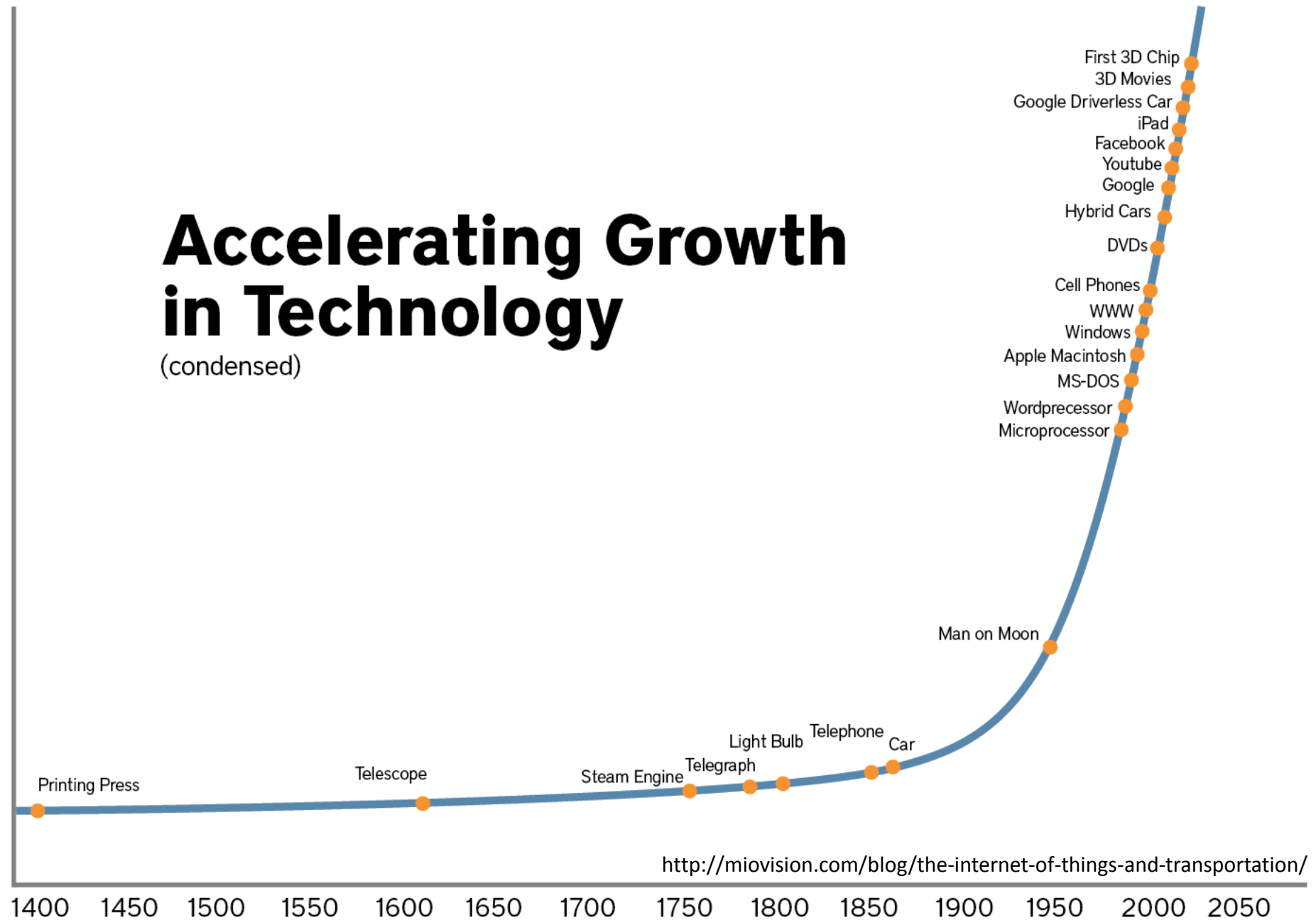


# Wireless Energy Transfer

# Accelerating Growth in Technology

(condensed)



<http://miovision.com/blog/the-internet-of-things-and-transportation/>

# Melvin Kranzberg

- Technology is neither good nor bad; nor is it neutral.

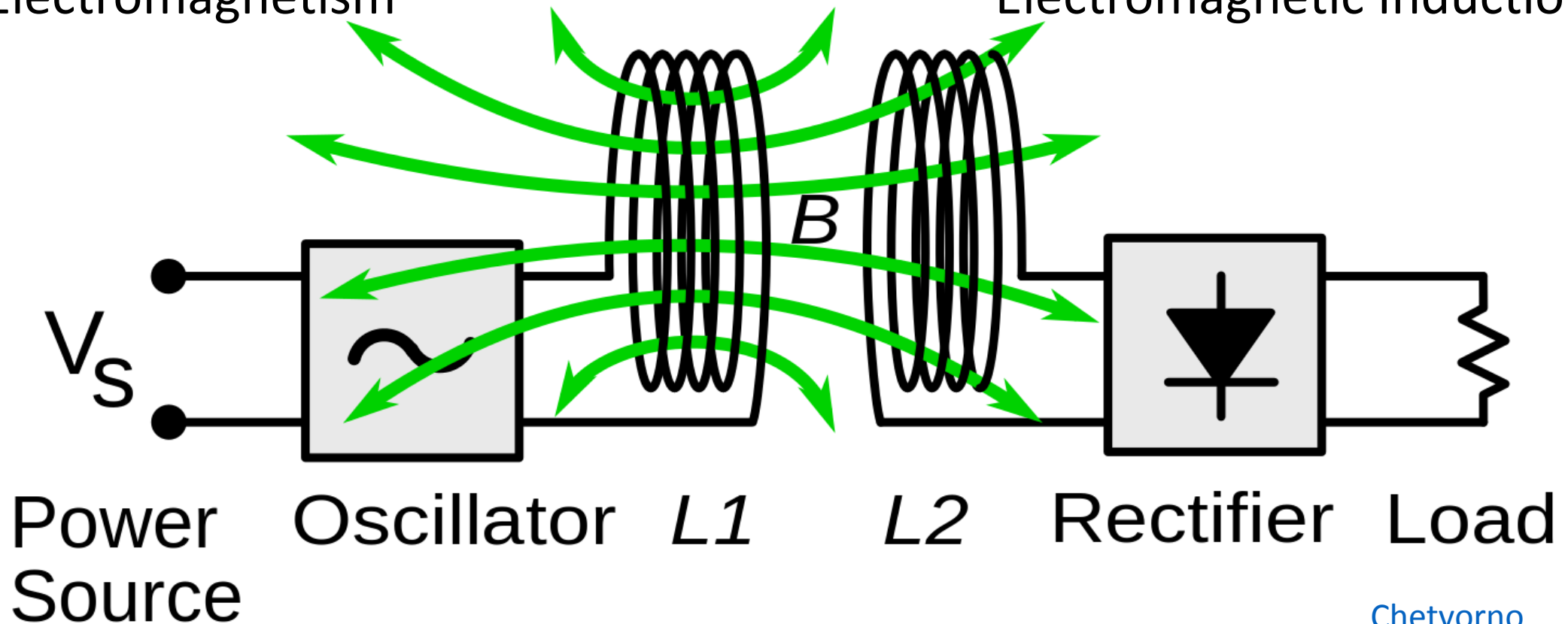
# Edward R. Murrow

- On television: this instrument can teach, it can illuminate; yes, and it can even inspire. But it can do so only to the extent that humans are determined to use it to those ends. Otherwise it is merely wires and lights in a box.

# Wireless Energy Transfer

Electromagnetism

Electromagnetic Induction





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[Ralf Roletschek](#), [GFDL](#)



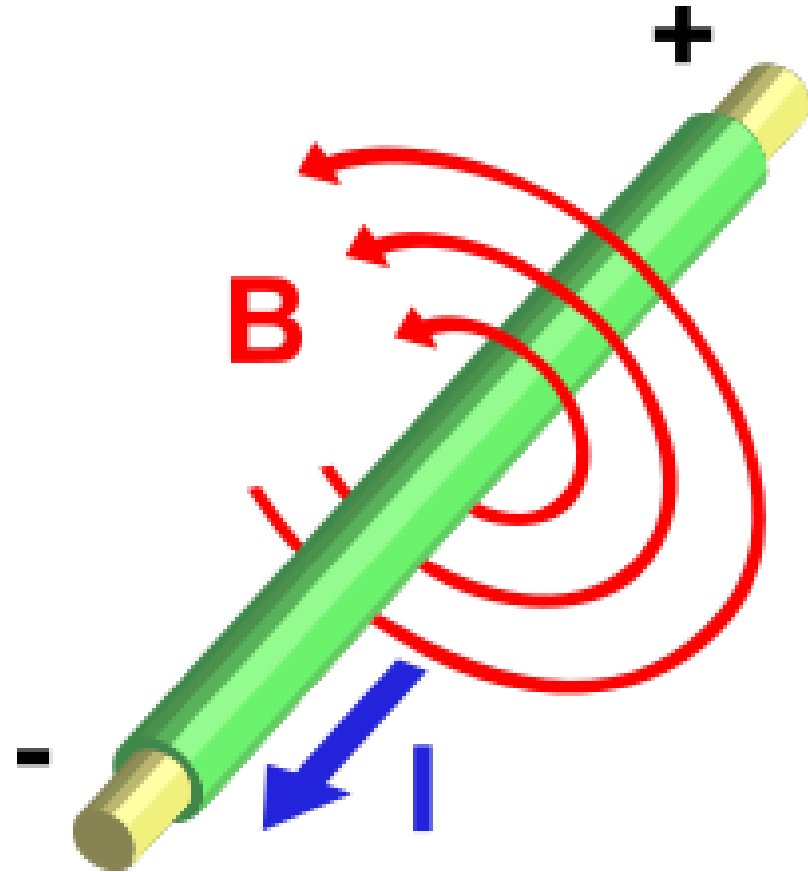
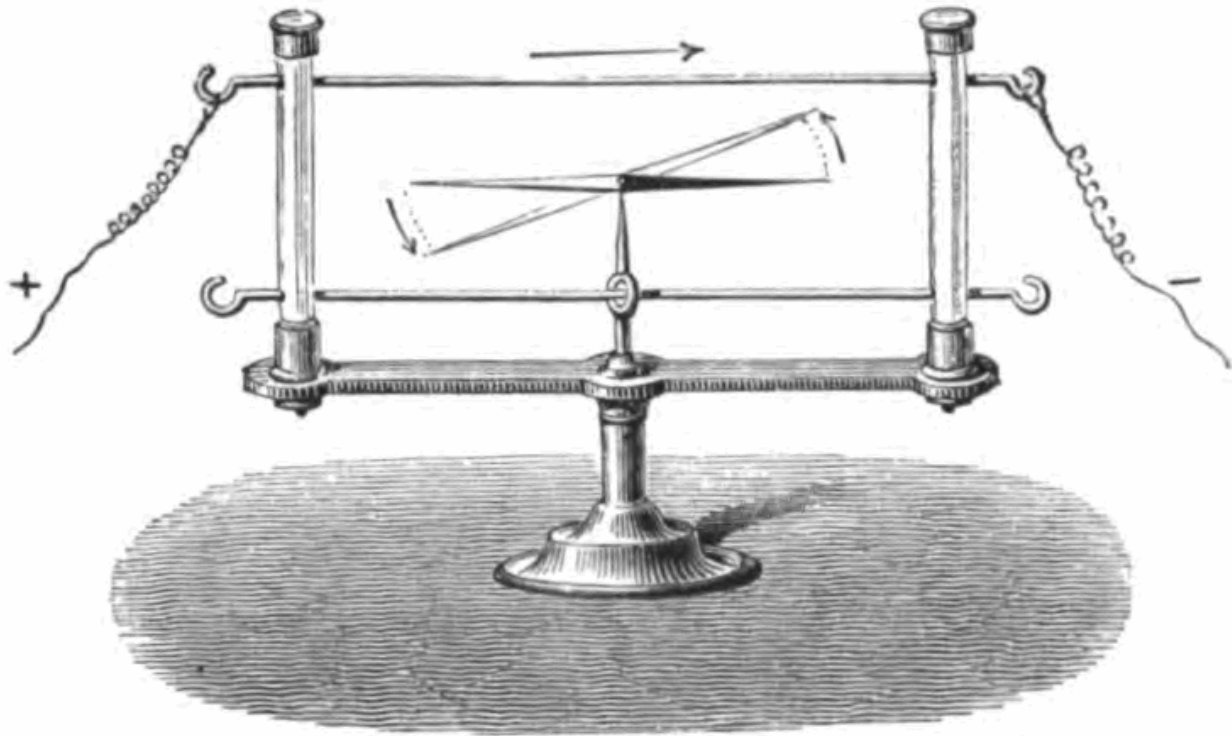
Norsk Elbilforening  
[CC BY 2.0](#)



