

AV Riot

www.avriot.com

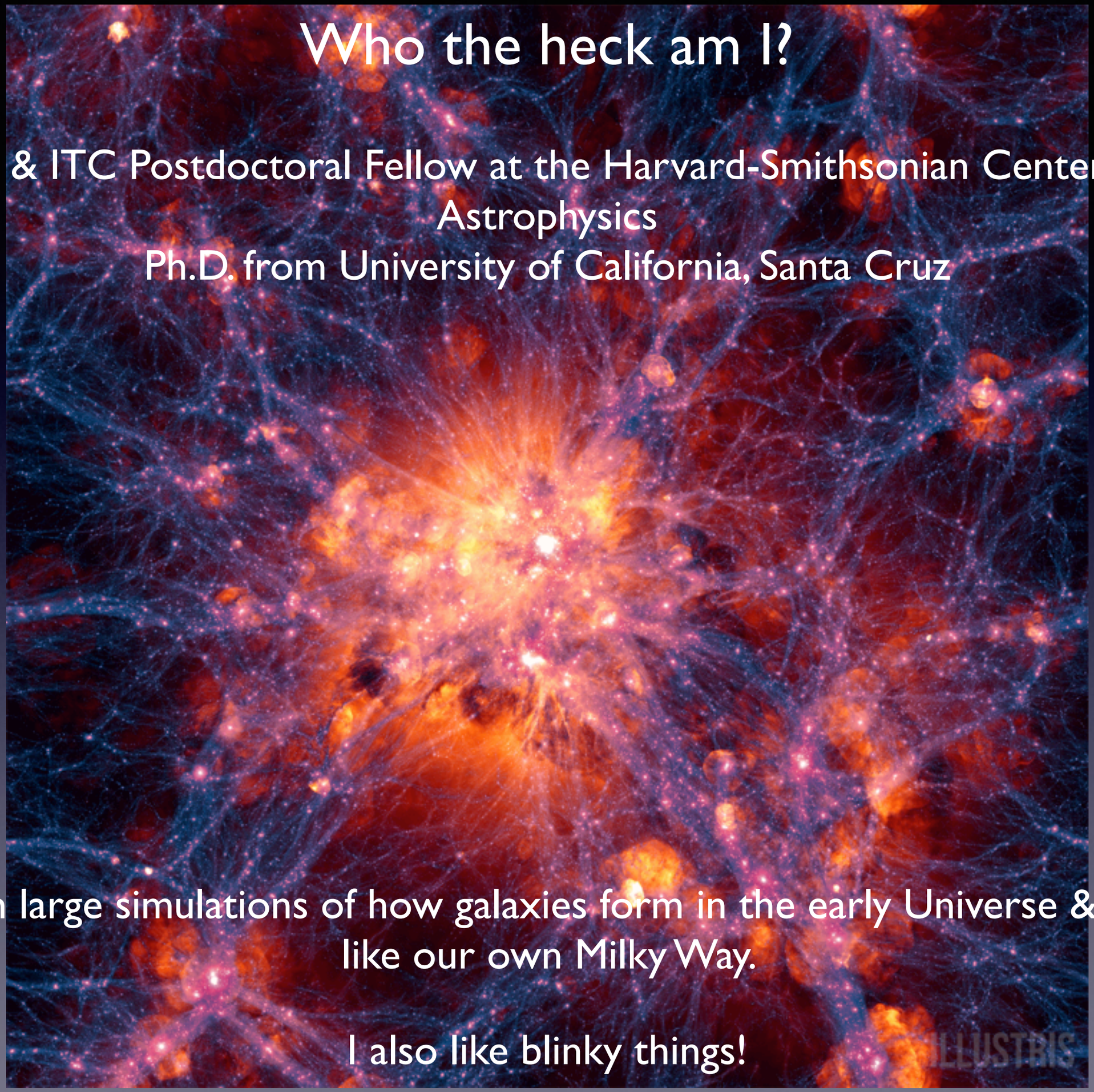
Jill Naiman
Alicia McBarron
Angela Fisk
Constance McBarron

GeekGirlCon 2015

Who the heck am I?

NSF & ITC Postdoctoral Fellow at the Harvard-Smithsonian Center for Astrophysics

Ph.D. from University of California, Santa Cruz



Work on large simulations of how galaxies form in the early Universe & become like our own Milky Way.

I also like blinky things!

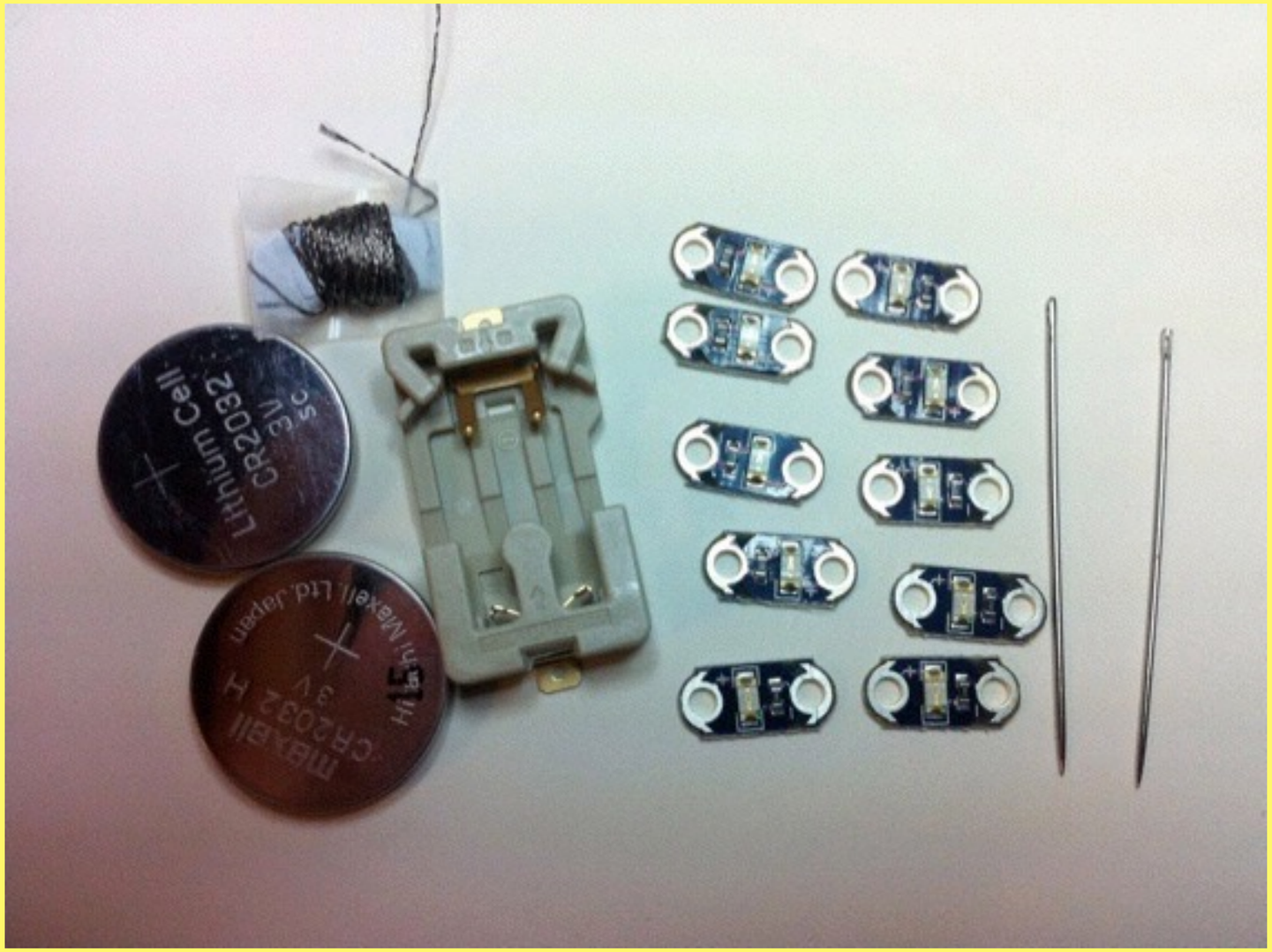
What the heck are we doing?

Some assumptions:

(I) You don't know anything about circuits

(II) You do know how to sew (if not, don't worry, ask an assistant for a demo!)

