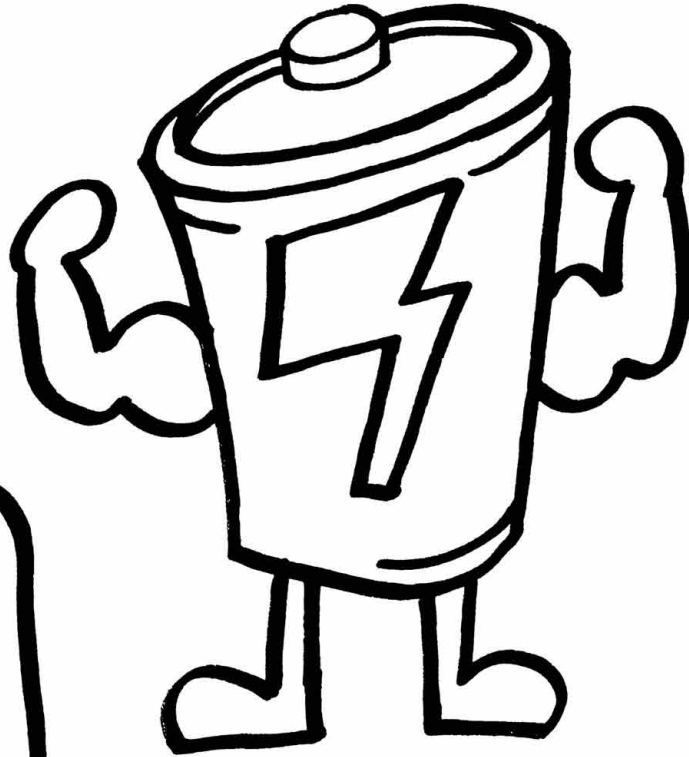
**YES** Sound!

OR



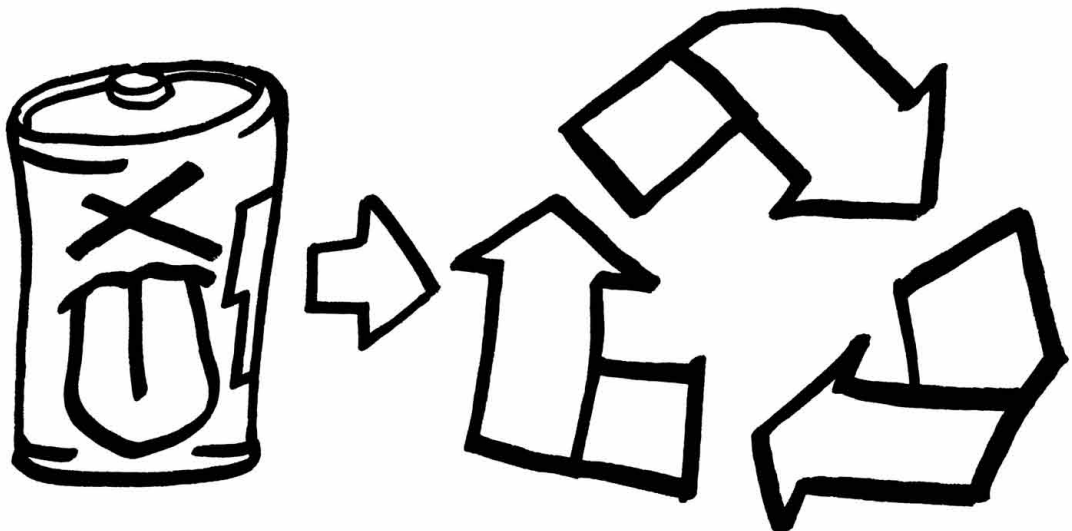
**NO** Sound...

# NO Sound ?



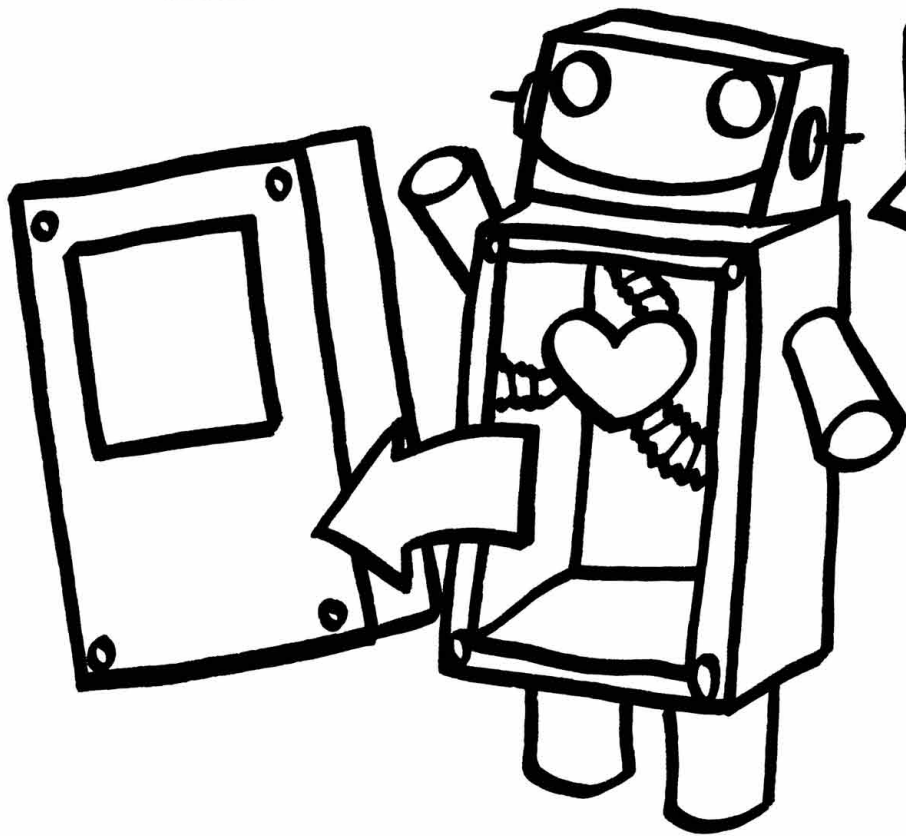
Replace  
the  
battery.

Recycle the old battery.