[Anders](#)  
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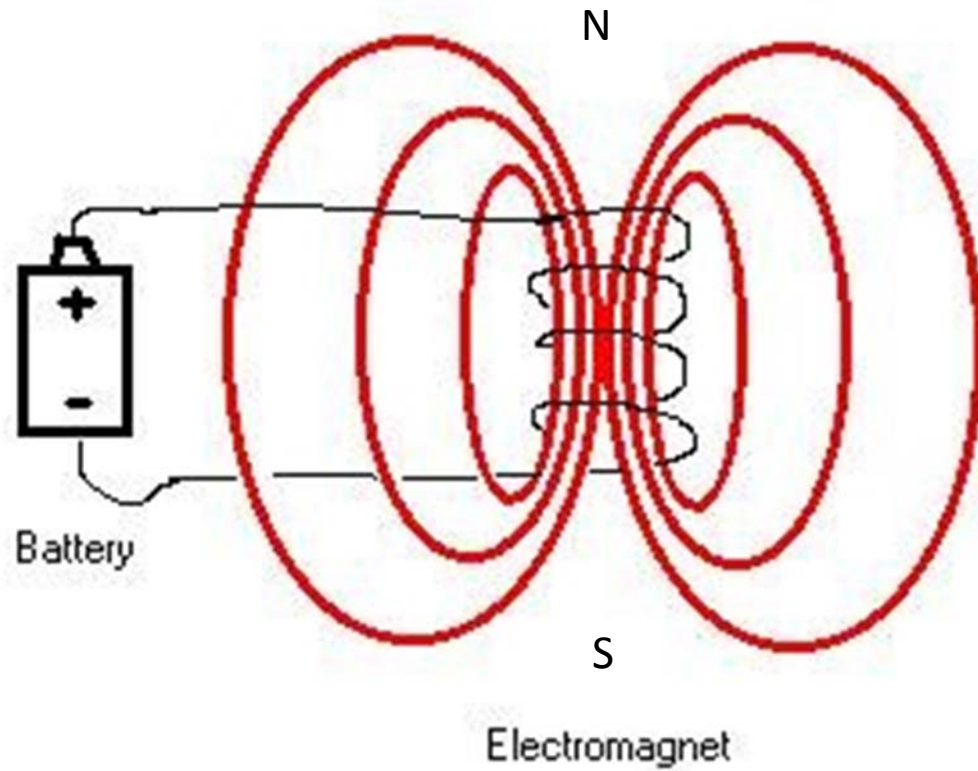
# Hans Christian Ørsted, ca. 1820

- Electromagnetism



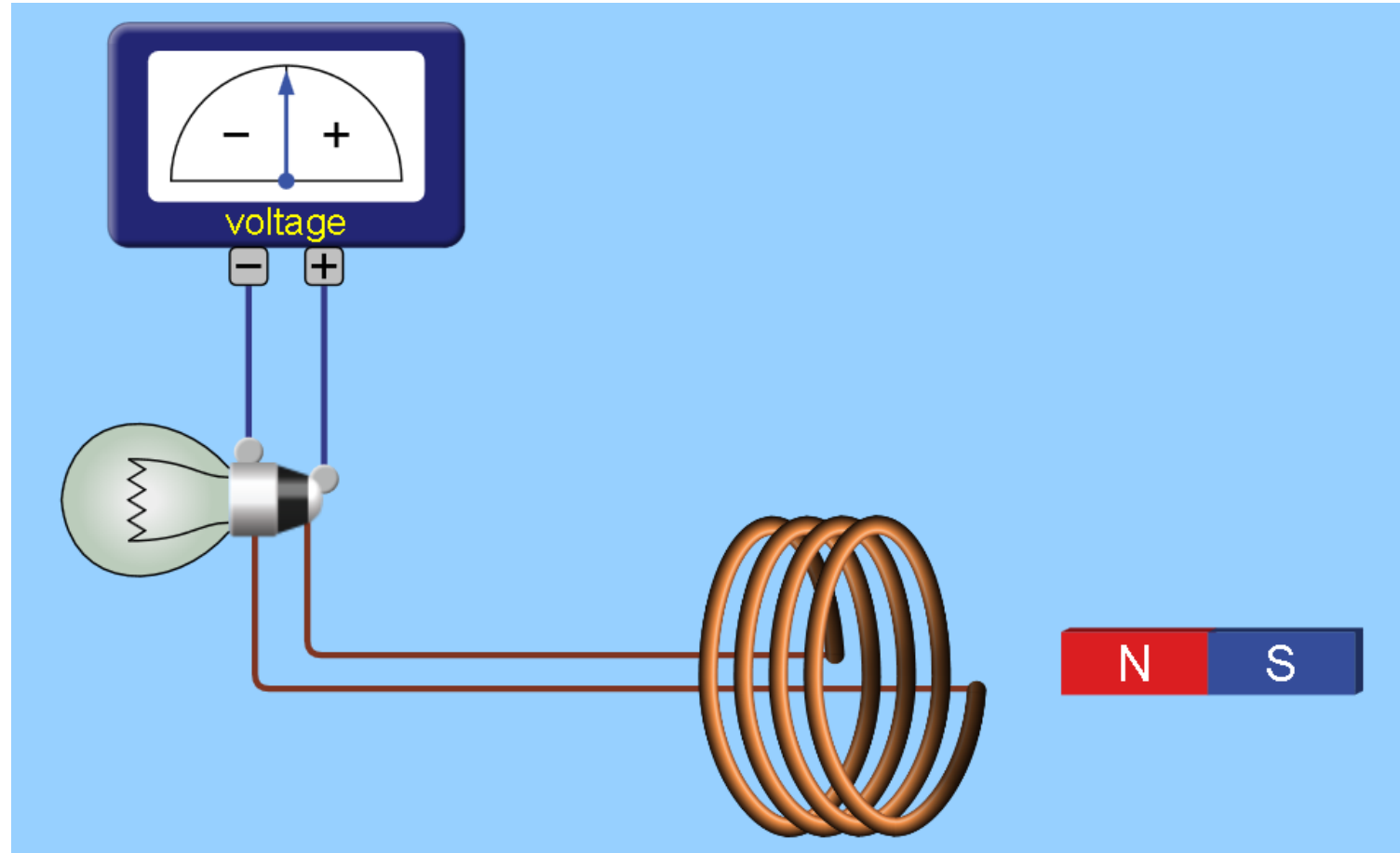
<http://en.wikipedia.org/wiki/Electromagnet>

# Right-hand Rule



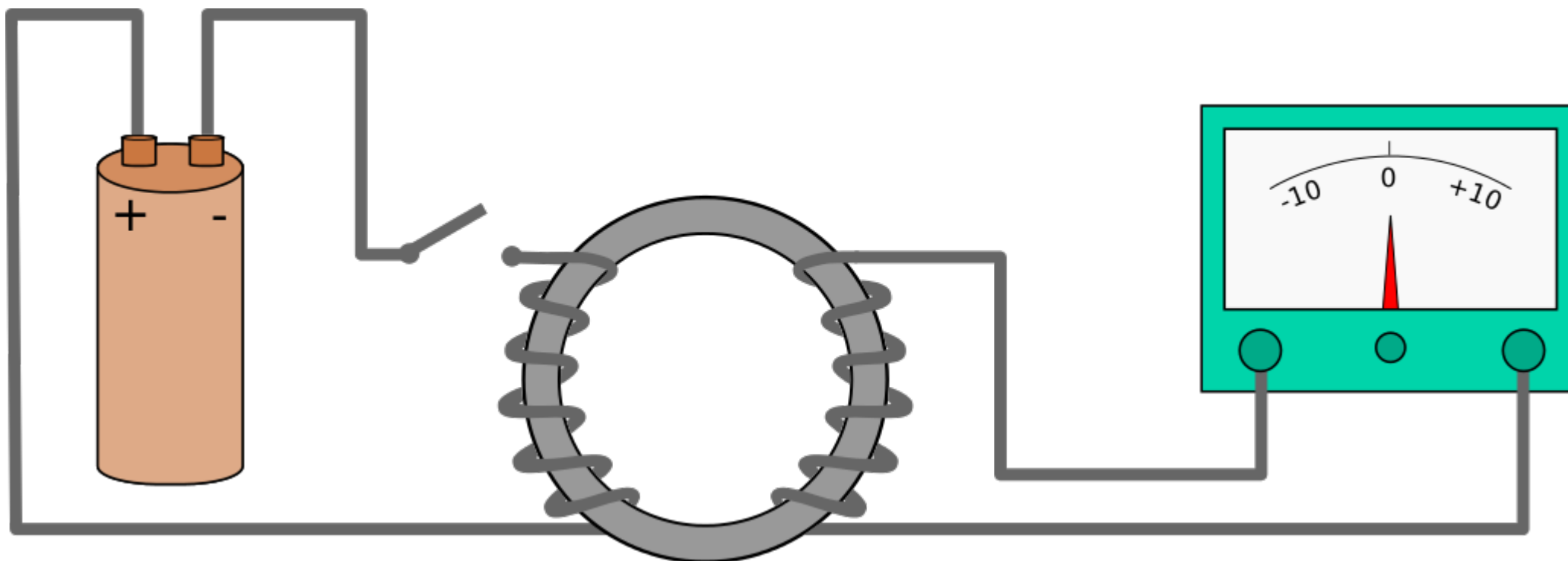


# Wow! Can a magnet make electricity?



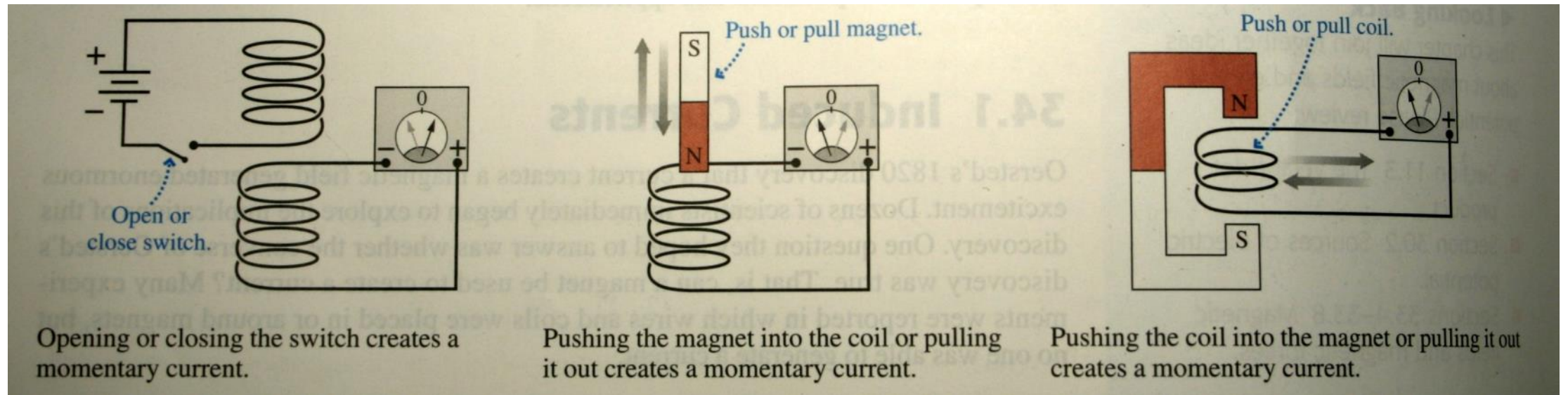
<https://phet.colorado.edu/>

# Faraday's Experiments



Eviatar Bach  
[CCO](#)