What the heck are we doing?



Your workshop materials

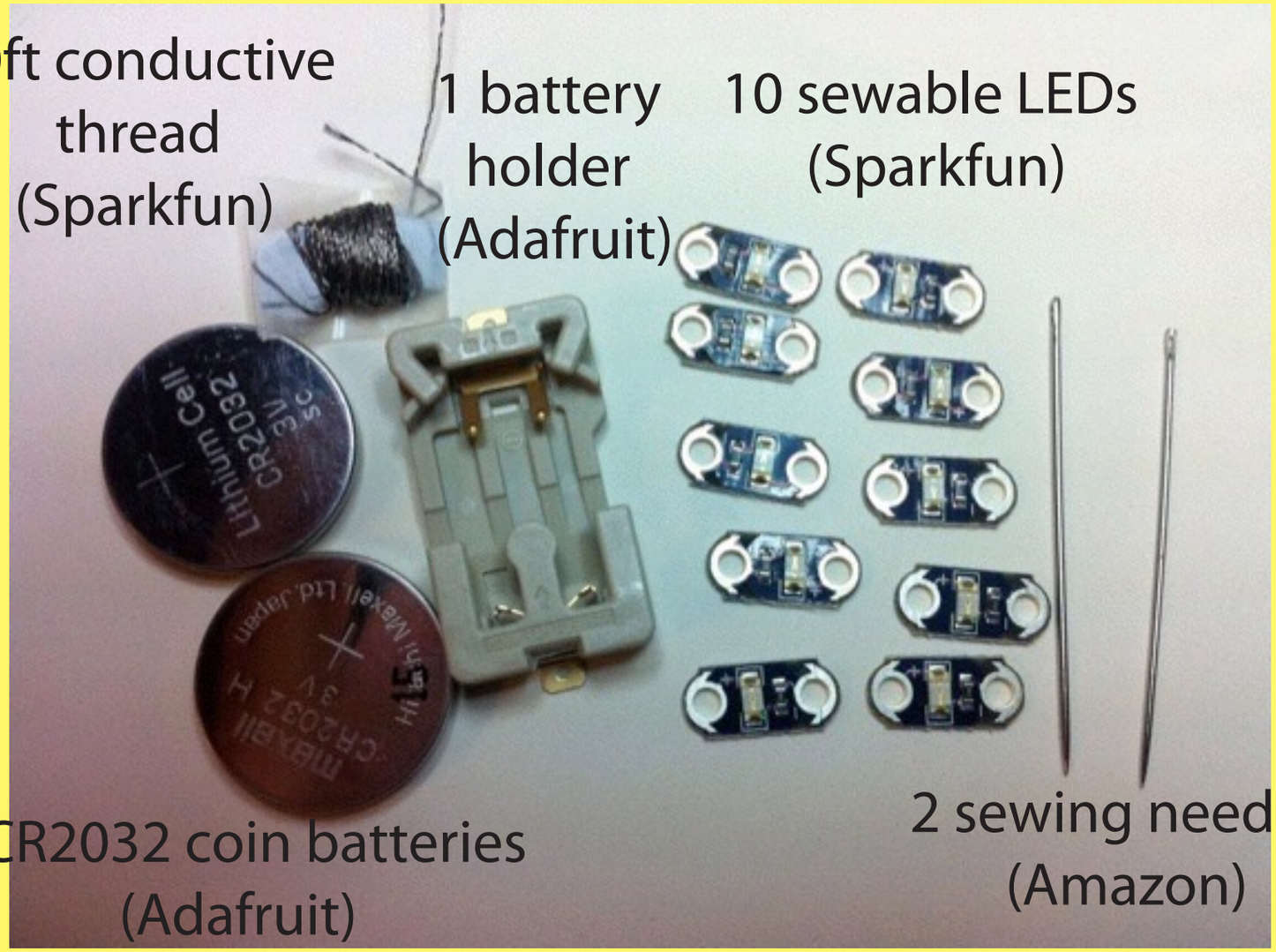
(you can open your packets if you want, but be careful of the needles!)

What the heck are we doing?

10ft conductive thread (Sparkfun)

1 battery holder (Adafruit)

10 sewable LEDs (Sparkfun)



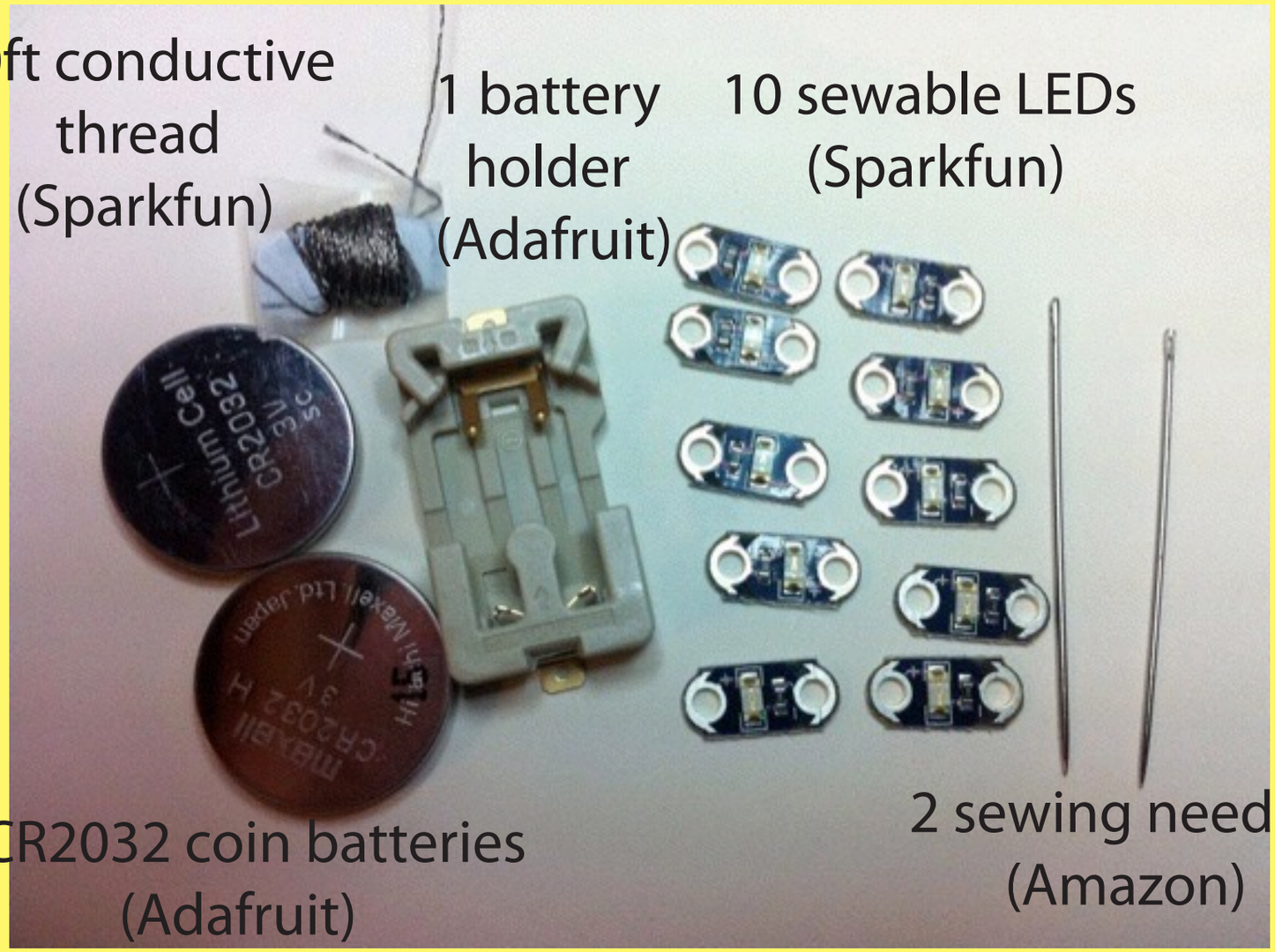
2 CR2032 coin batteries (Adafruit)

2 sewing needles (Amazon)

Not pictured: Beanie (Amazon)

2 of every color, but everybody has different colors so, feel free to swap if you want after the talk!

What the heck are we doing?