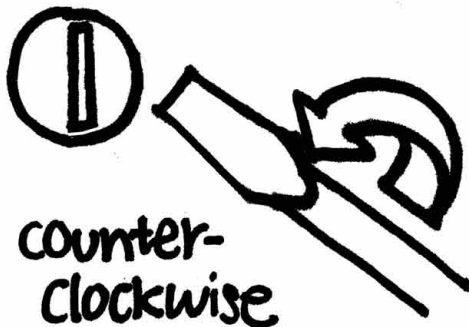




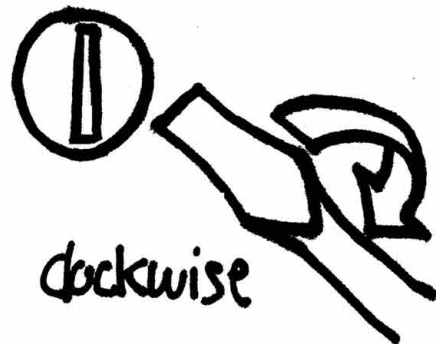
OPEN THE TOY with  
a screwdriver.



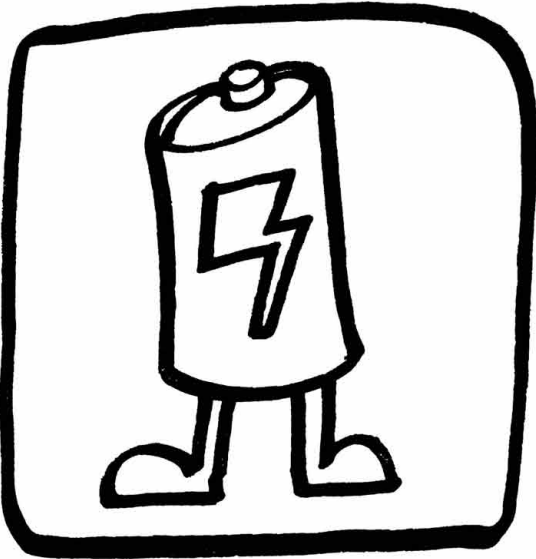
Removing a  
Screw



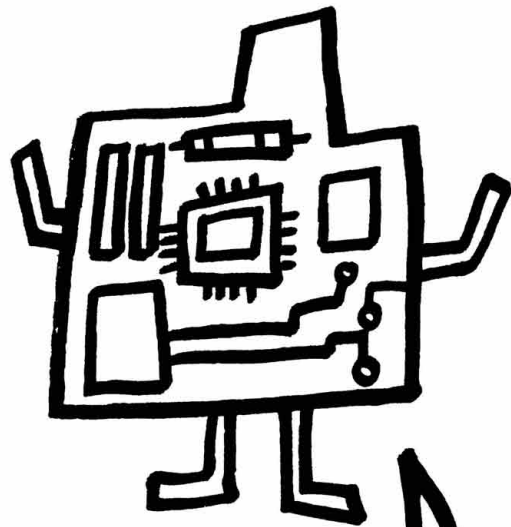
Inserting a  
Screw



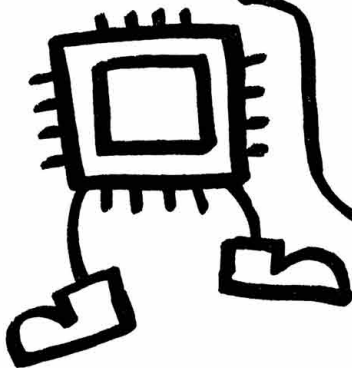
How does your toy make a sound?



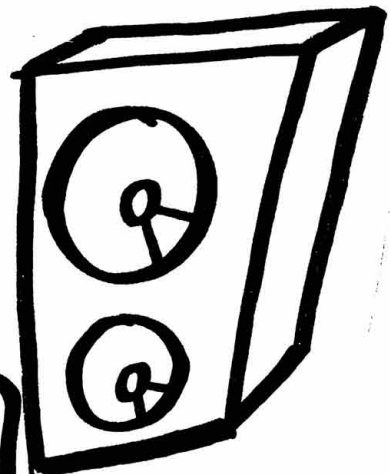
Batteries are power!



I'm a circuit board.