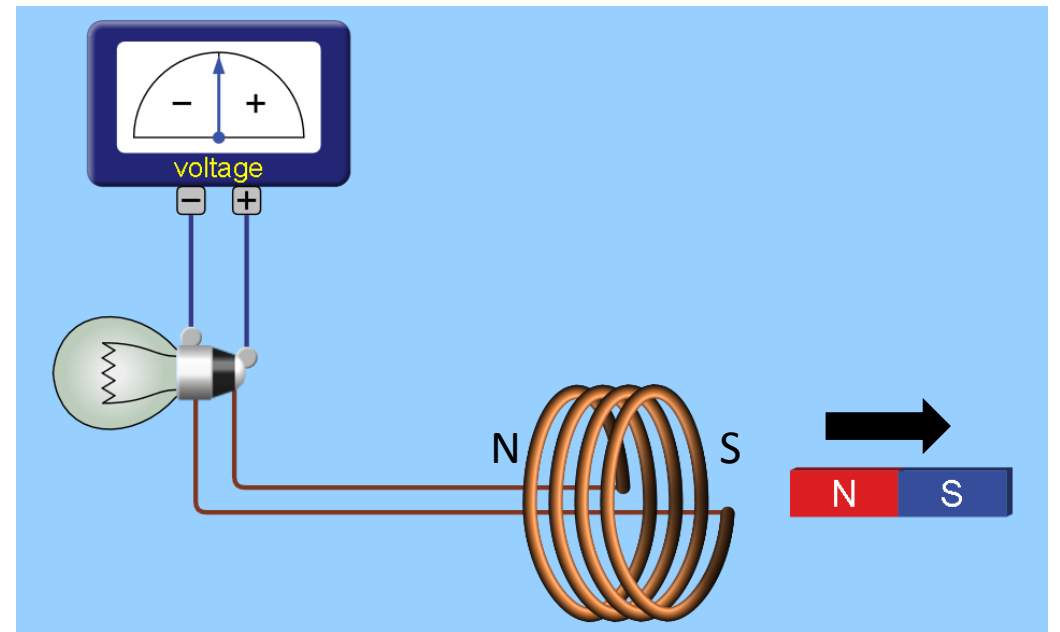
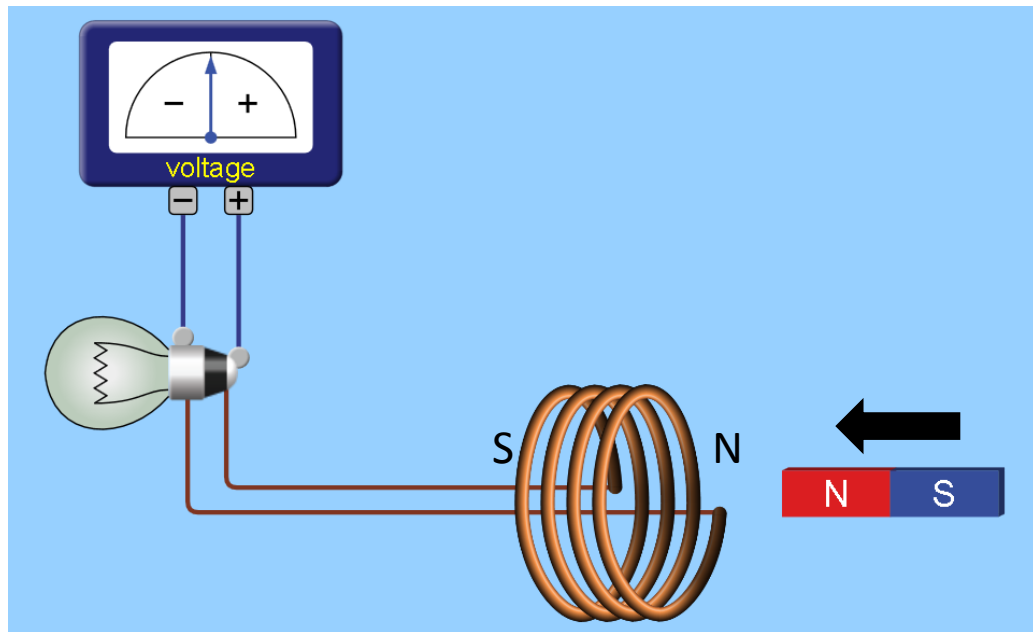
# Faraday's Experiments



*Physics for Scientists and Engineers: A Strategic Approach with Modern Physics (2nd Edition), Randy Knight*

# Lenz's Law

- If an induced current flows, its direction is always such that it will oppose the change which produced it.



# Faraday's Law

The induced electromotive force in any closed circuit is equal to the negative of the time rate of change of the magnetic flux enclosed by the circuit.

Single loop of wire

$$\mathcal{E} = -\frac{d\Phi_B}{dt}$$

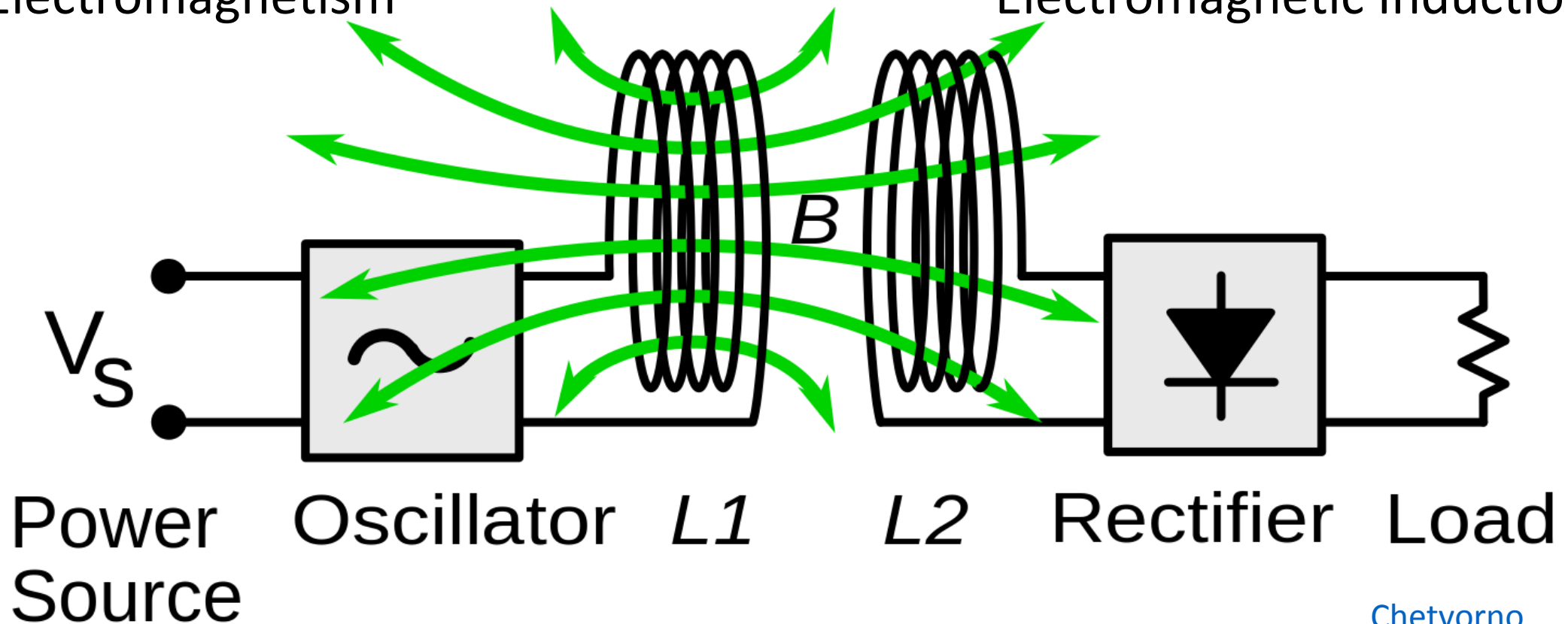
N loops of wire

$$\mathcal{E} = -N\frac{d\Phi_B}{dt}$$

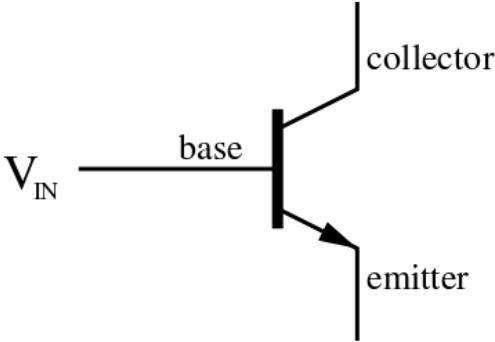
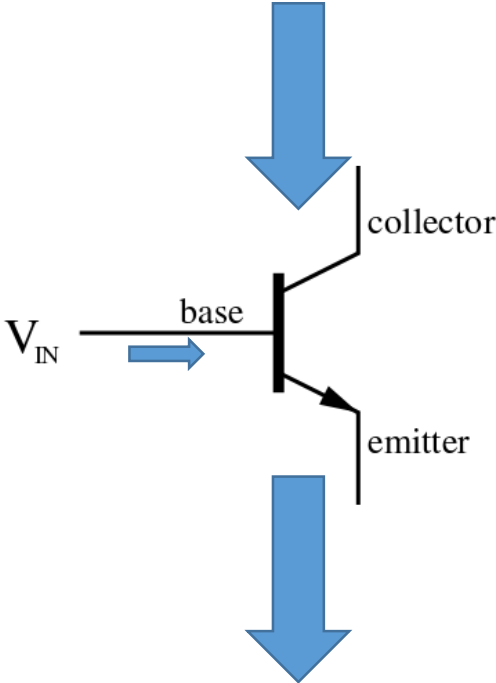
# Wireless Energy Transfer