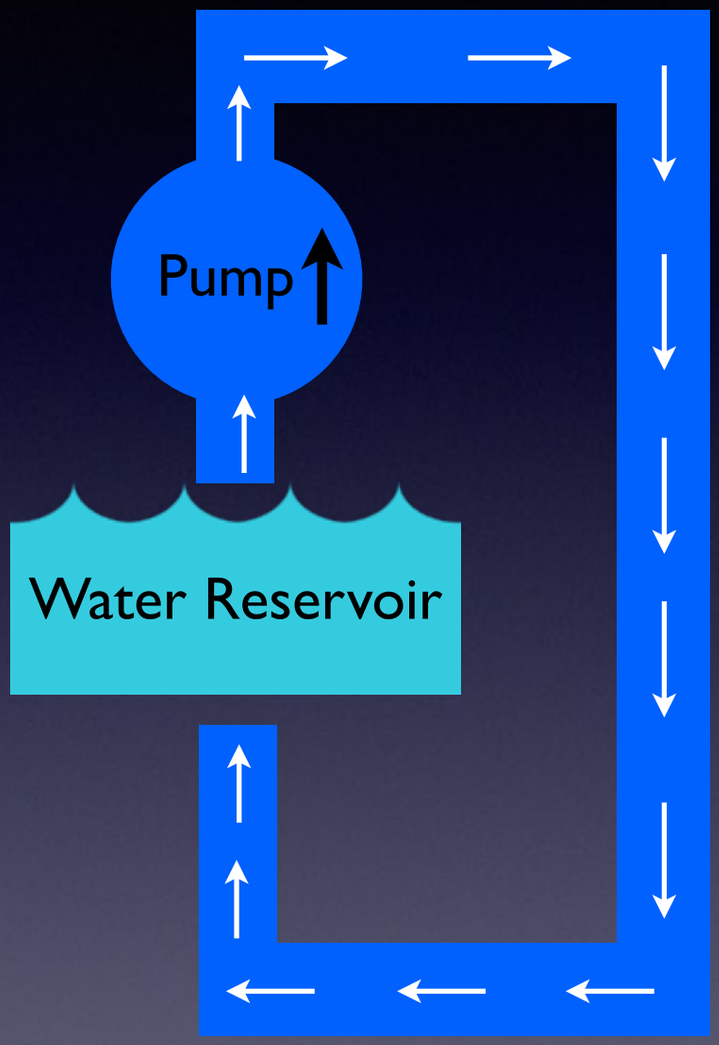


Not pictured: Beanie (Amazon)

\+ a knowledge of circuits

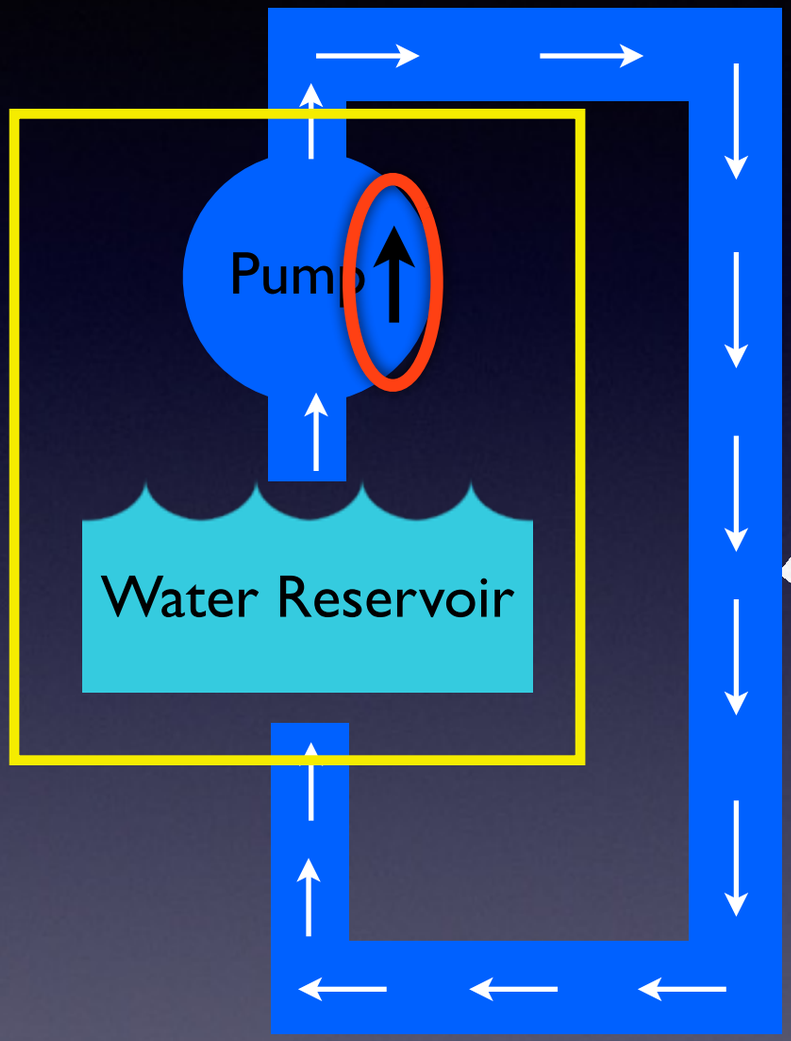
= awesome light up beanie thingy!