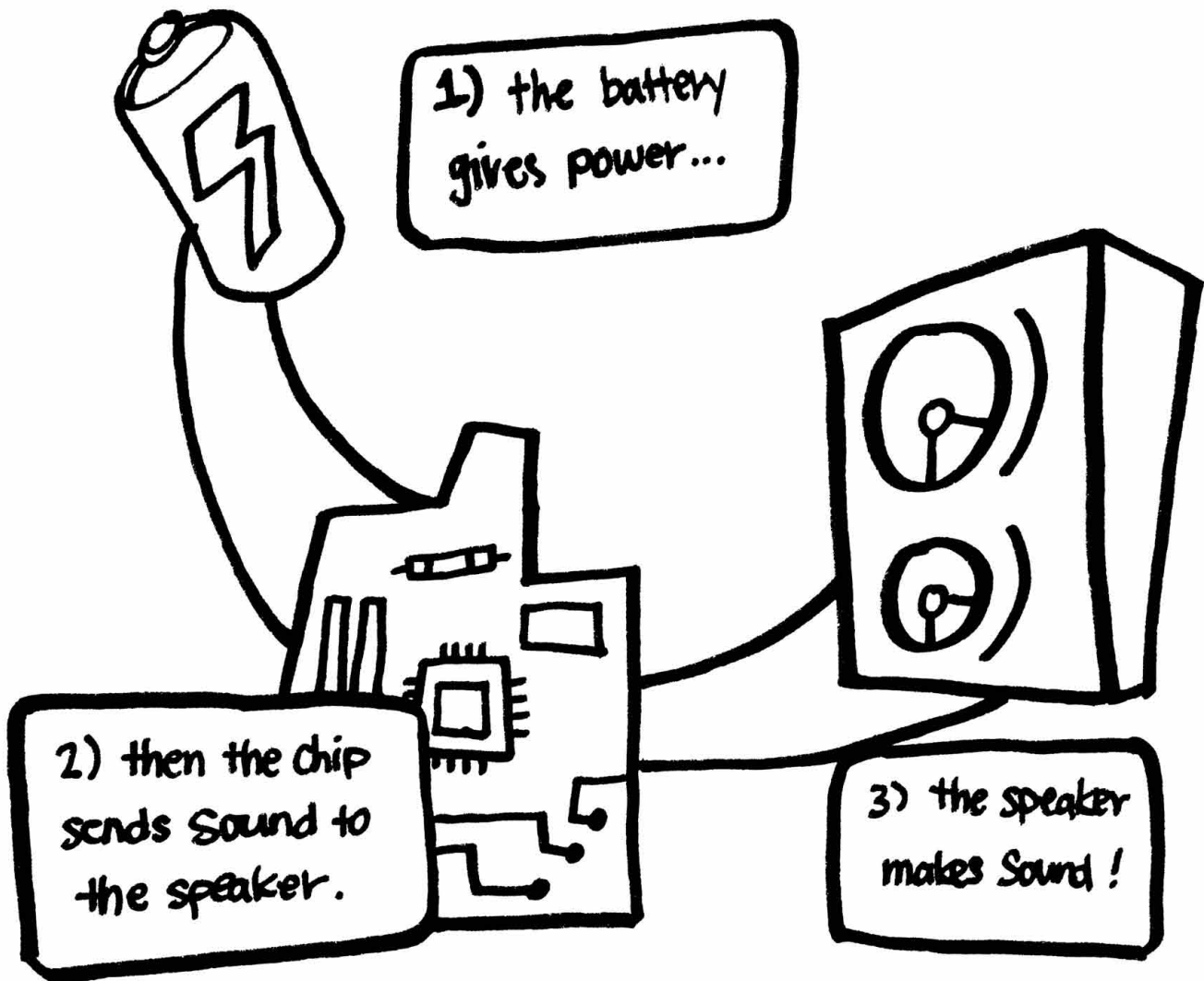


I am a chip  
and hold  
the sound!



I am a speaker  
and I make  
Sound!

How do they work together?

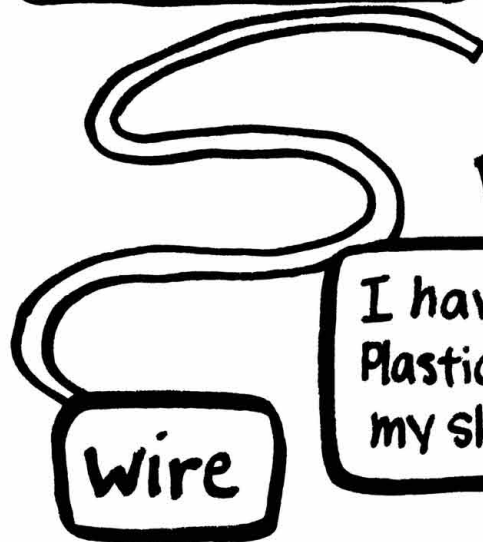


They are a sound making team -  
**KEEP THEM Together!**



# How to find Cool Sounds:

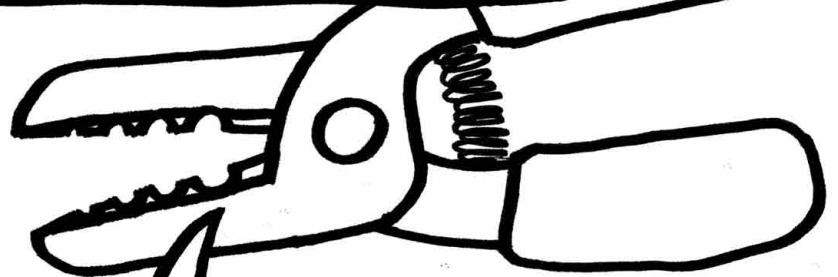
Stuff we need:



Wire

I have  
Plastic as  
my skin.

I strip  
wires.



wire  
stripper

No  
Plastic  
Skin

Let's strip some wire

No  
Plastic  
Skin



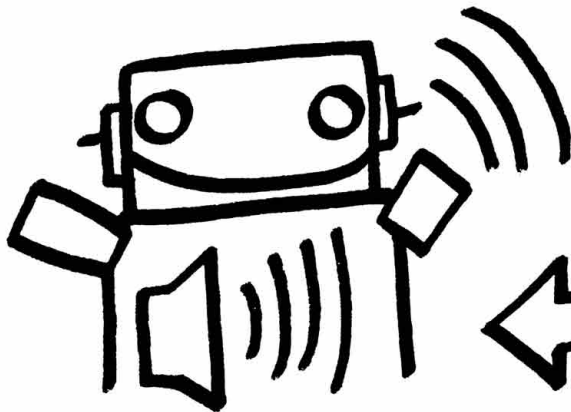
NEXT

Find a button on the toy  
that makes a LONG sound.

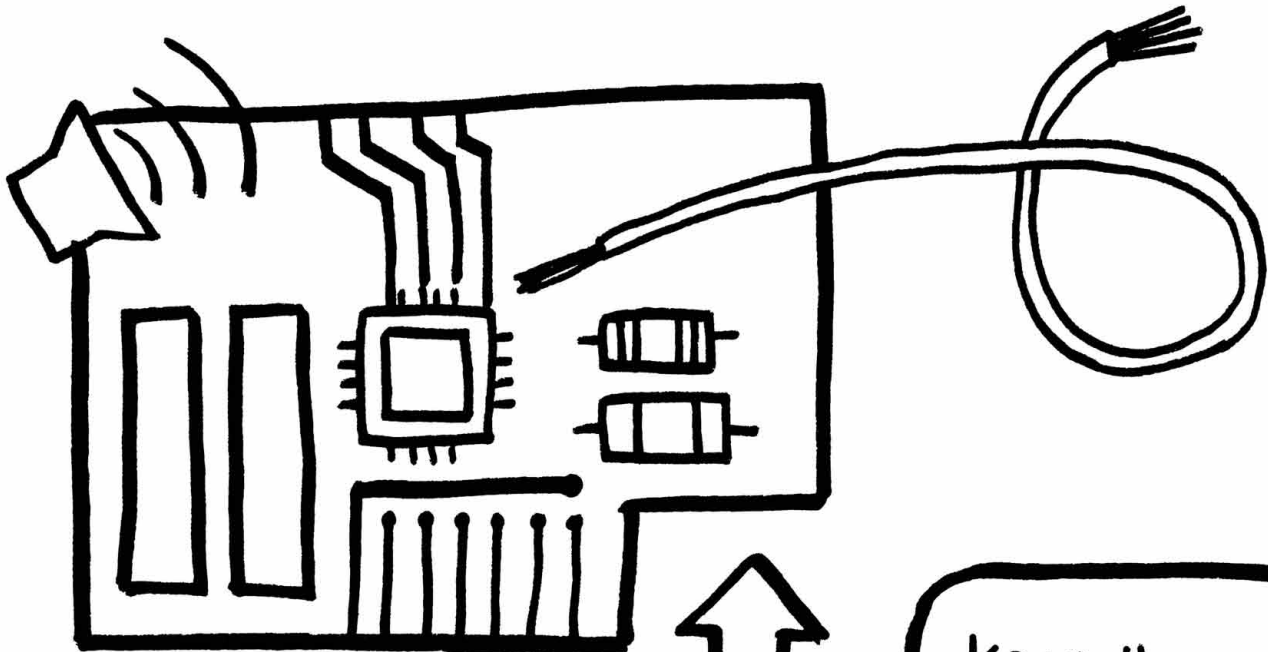
Have your friend  
keep pressing that button.