Electromagnetism

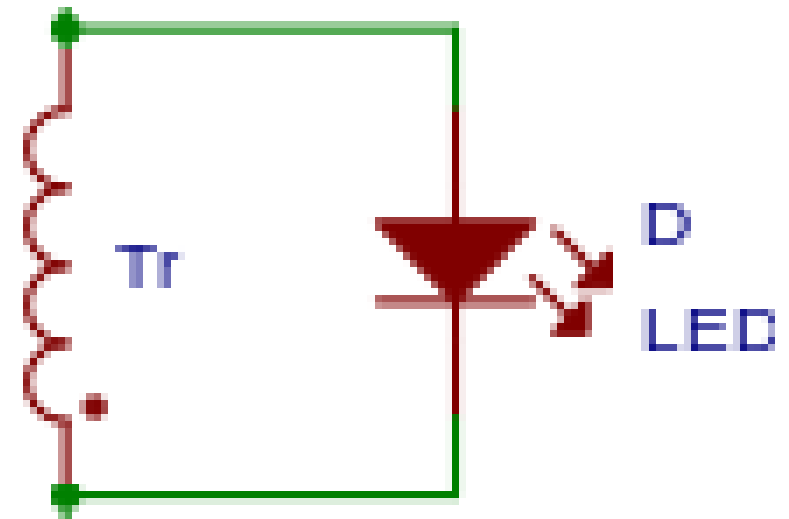
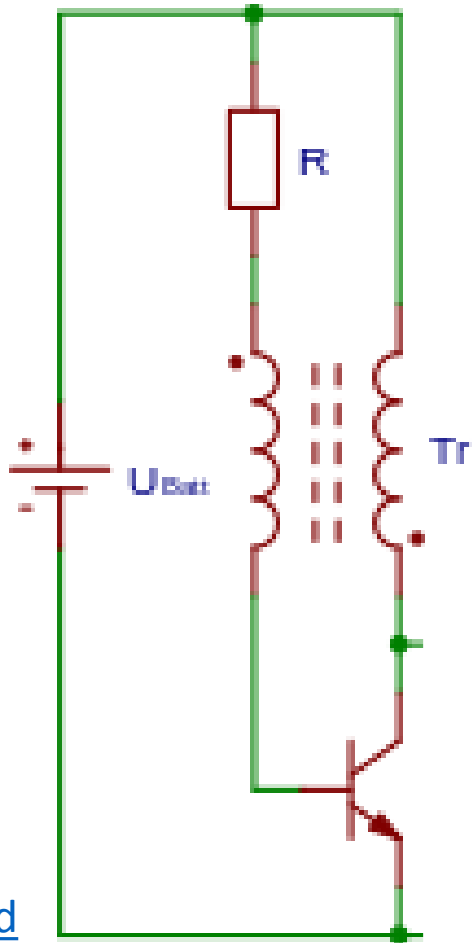
Electromagnetic Induction



# Transistor



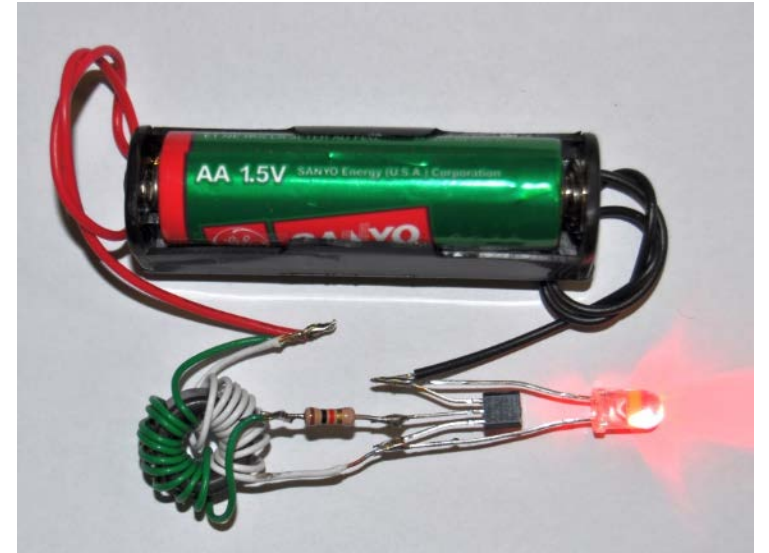
# Oscillator Circuit





# More information

- Joule Thief
  - Steal every last joule of energy from a dead battery.
- Blocking Oscillator



[AcmeFixer](#)  
[CC BY-SA 3.0](#)

### Receiver Materials


- 30 AWG Magnet wire (15 ft.)
- LED

### Transmitter Materials

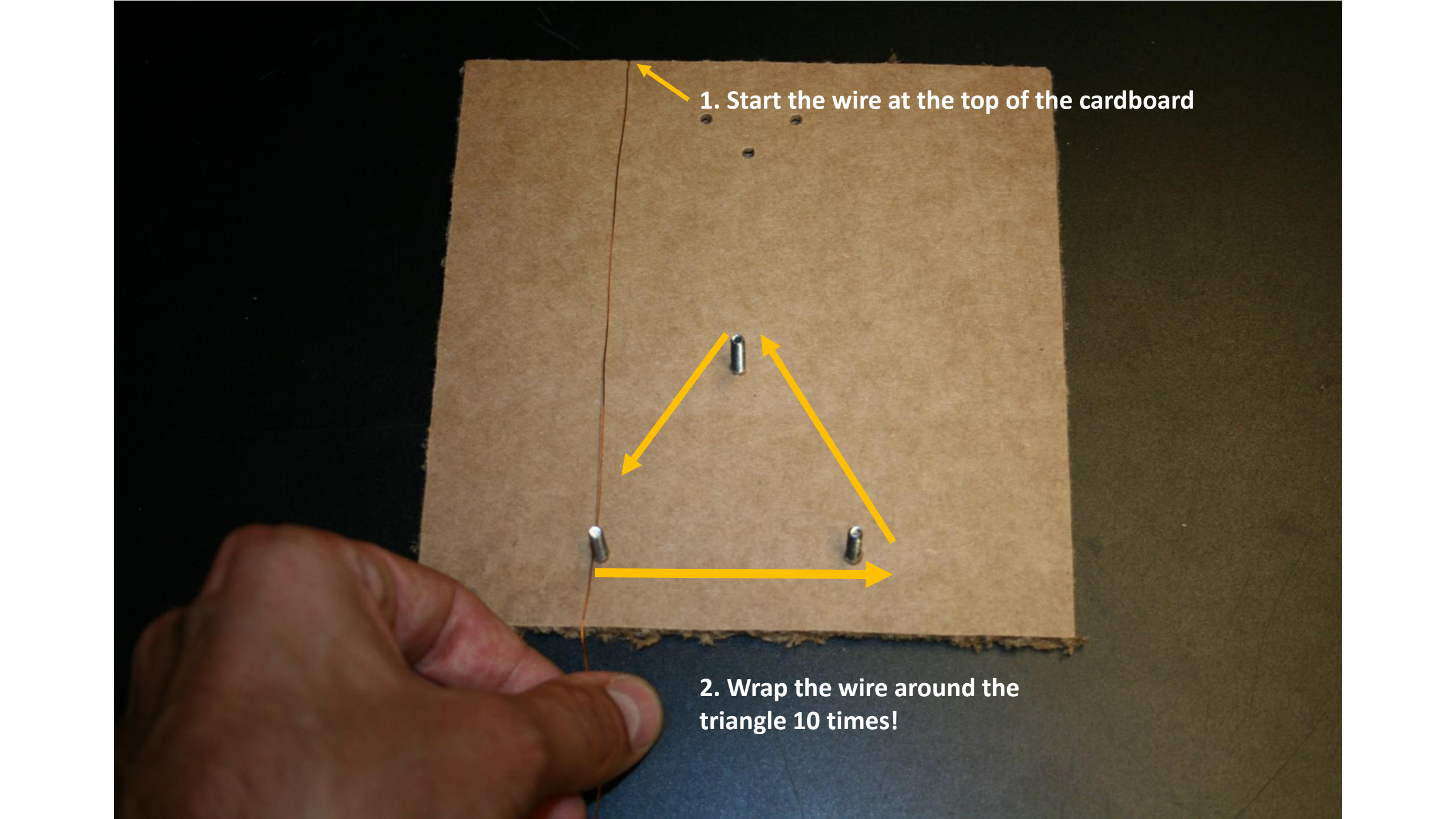
- Transistor (2N3904)
- Resistor (270 Ohm)
- 3 Long screws
- Piece of cardboard
- 3 Short screws
- 3 Washers
- AA Battery
- 3 Wing nuts
- 30 AWG Magnet wire (15 ft.)