Electricity = Water Flow

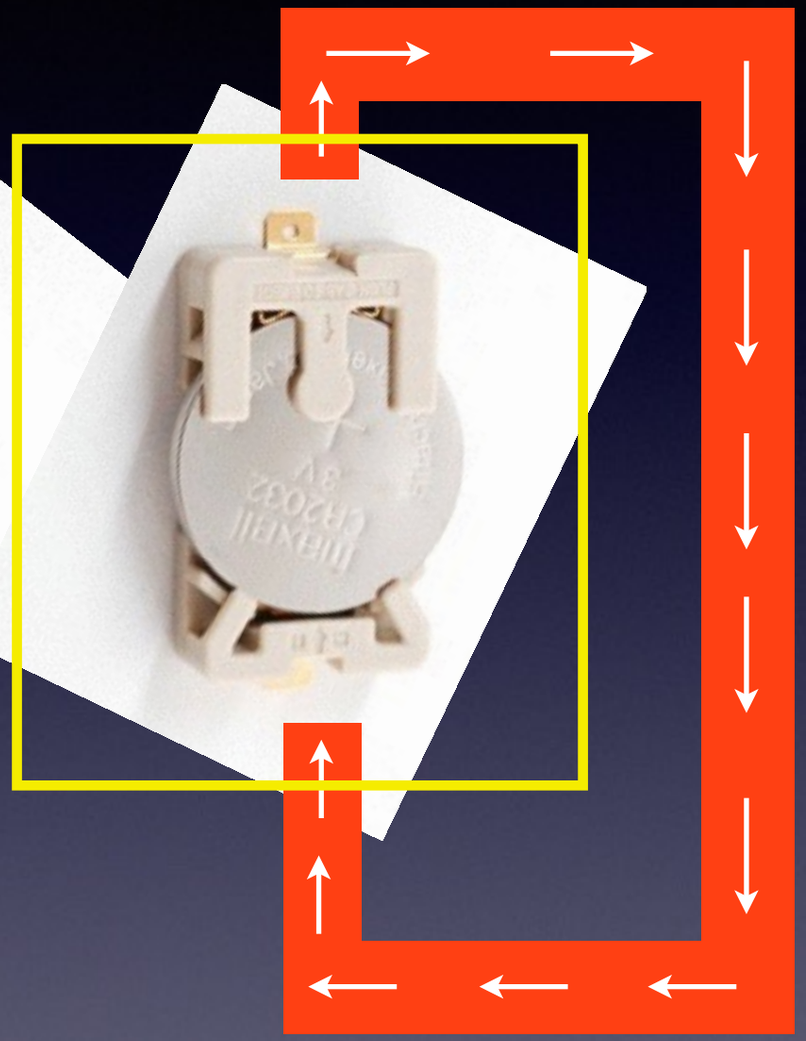


Electricity = Water Flow

Battery = Pump+Reservoir







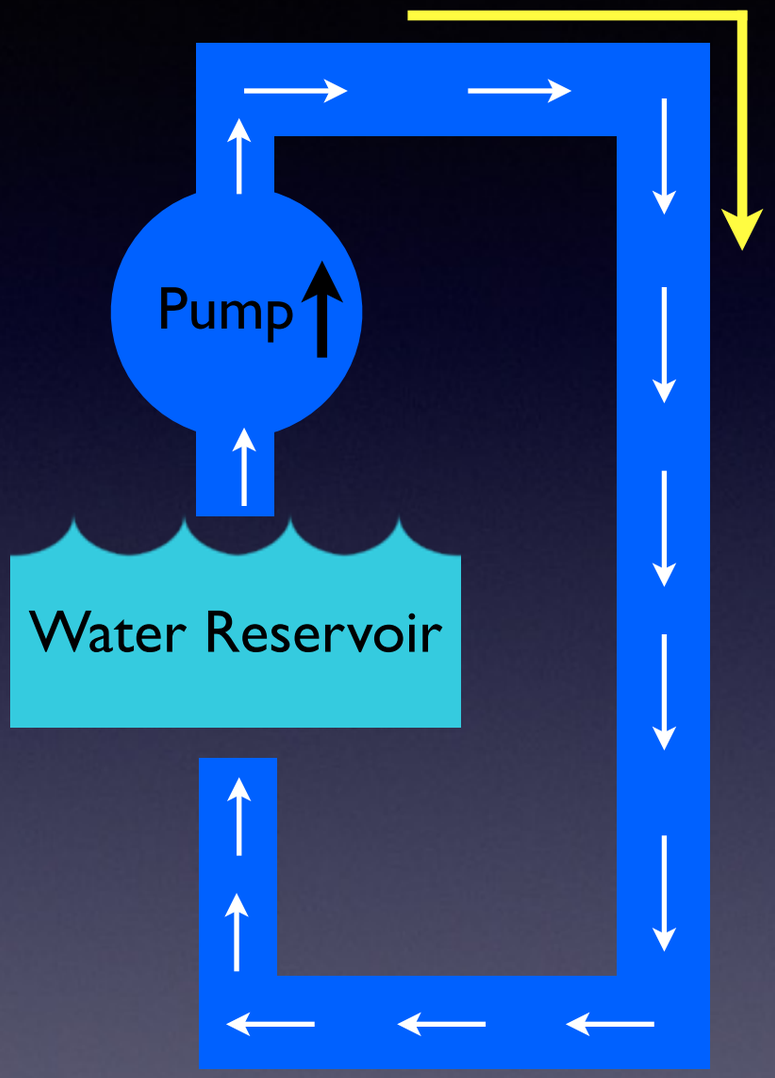
Water-Pump System

Battery System

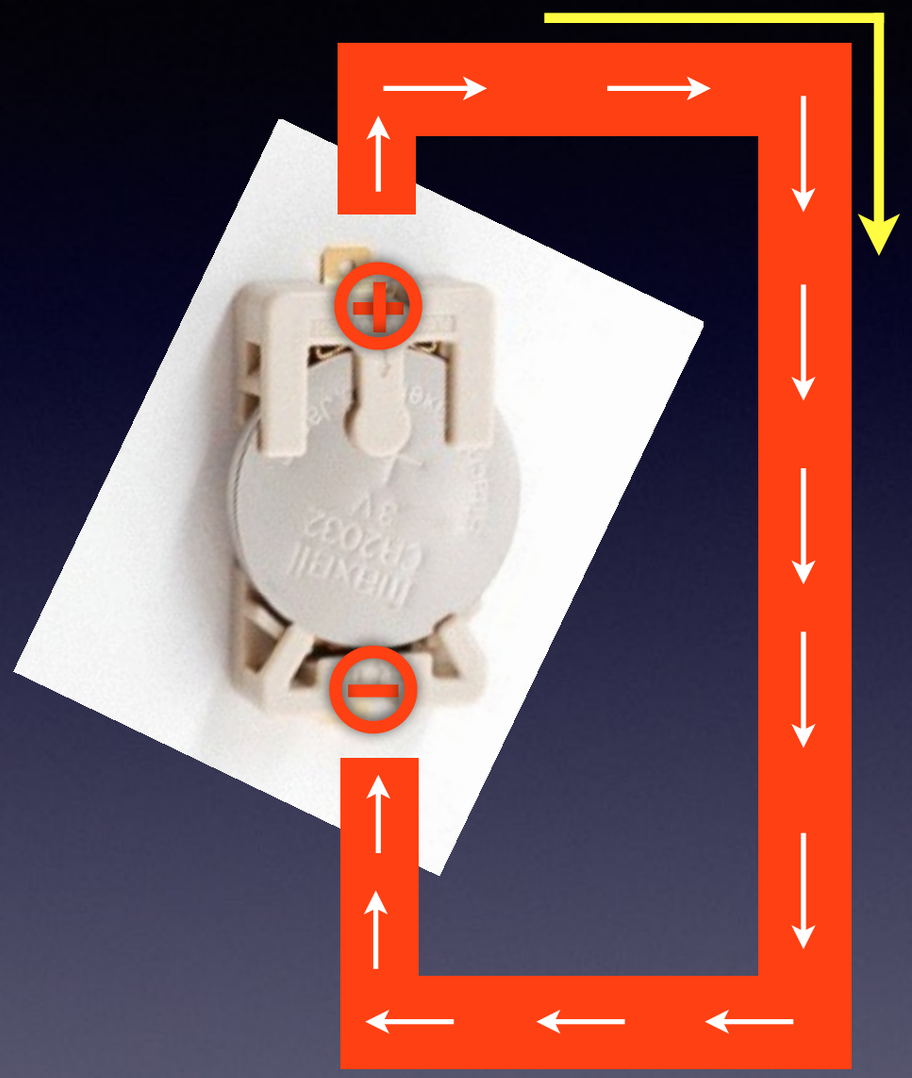
(Due to a poor naming decision by Benjamin Franklin, the actual flow of electricity is in the opposite sense of our water diagram, but we don't have to worry about that now.)

Electricity = Water Flow

Flow of Electricity = Flow of Water



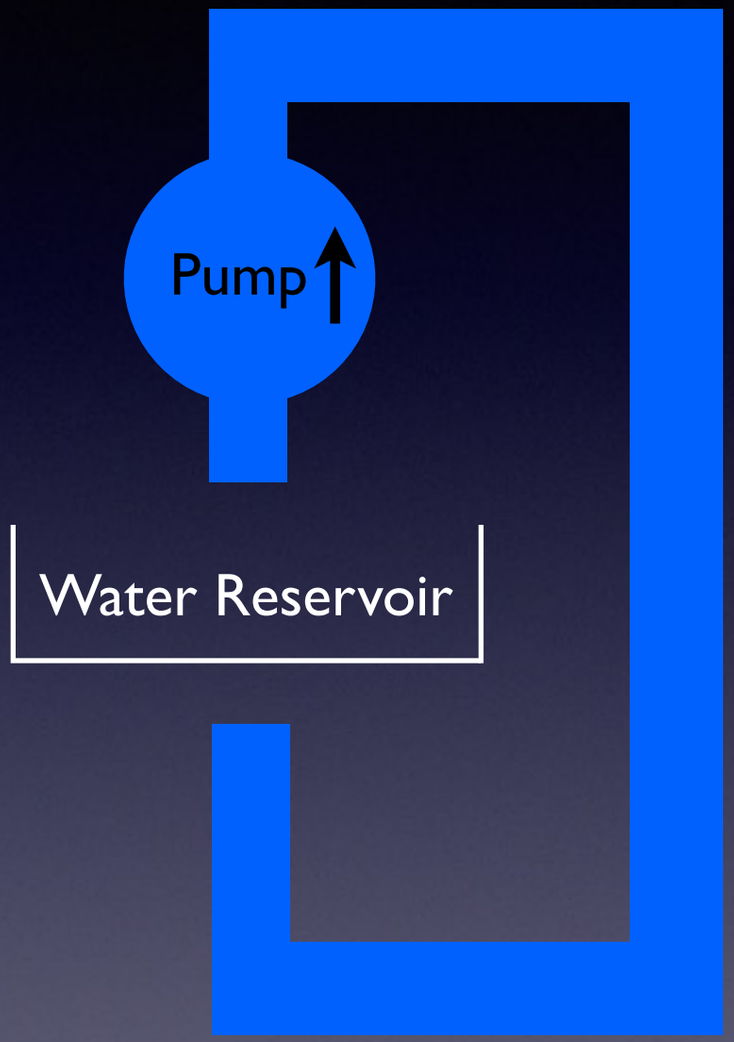
Water-Pump System



Battery System

Electricity = Water Flow

If nothing resists the flow of water in our pump system, we'll quickly run out of water in our reservoir without anything to show for it!