How to find cool sounds :

**It's LIKE a treasure hunt!**



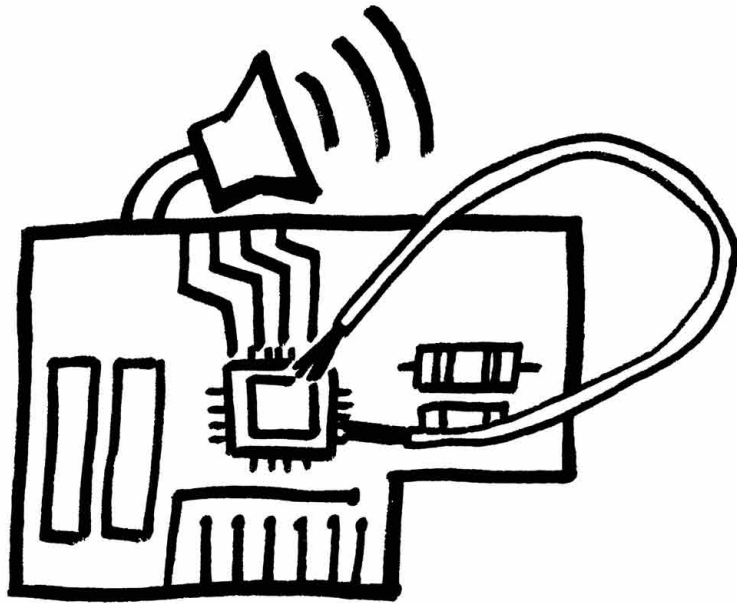
1) When the toy is making a sound.



2) Take the wire and touch it to any part of a circuit board.

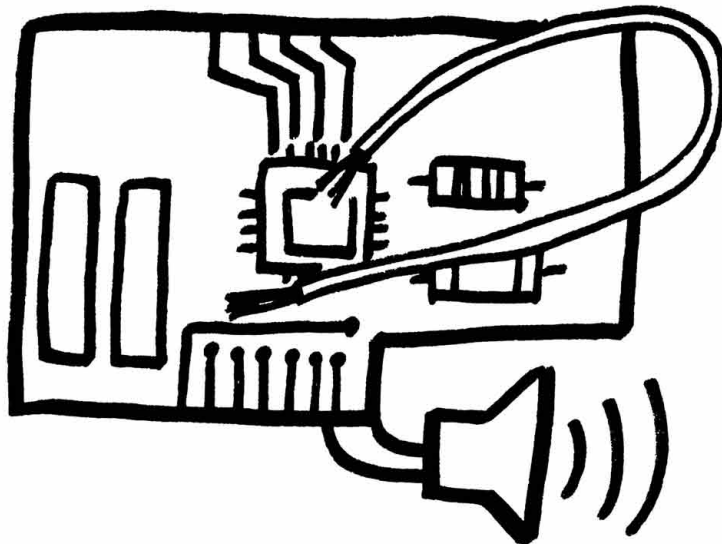
Keep the wire touching.

3)  
Touch the  
other end  
of the wire  
to any other  
part of the  
circuit board.



Did the sound change?

4)  
**IF NOT,**  
touch the wire  
to another  
part of the  
circuit board  
and Listen!

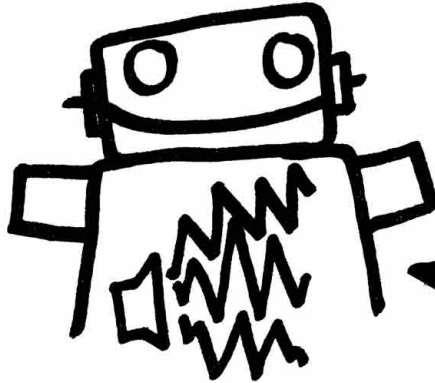


Make sure that you are doing this when  
the toy is making a sound!