Push the three long screws through the cardboard



1. Start the wire at the top of the cardboard

2. Wrap the wire around the triangle 10 times!

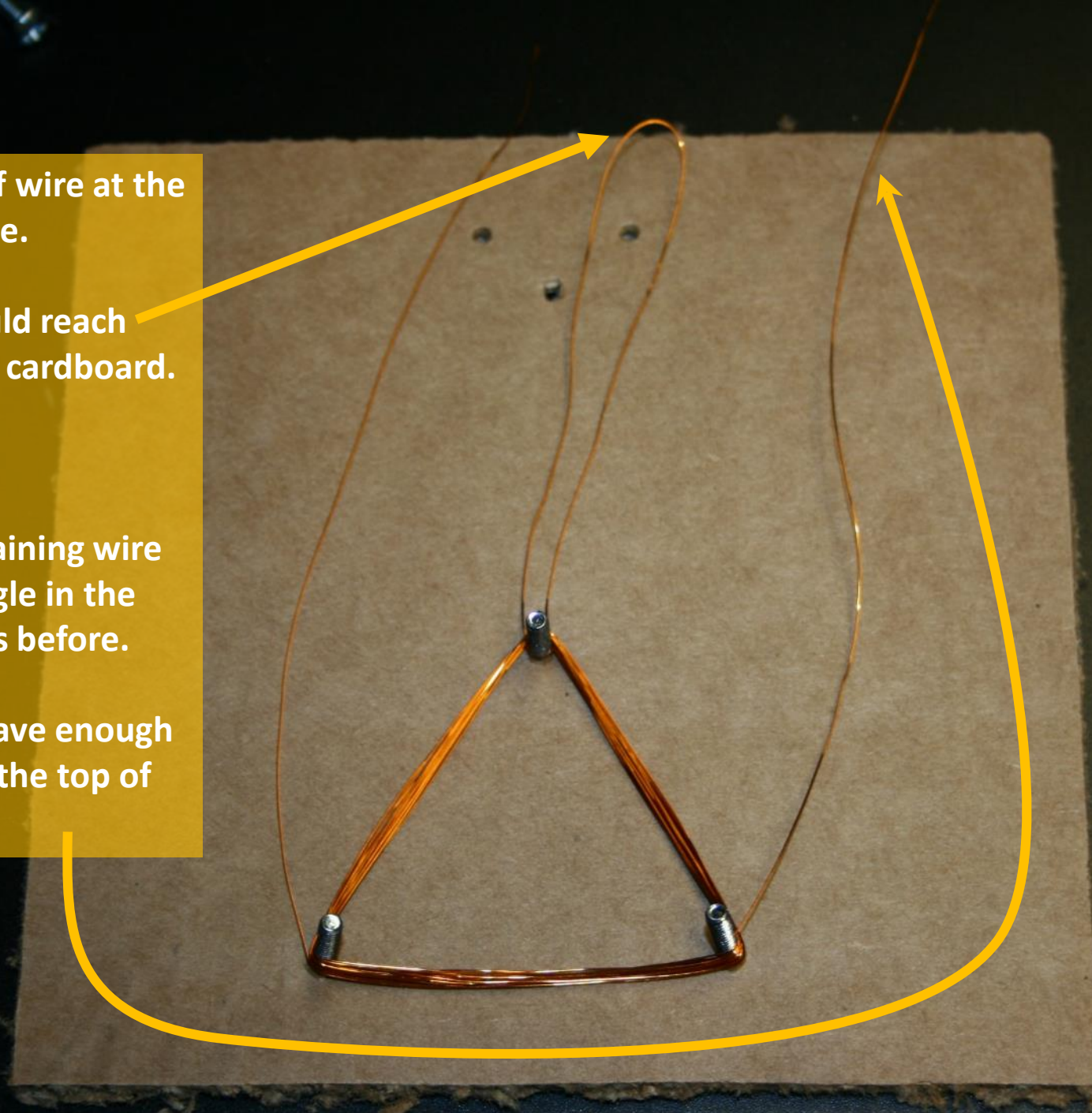


**1. Make a loop of wire at the top of the triangle.**

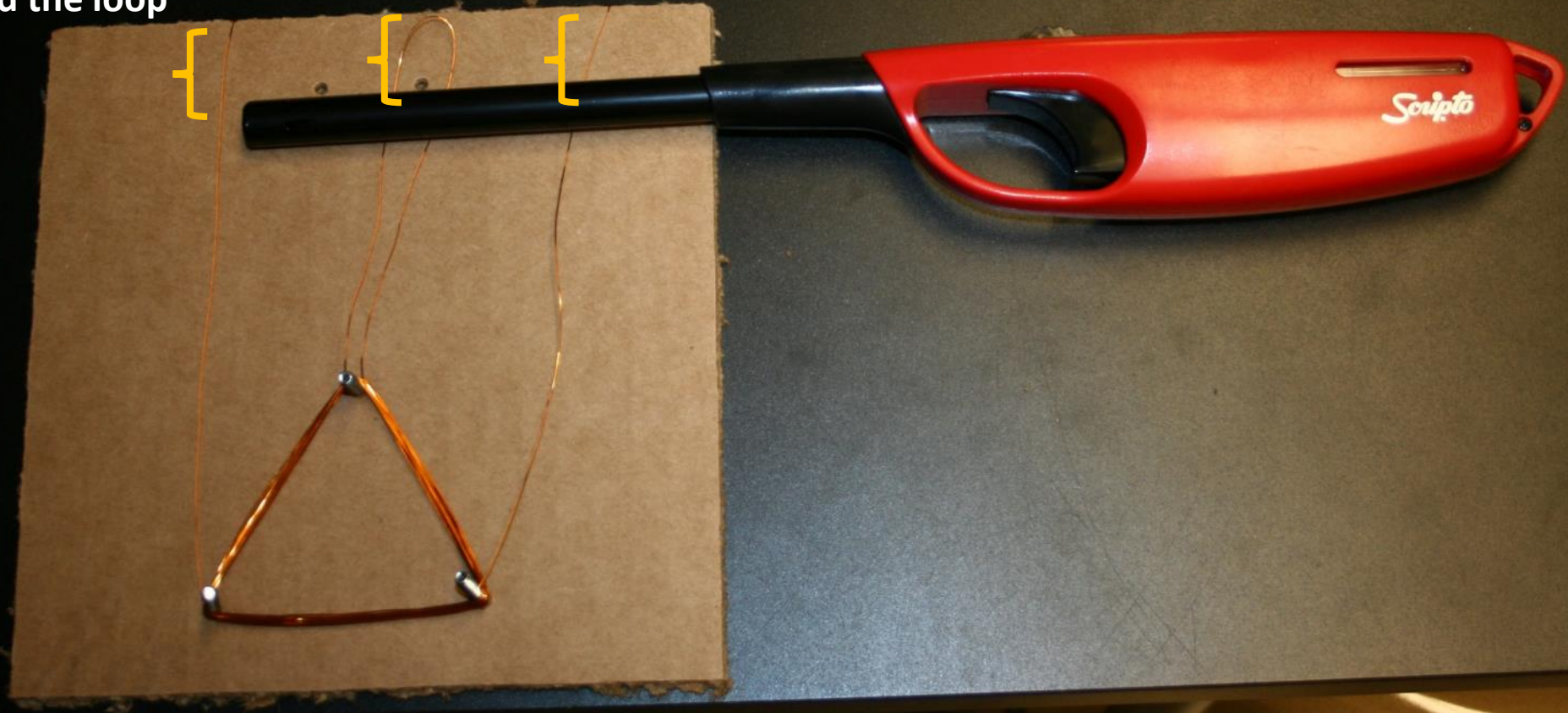
- The loop should reach the top of the cardboard.

**2. Wrap the remaining wire around the triangle in the same direction as before.**

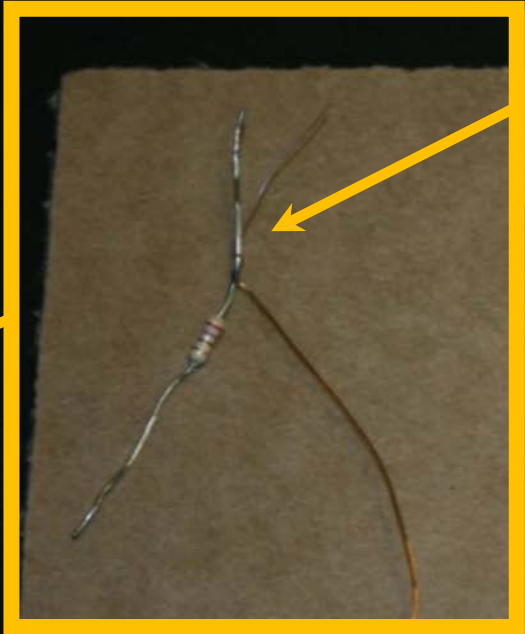
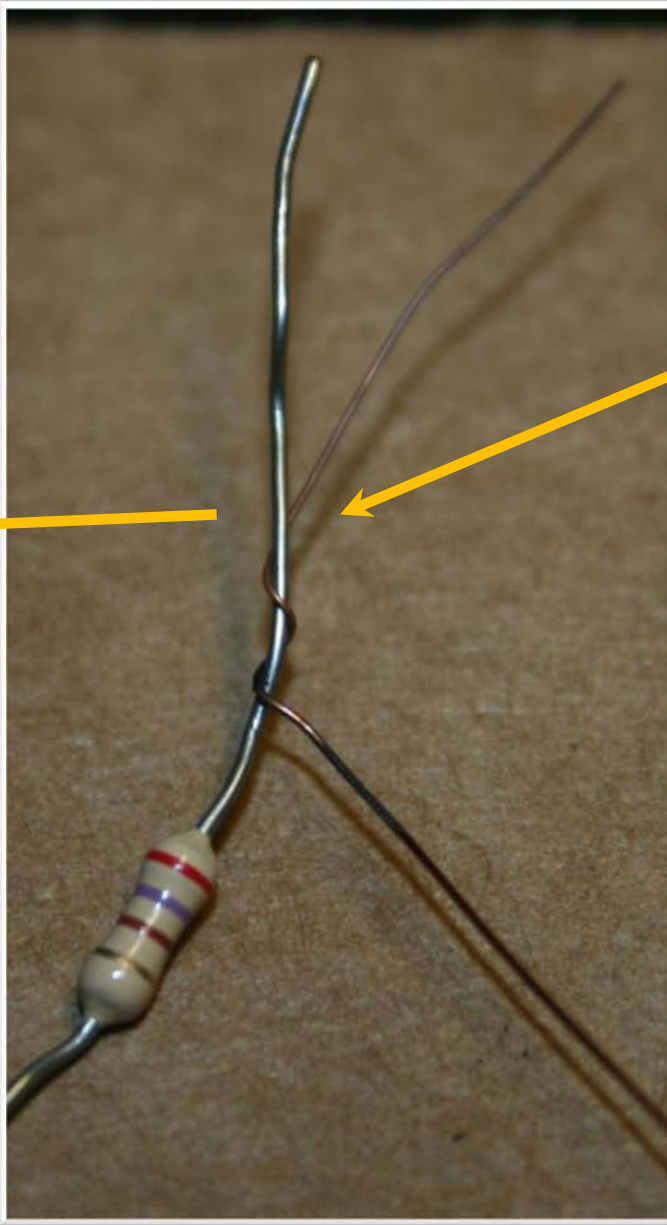
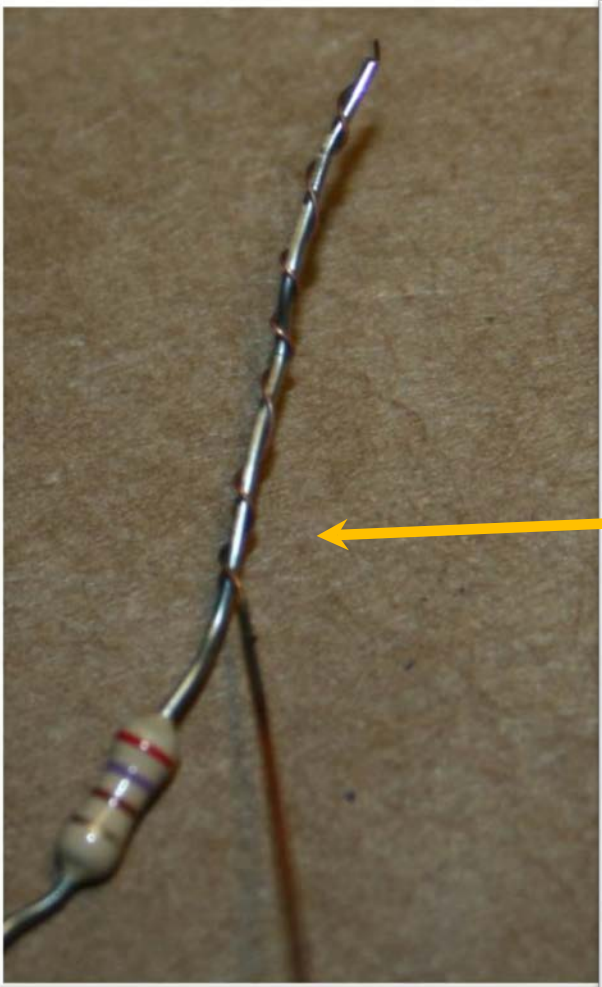
- At the end, leave enough wire to reach the top of the board.



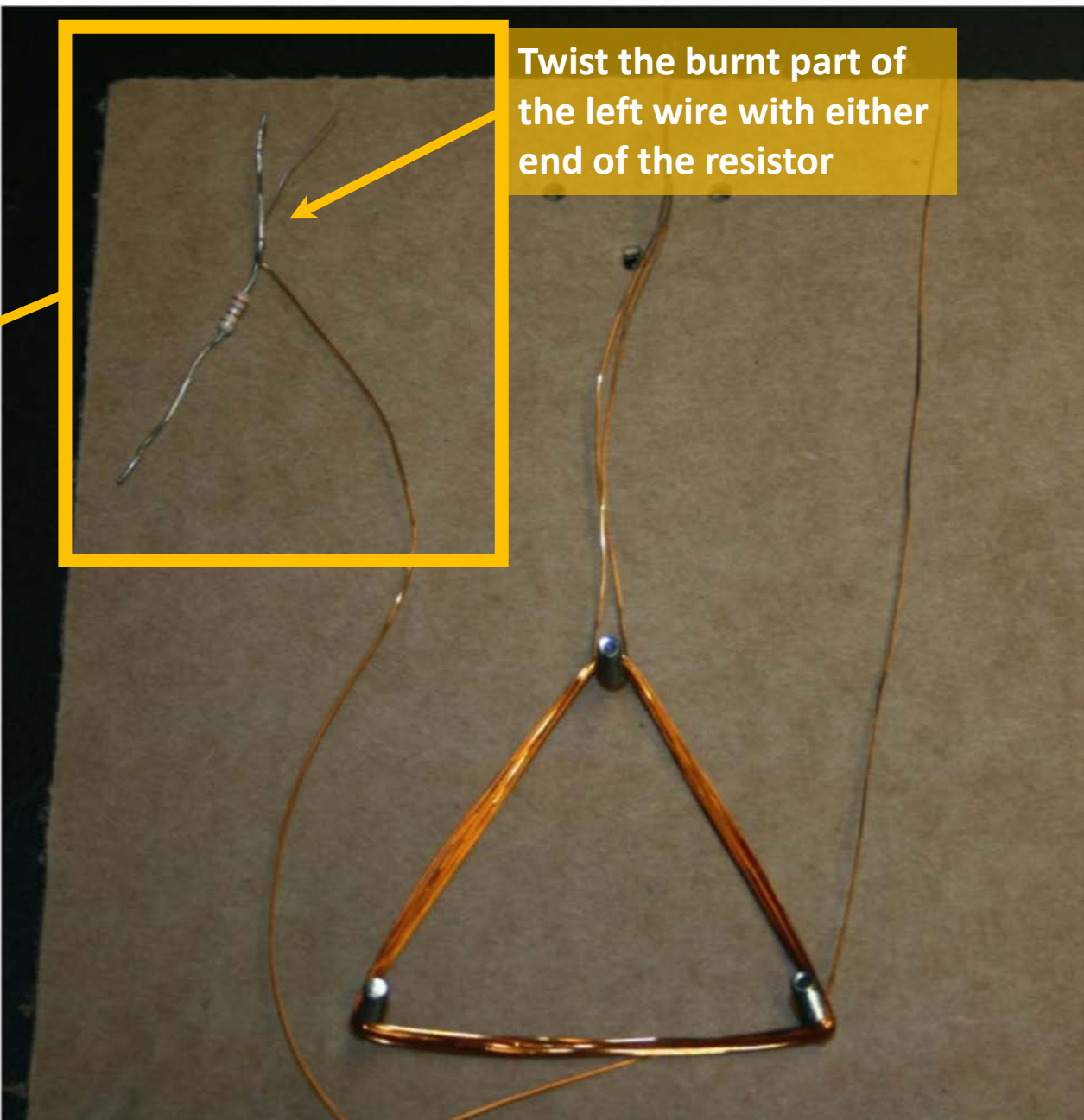
Burn the top 2 inches of  
each wire and the loop