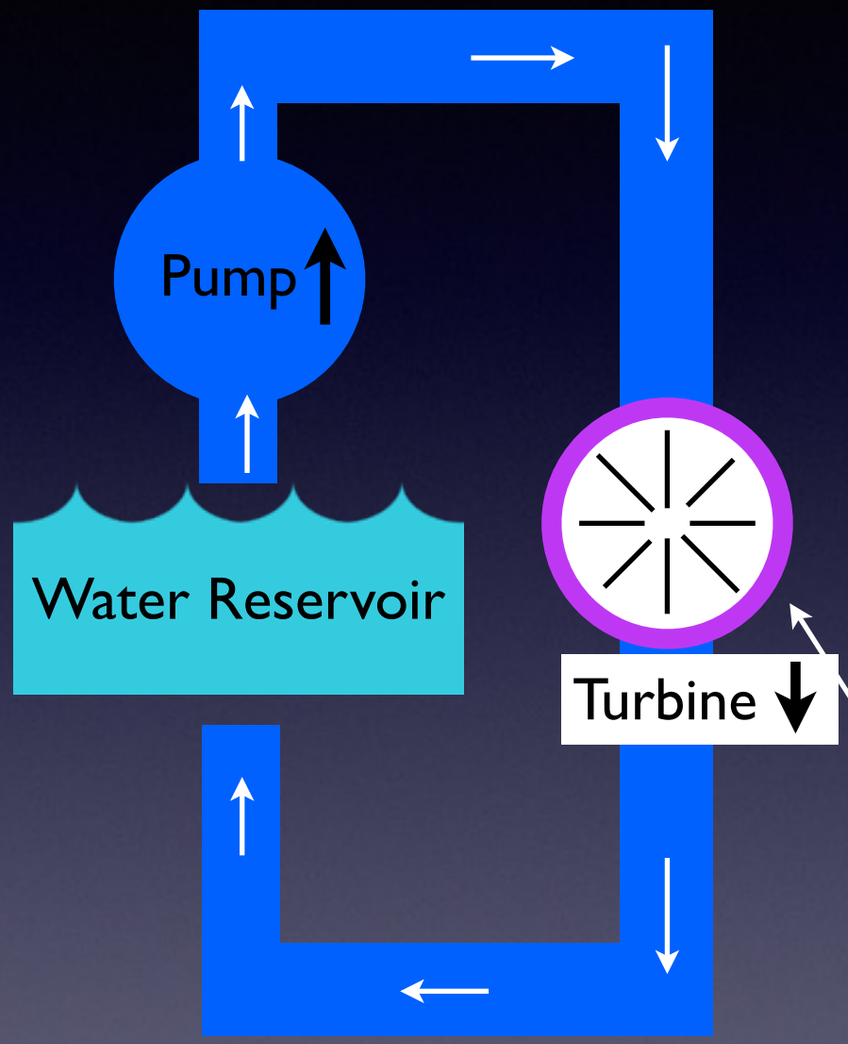
Water-Pump System



Battery System

This is equivalent to *shorting* our battery by simply connecting the positive (⊕) and negative (⊖) ends.

Electricity = Water Flow



Water-Pump System



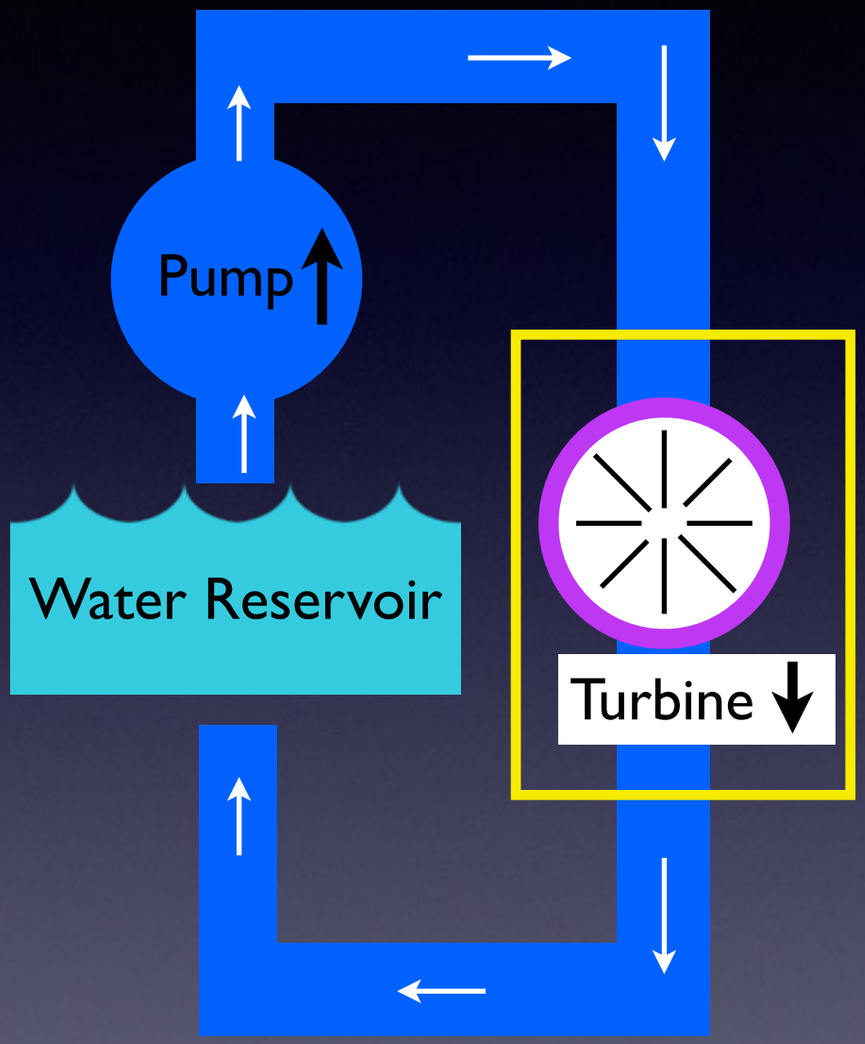
Battery System

Now we are actually doing something with our water pump, and slowing down the depletion of our water reservoir too!