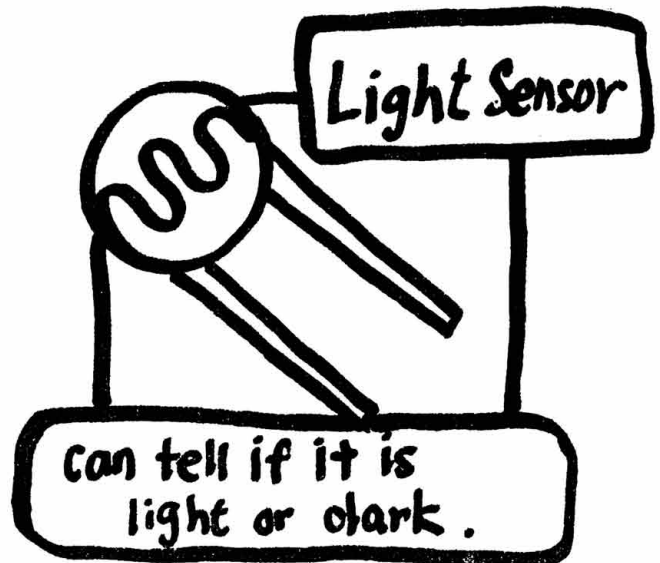
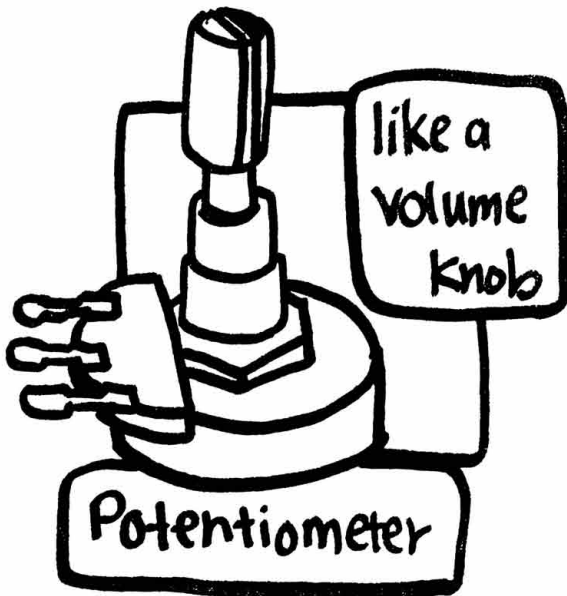
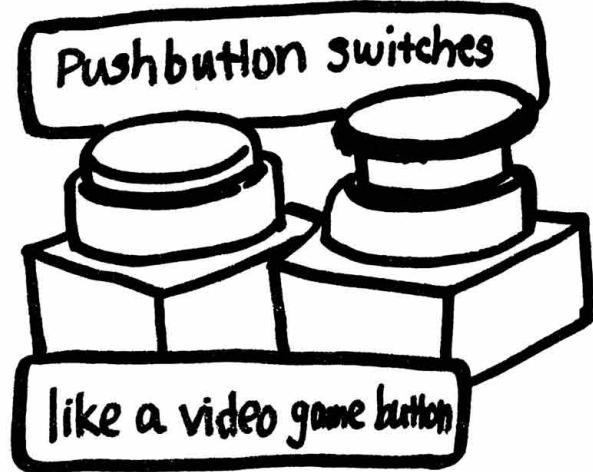
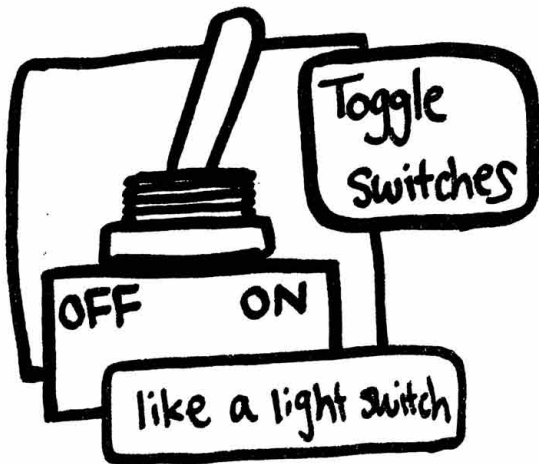


Find a weird sound?

Remember how you did it!

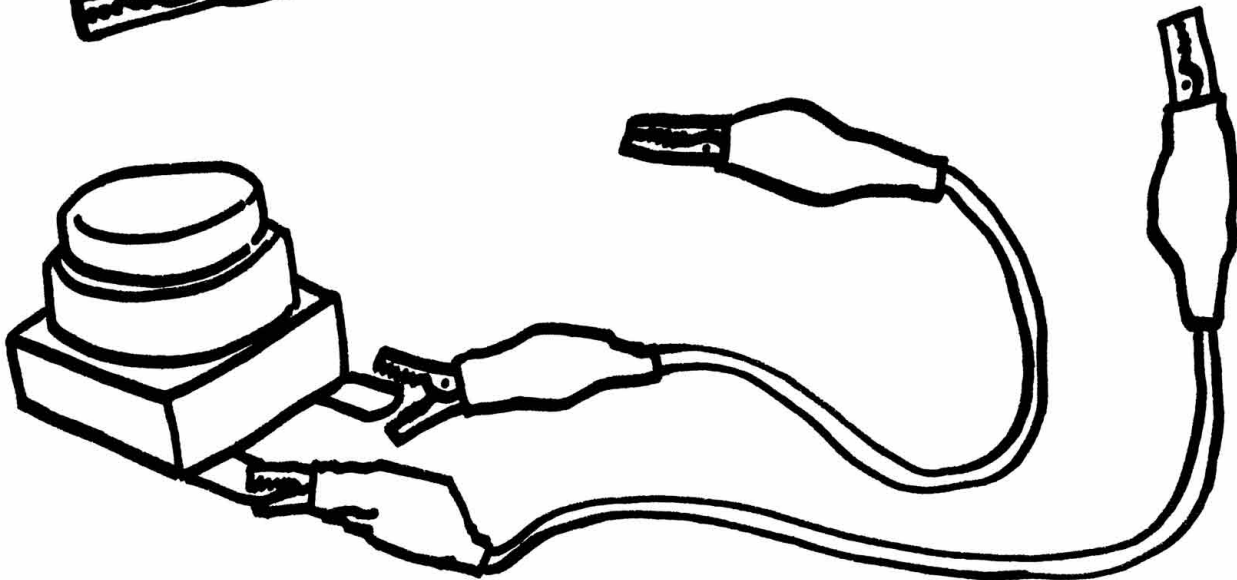


We will now  
add your own  
Stuff to the toy.