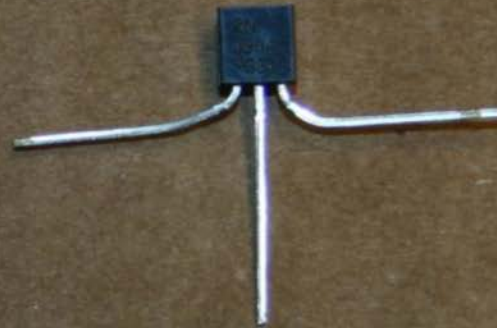




Twist the burnt part of the left wire with either end of the resistor



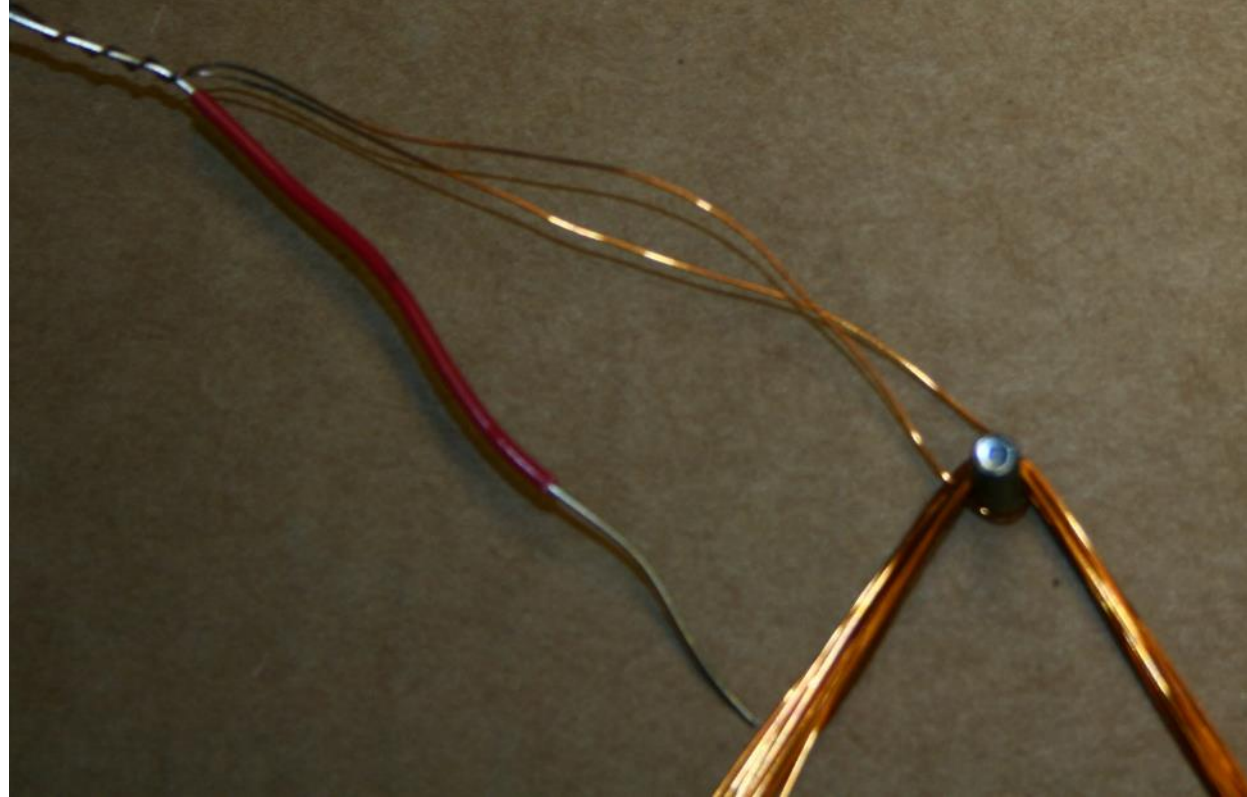
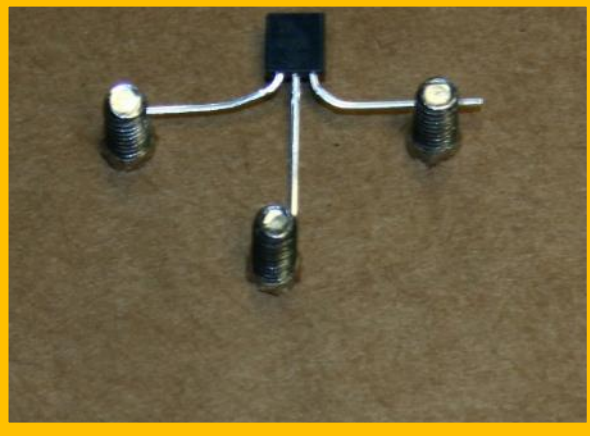
Spread the leads  
of the transistor

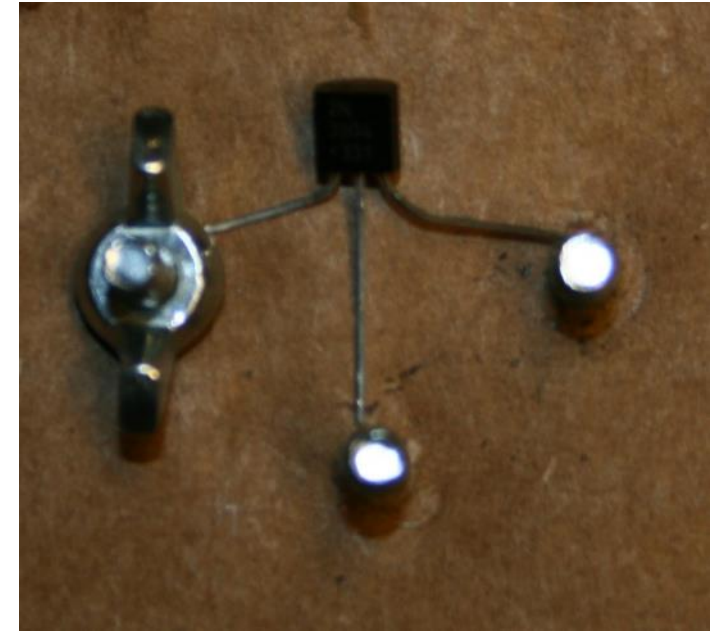
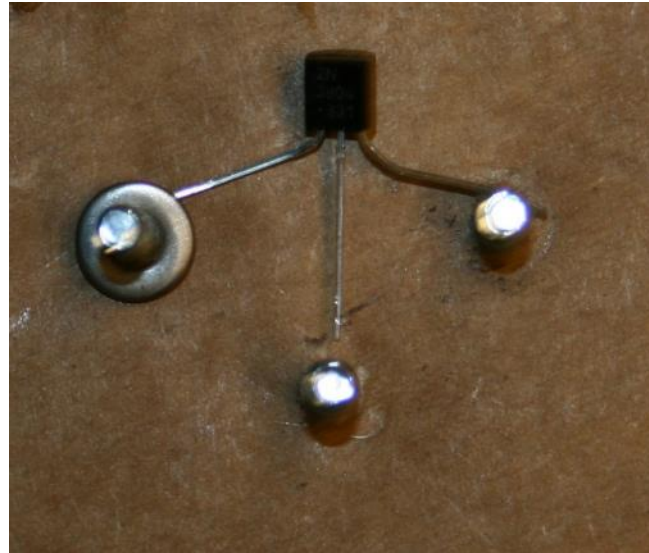
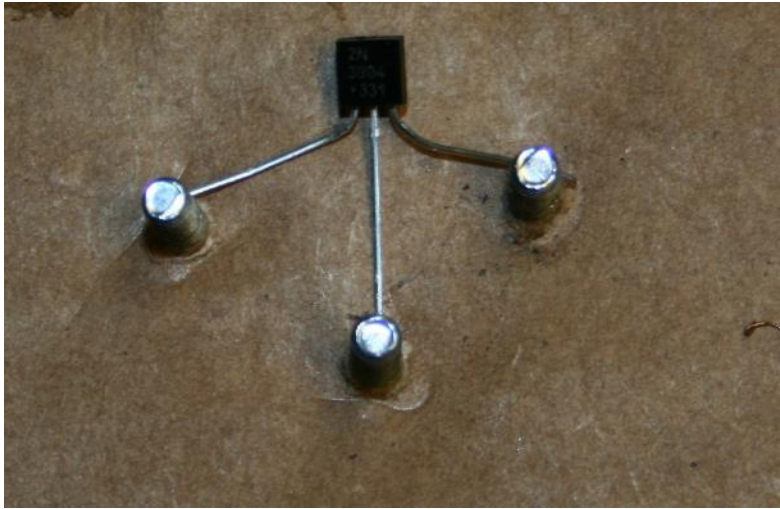




Be sure the ROUND SIDE  
of the TRANSISTOR  
is AGAINST THE CARDBOARD

Push the short screws through the cardboard and place the transistor as shown.