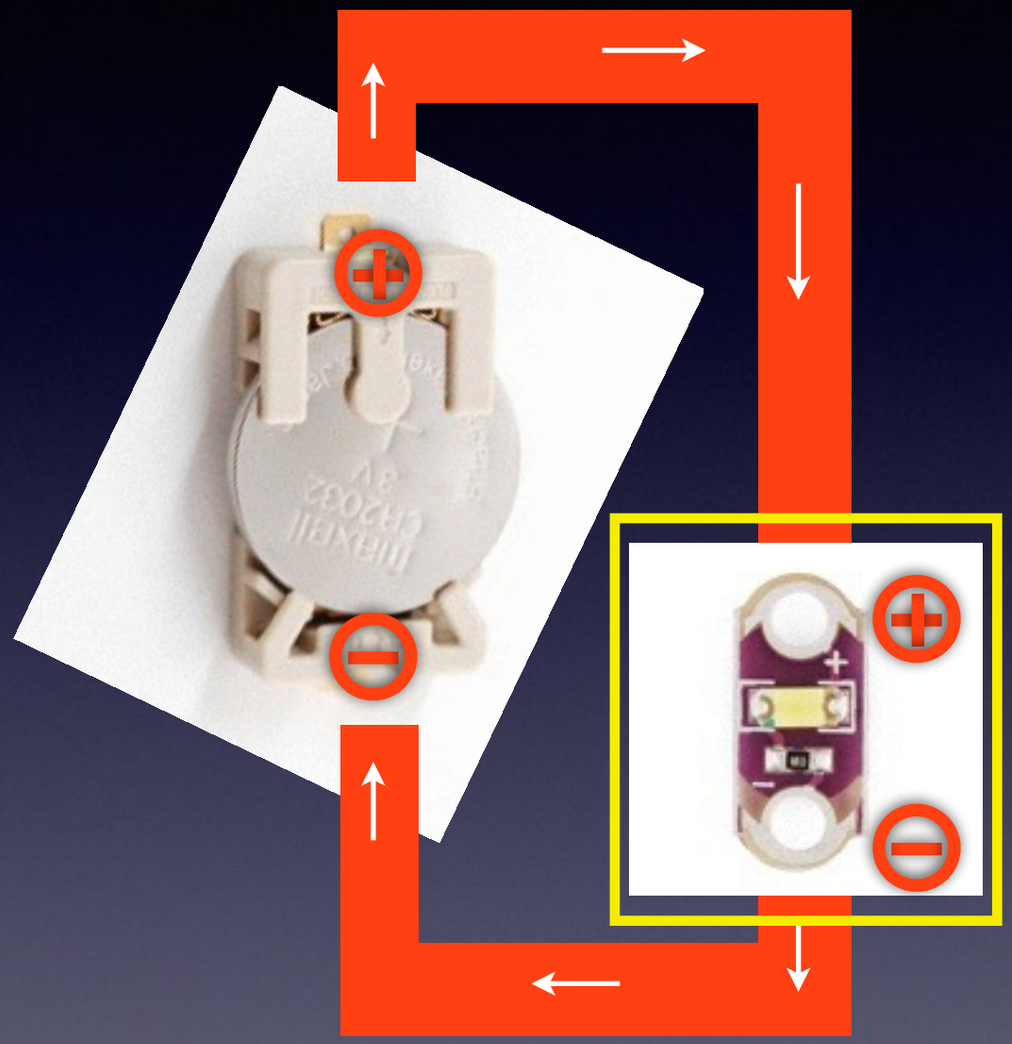
Electricity = Water Flow

LED = Turbine

These resist the flow of electricity (or water)



Water-Pump System



Battery System

Lets sew some LEDs!

First, lets sew one end of our battery holder onto our scarf by sewing conductive thread through one of the little holes at the end of the holder.



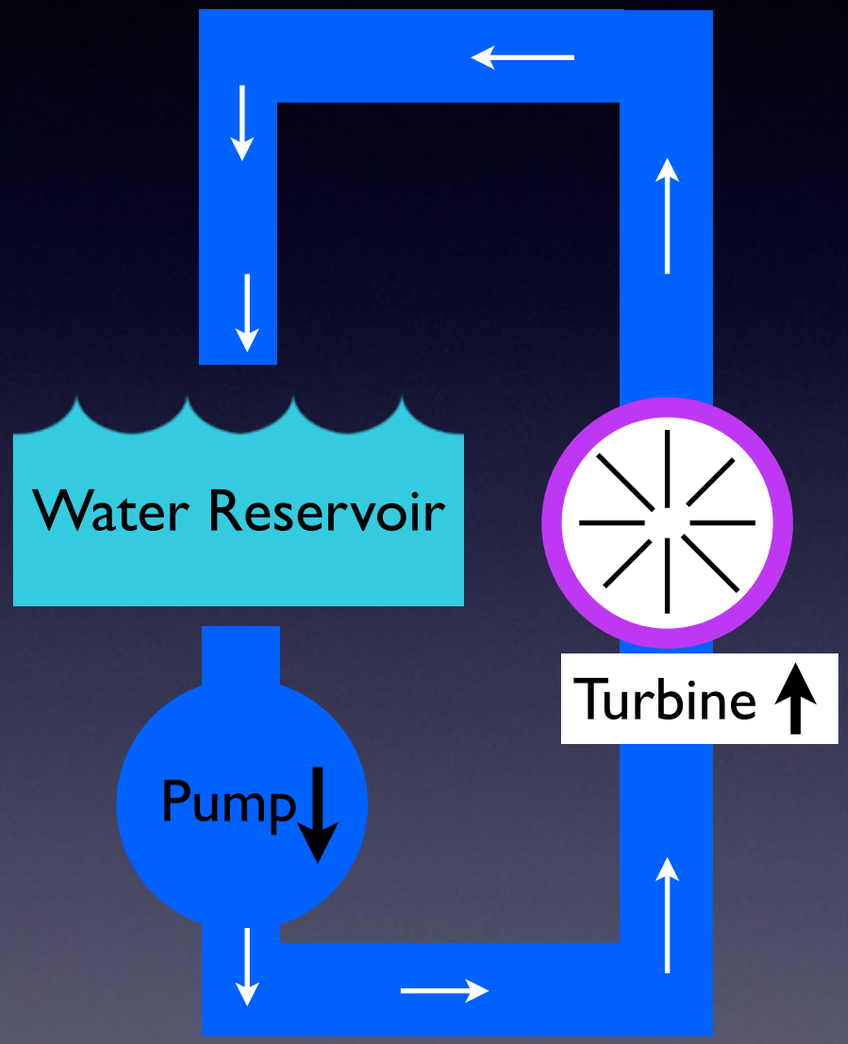
Then we'll sew a connection to the LED (here, negative battery end to negative LED end).

Repeat the same process to connect the positive battery end to the positive LED end.

Lets sew some LEDs!



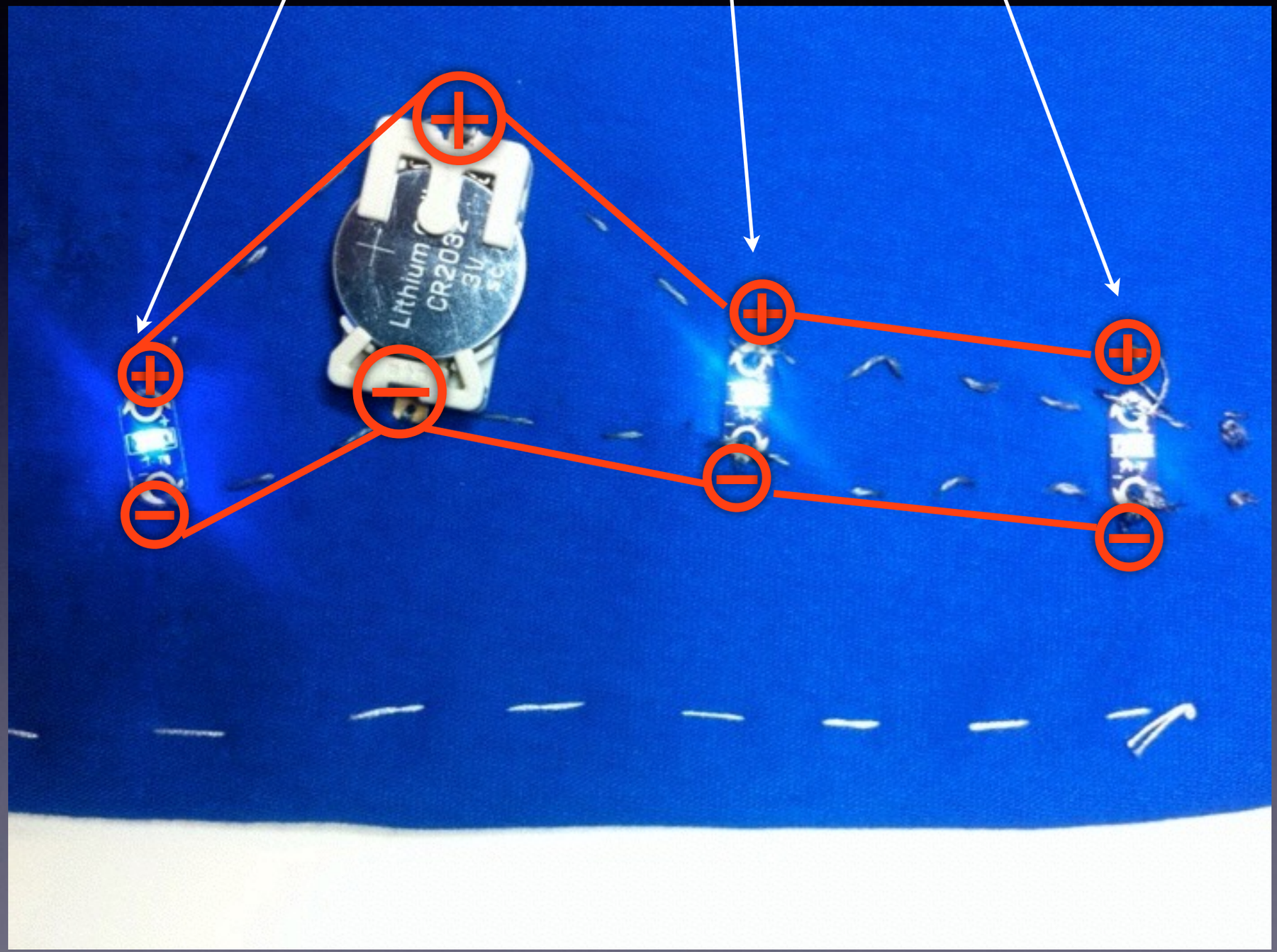
Electricity will flow in the direction shown