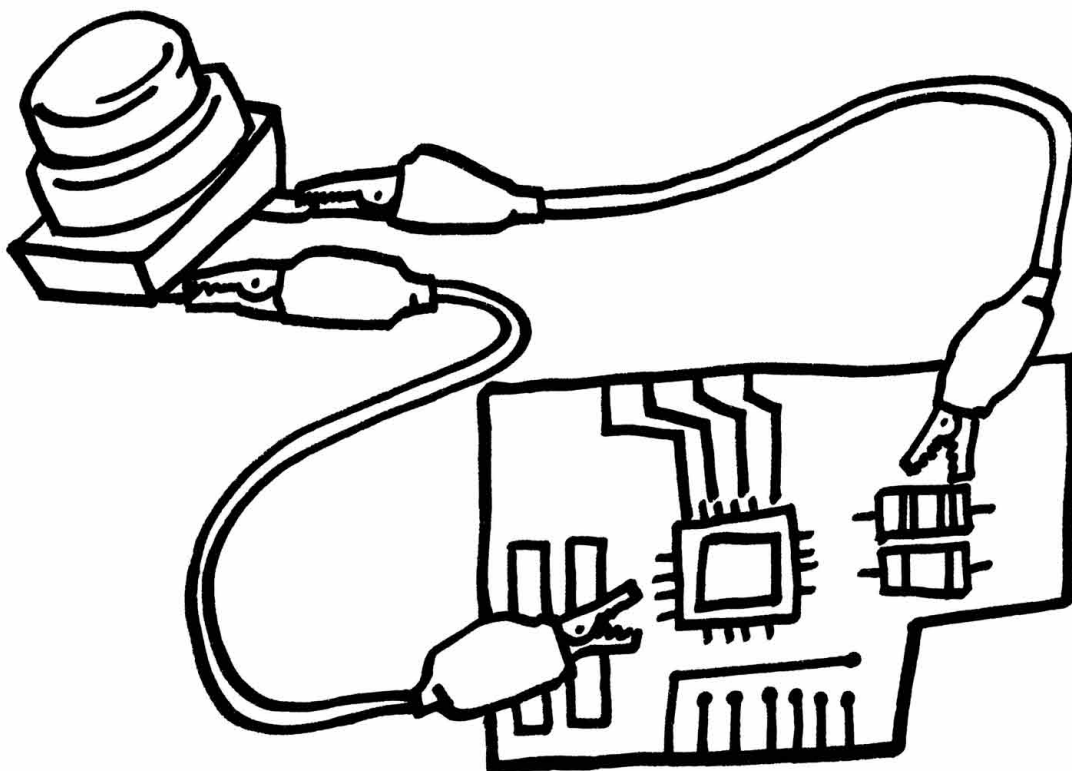


Find the places on your board that changed the sound.

Use alligator clips to connect stuff.

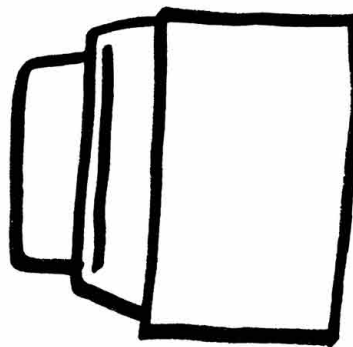


Connect two alligator clips to a switch.



Put the clips on the Sound Changing Places on the board.

Push the Button!



Try Potentio-  
-meter and  
light sensor!