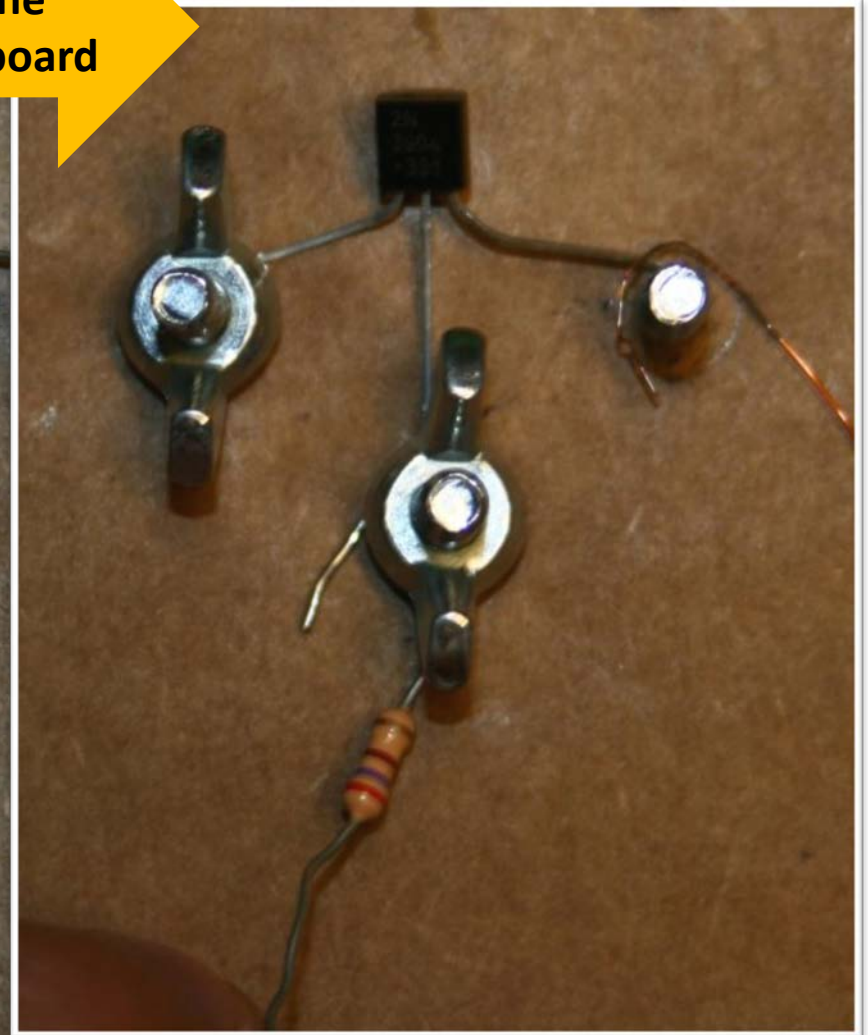
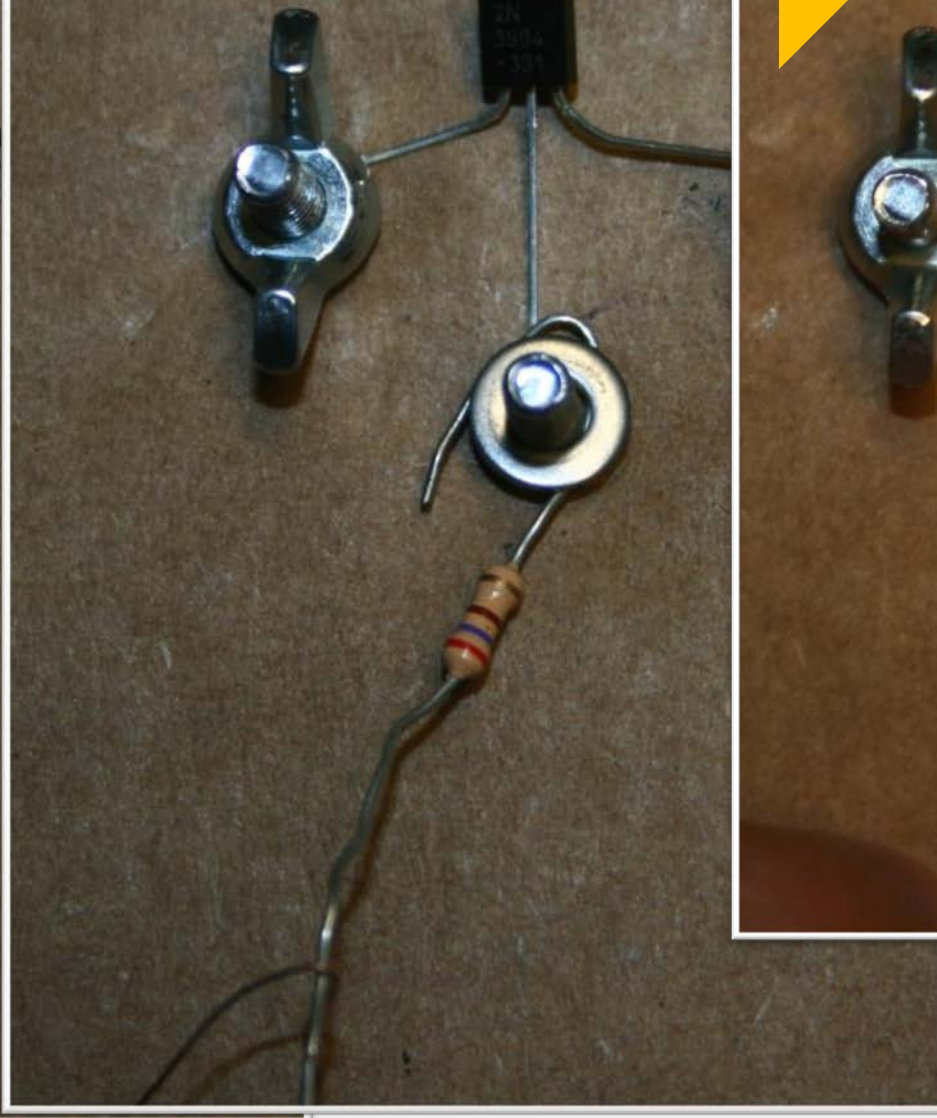




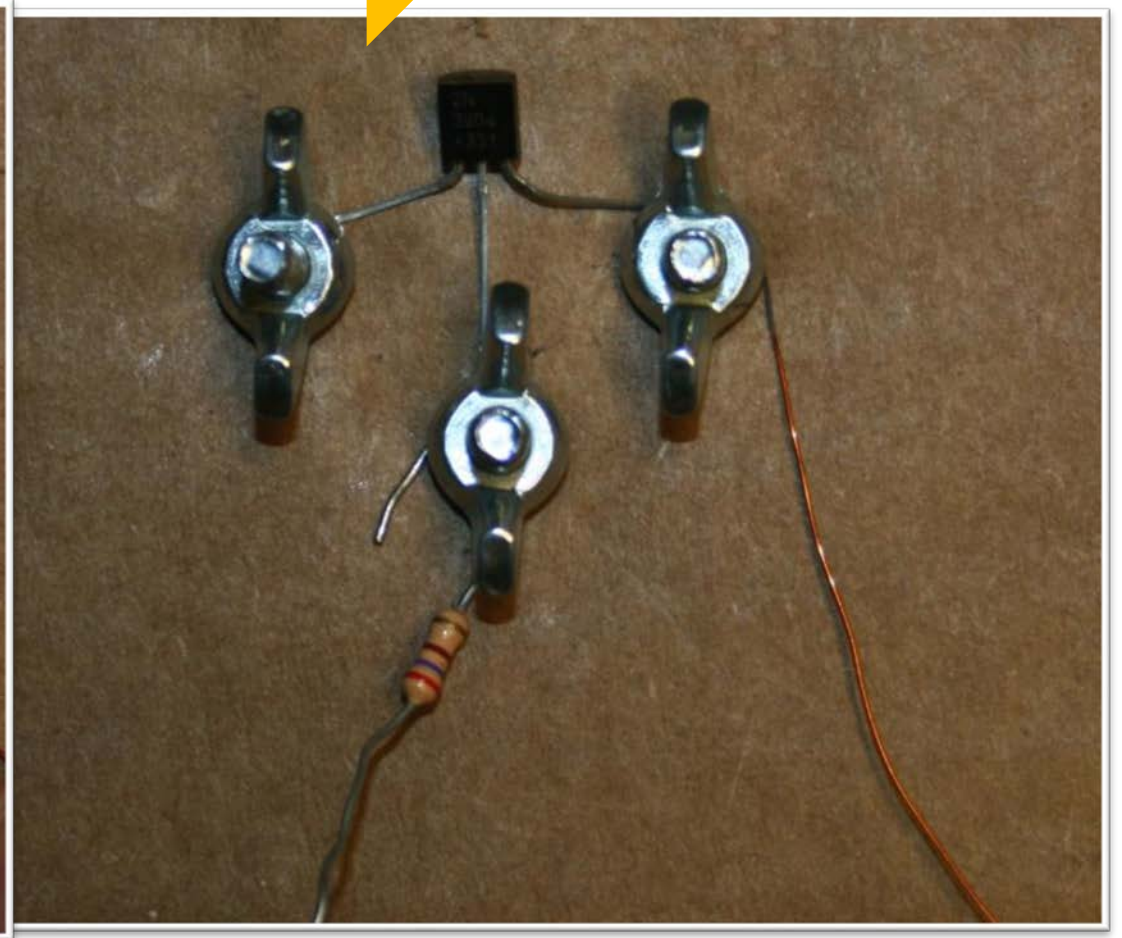
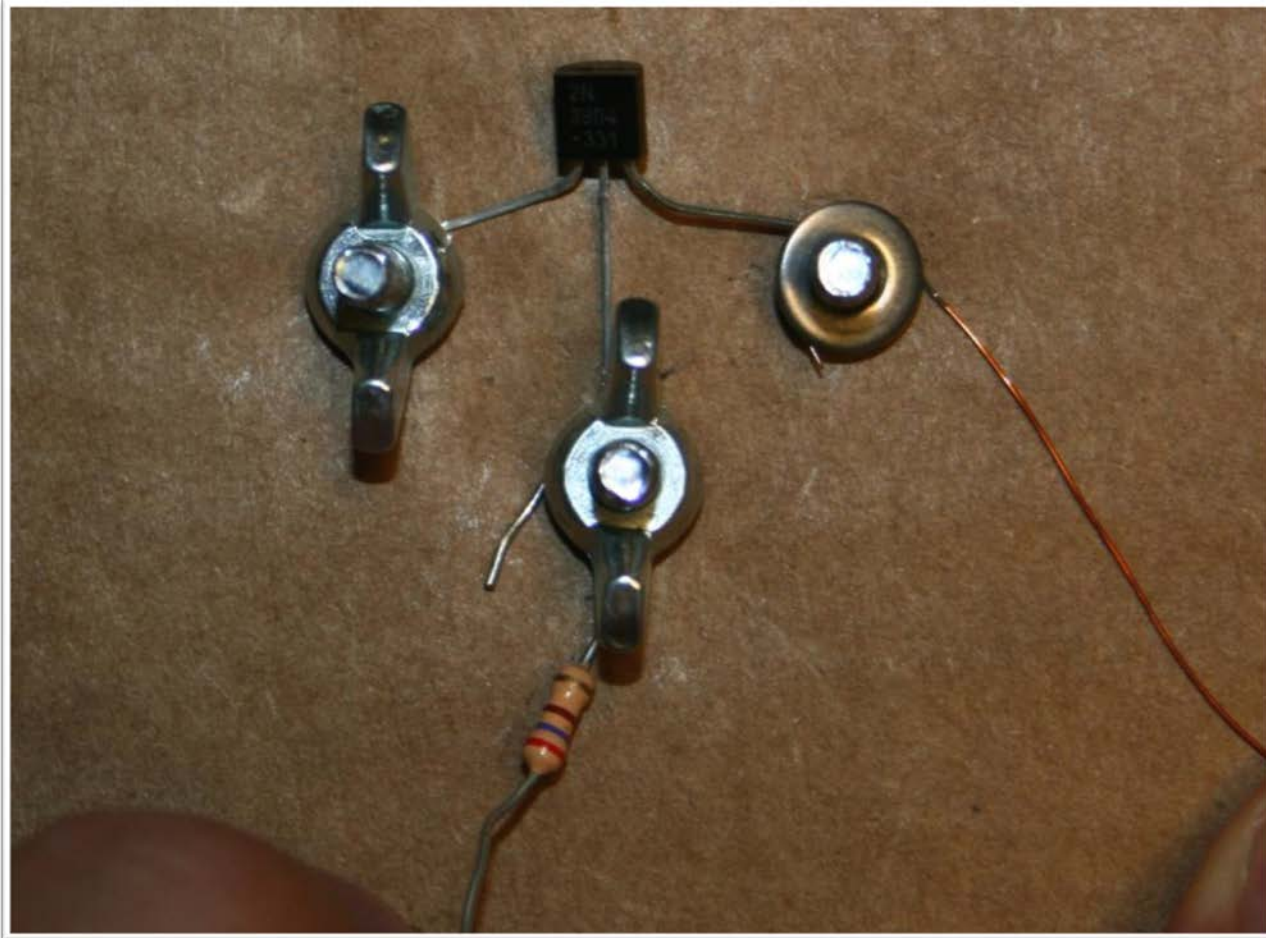
**Smash the left lead of the transistor against the cardboard**