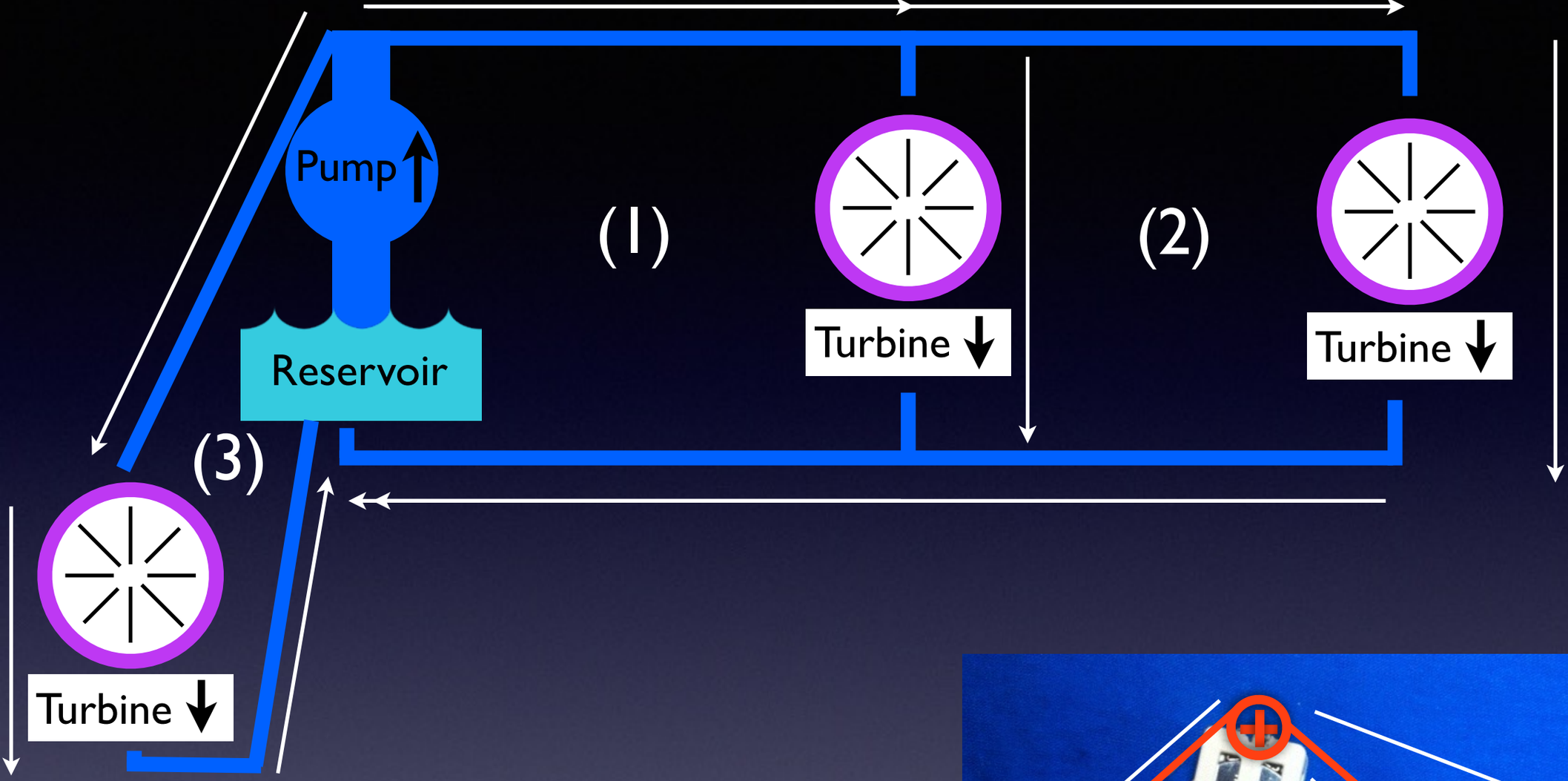
Water-Pump System

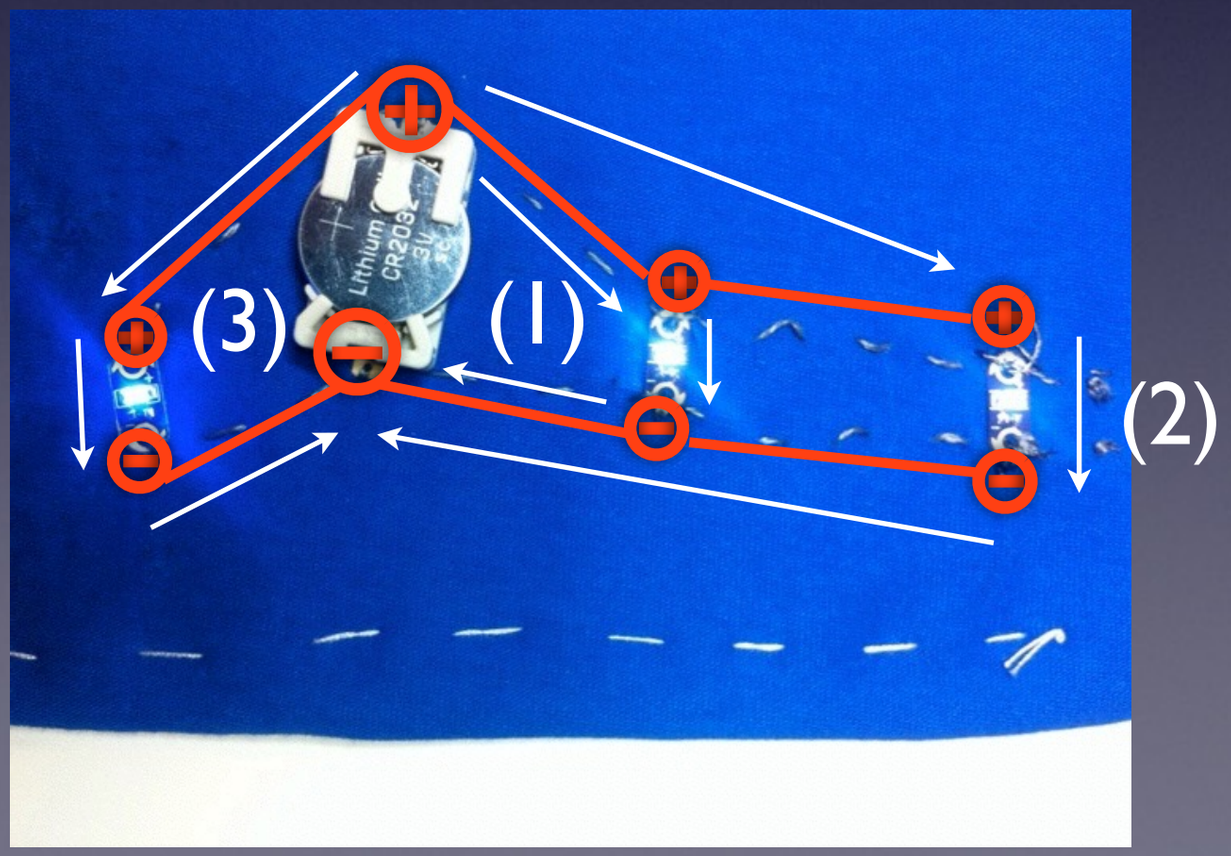
Lets sew some LEDs!

Notice that all of the LEDs' positives hook up to the battery positive, and negatives with the battery negative!