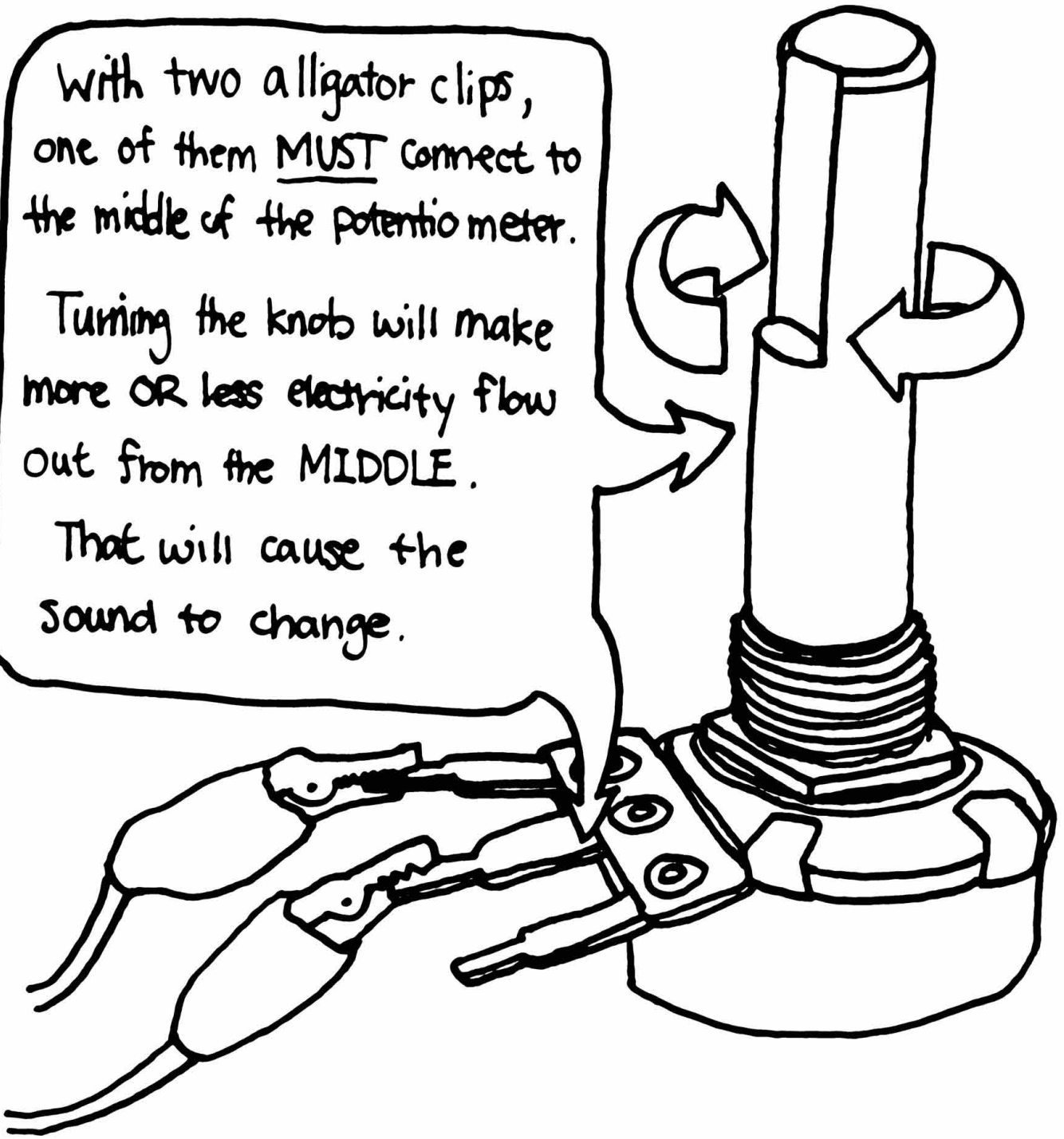


## How to add a potentiometer

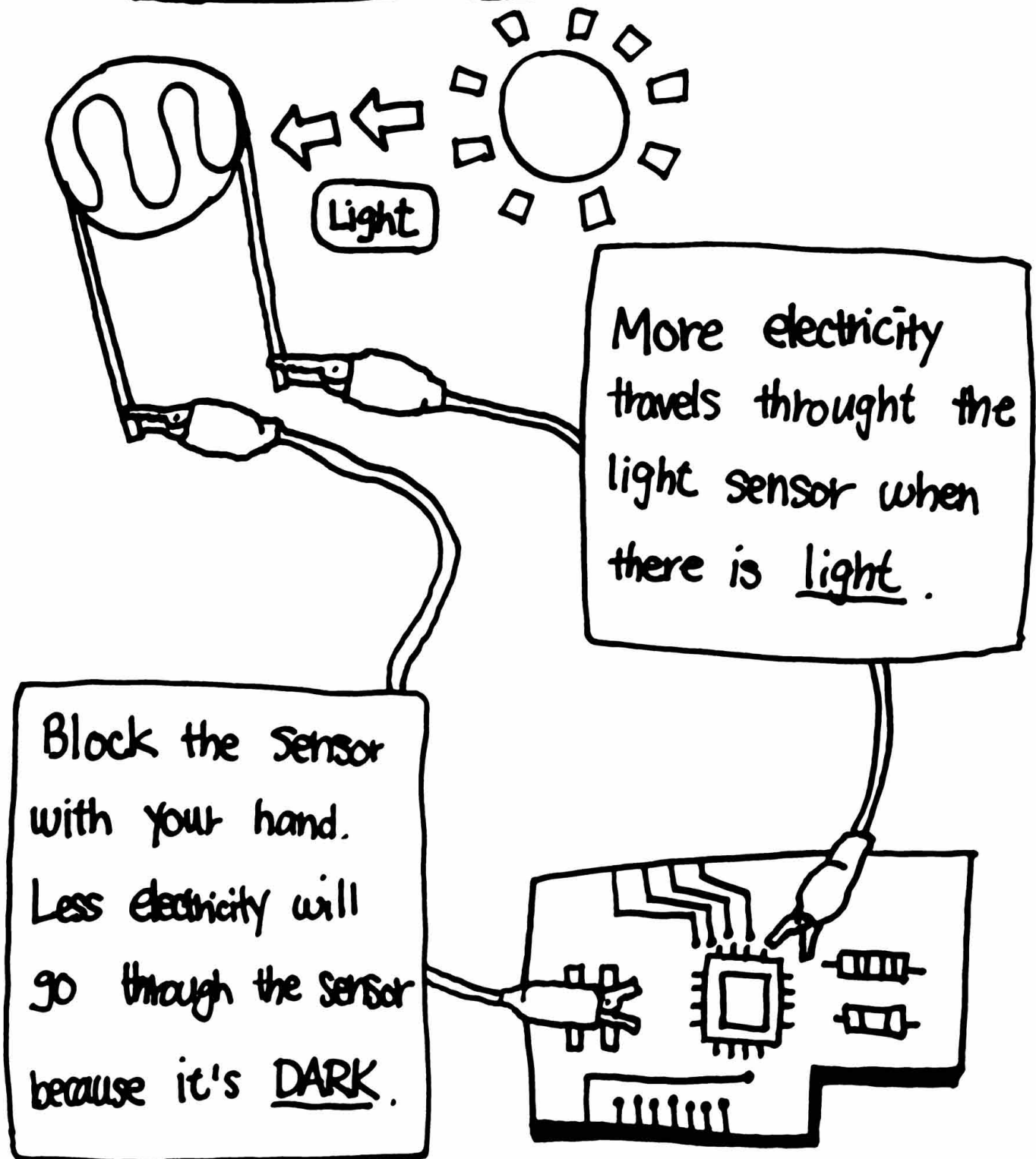
With two alligator clips, one of them MUST connect to the middle of the potentiometer.

Turning the knob will make more OR less electricity flow out from the MIDDLE.

That will cause the sound to change.



# How to add a Light Sensor



Like it?

get an adult to  
Solder it!

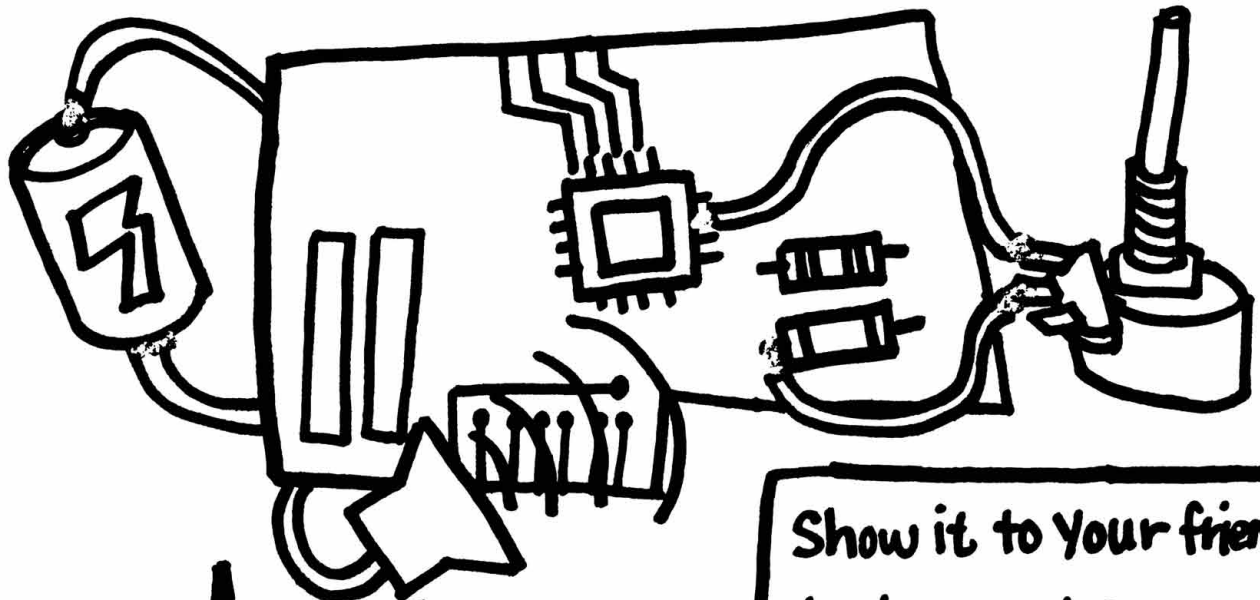
Melted metal can  
connect wires  
and buttons  
to the circuit  
board so they  
don't fall off.



HOT!

Danger!  
Adult supervision  
Required!

Put everything back together!