**Smash the unused end of the resistor and the middle lead of the transistor against the cardboard**



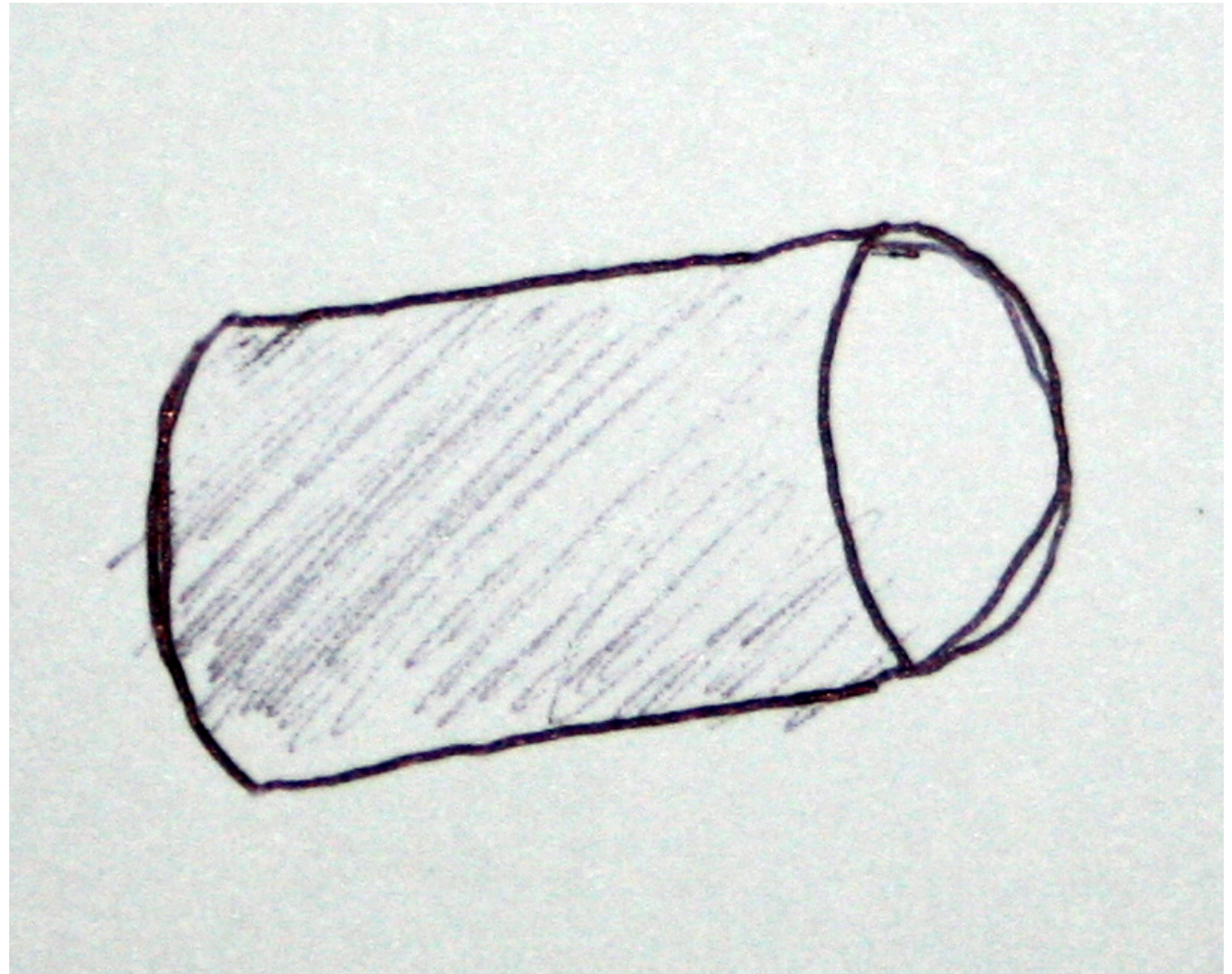
**Smash the unused wire and the right lead of the transistor against the cardboard**





# Receiver

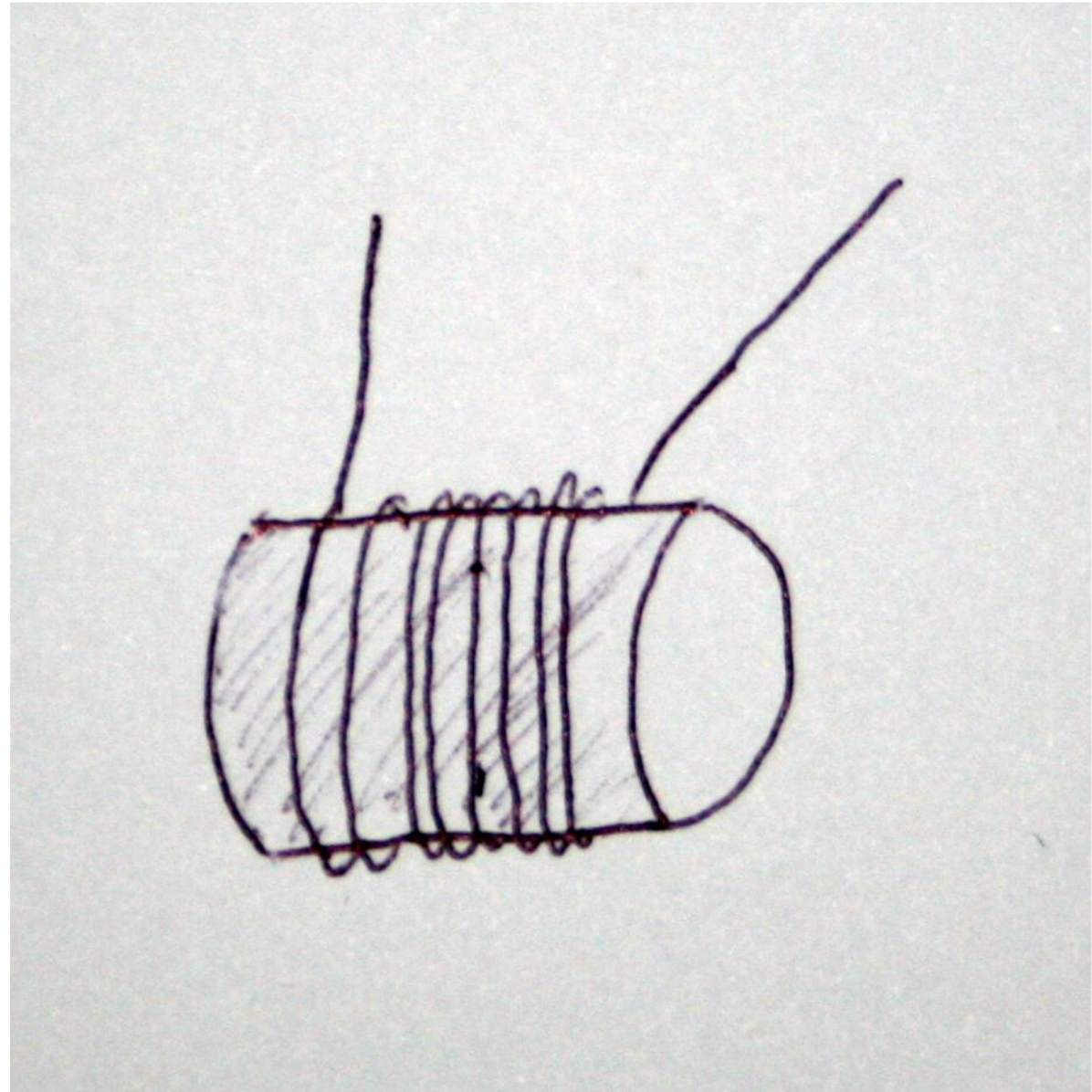
Start with a cylindrical form, like a D battery



# Receiver

Wrap the receiver wire around the form.

- Eventually you need to take this wire off the form so DON'T WRAP IT TOO TIGHTLY!



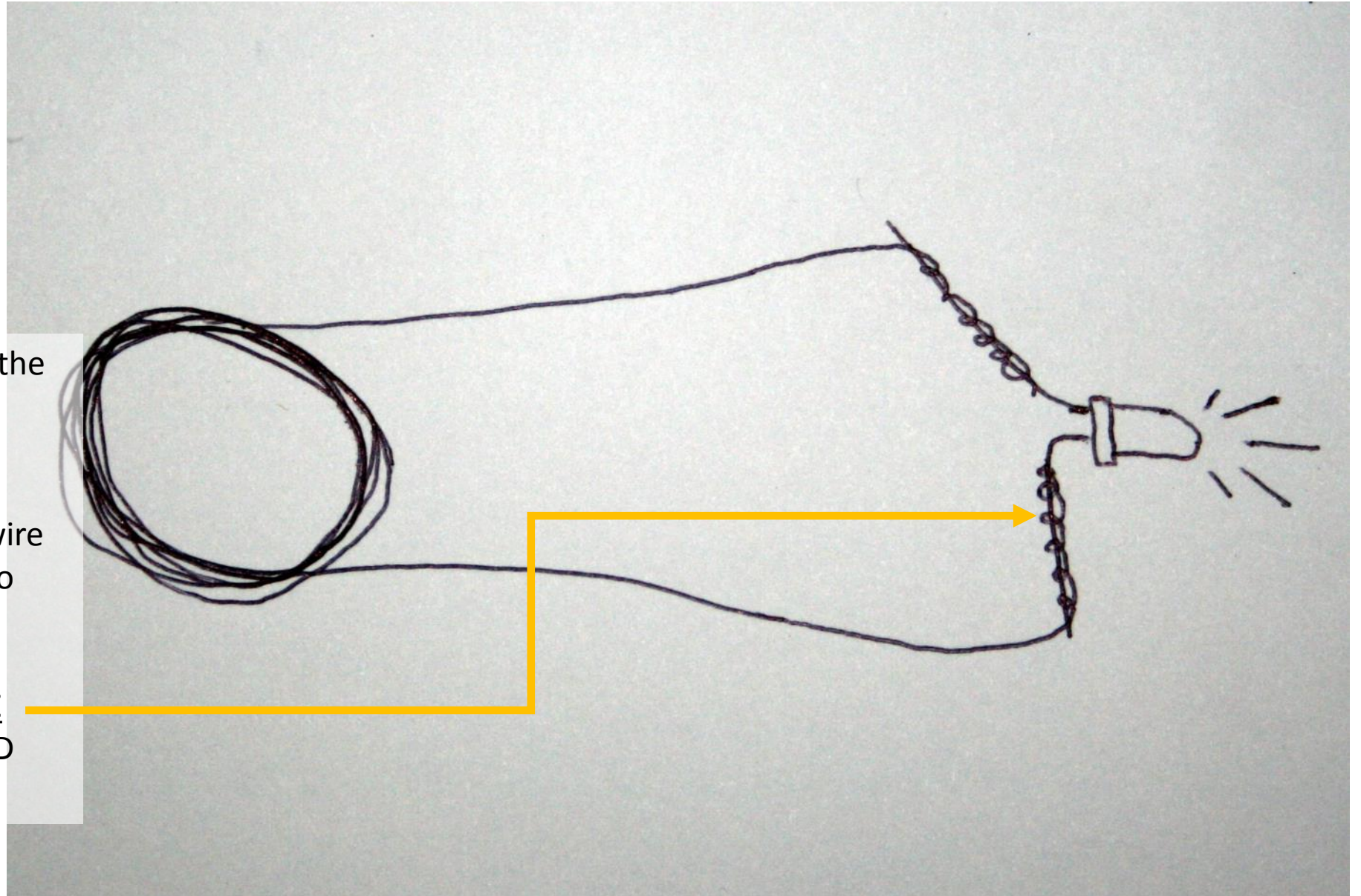


# Receiver

Carefully slide the coil off the form.

- The coil will attempt to **SELF-DESTRUCT!**
- Use tape or wrap the wire ends through the coil to hold it together

**BURN THE WIRES BEFORE** twisting them with the LED leads.



# Put it all together!

Touch the flat end of the battery to the left wing nut.

Touch the burnt part of the loop to the '+' side of the battery.

Put the receiver near the transmitter. If everything is working, the LED should light up!