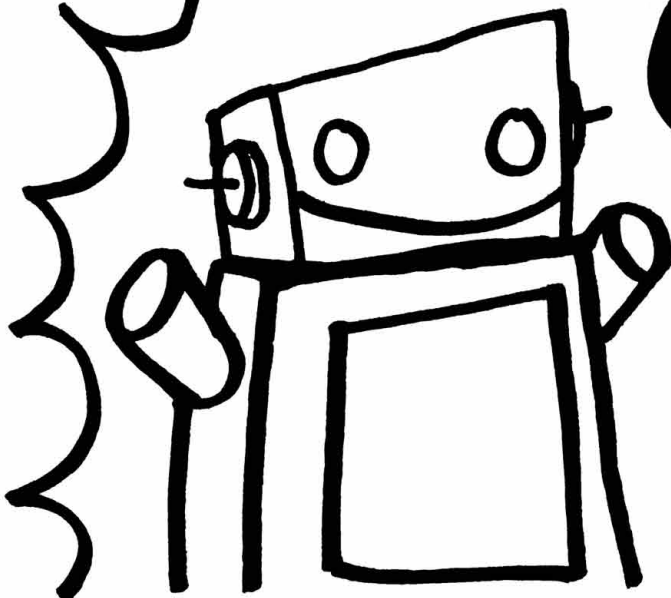


Show it to your friends,  
teachers, and parents!

**Congratulations!**

😊 You are now a

**Toy Hacker!**



# What to do with Your Project

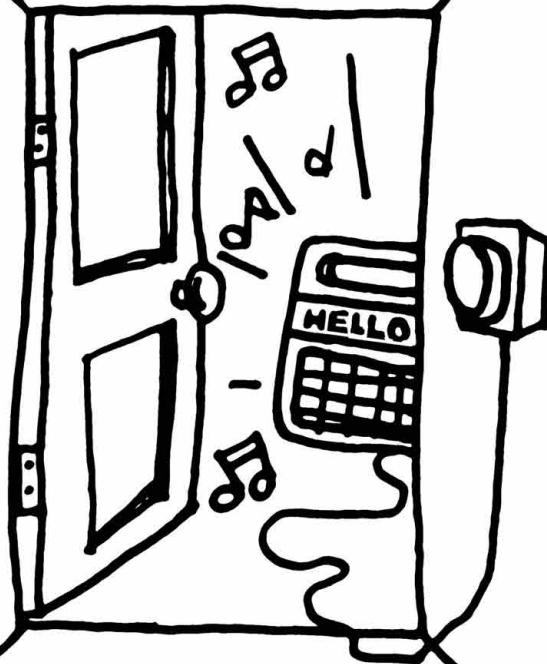
You Can...

① use it for a science fair project.



②

Make it into your very own personal doorbell!

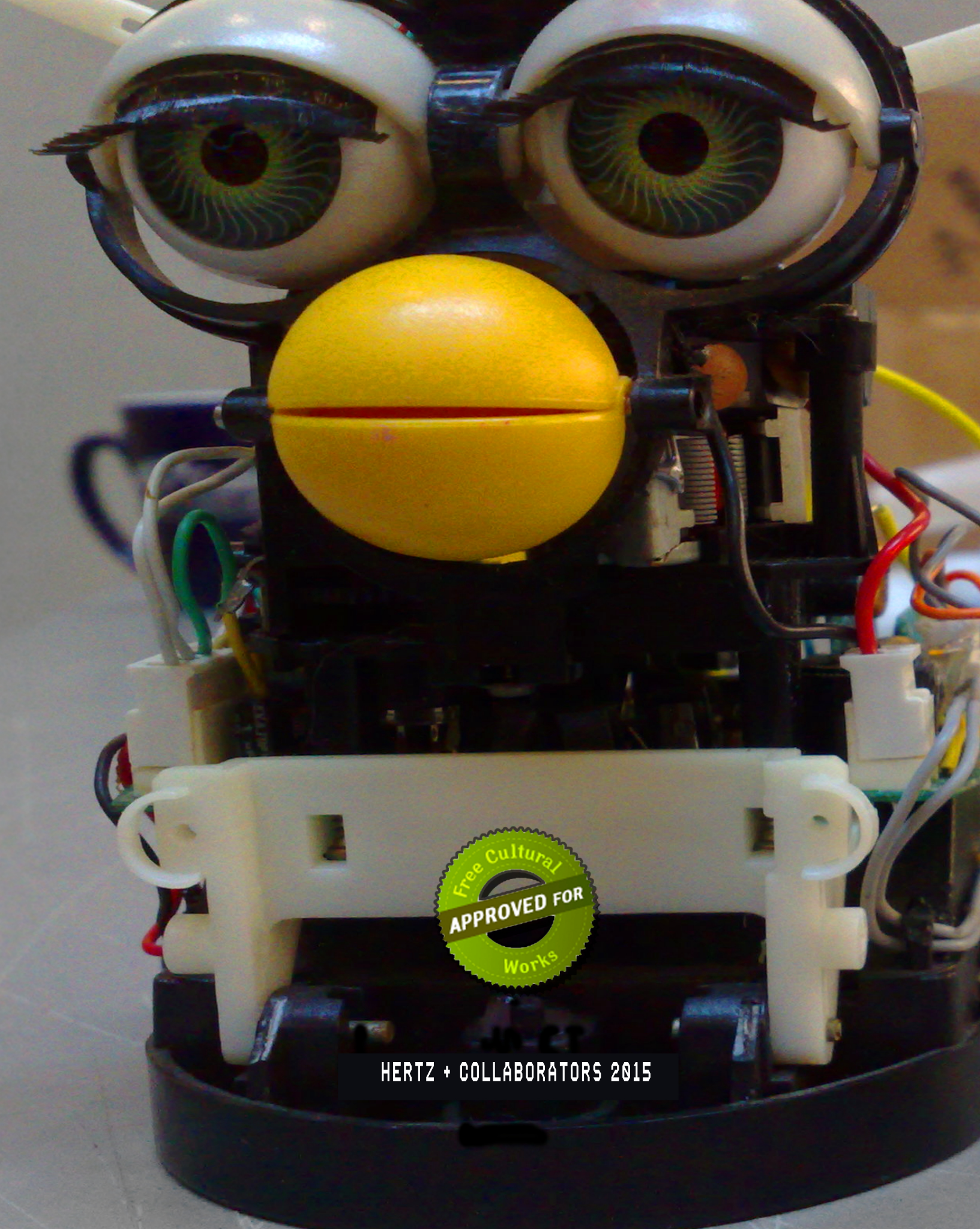


③ Make a YouTube video

YouTube

USE YOUR  
Imagination!





HERTZ + COLLABORATORS 2015