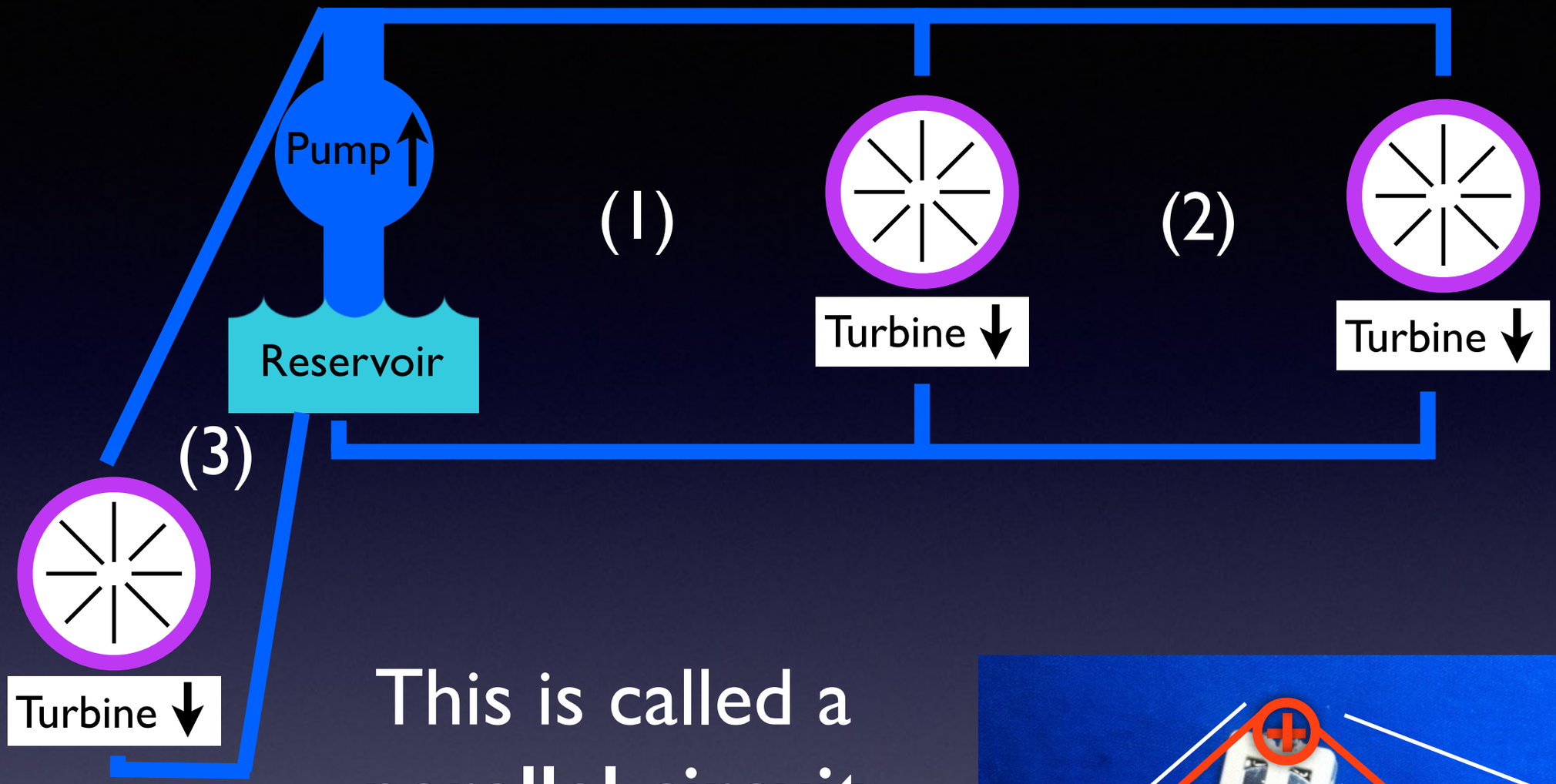


Lets sew some LEDs!



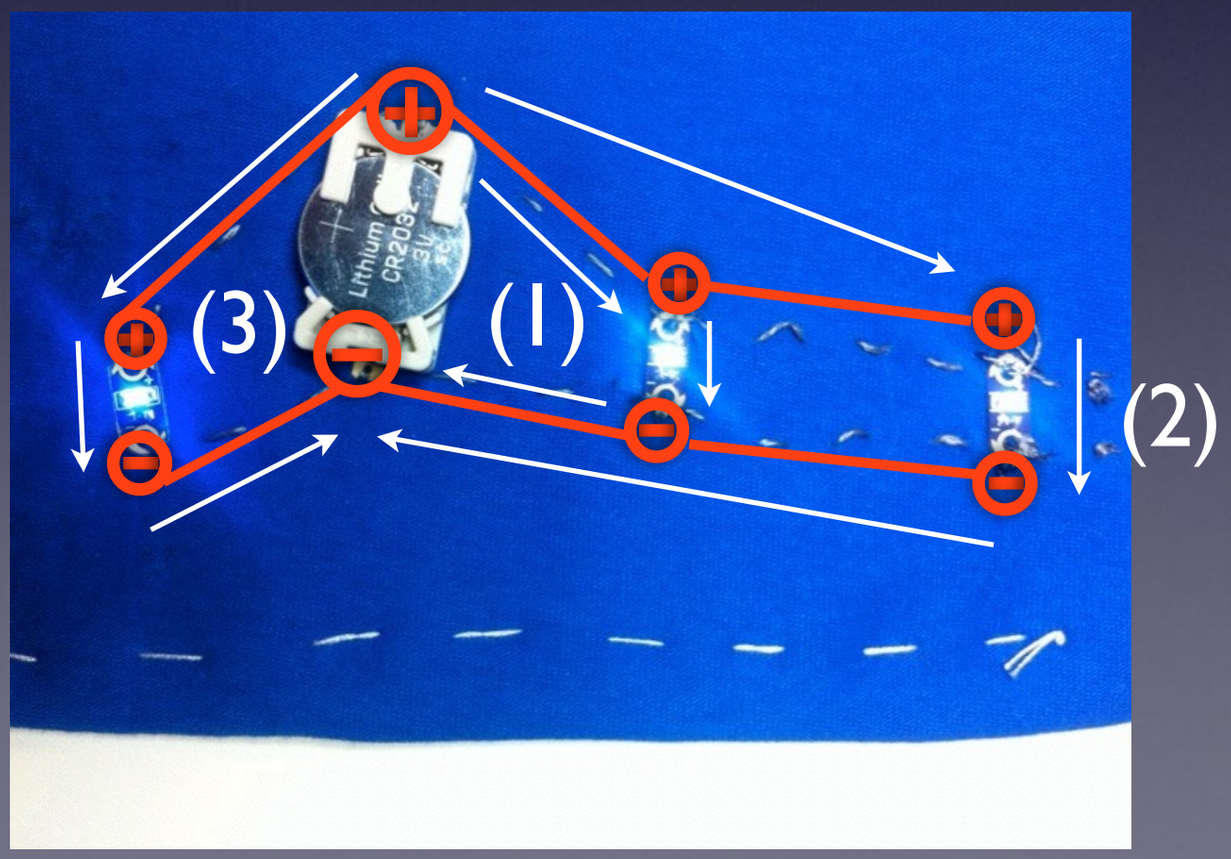


Lets sew some LEDs!

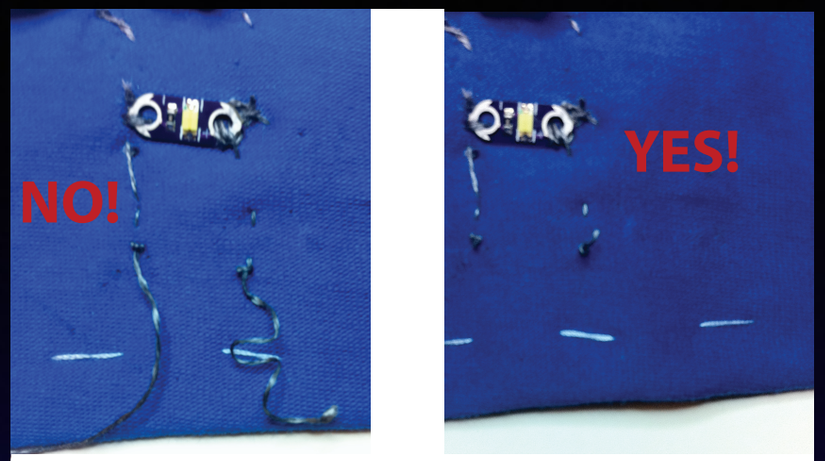


This is called a **parallel circuit**

Always connect your LEDs in parallel!



So, you're LEDs don't light up...

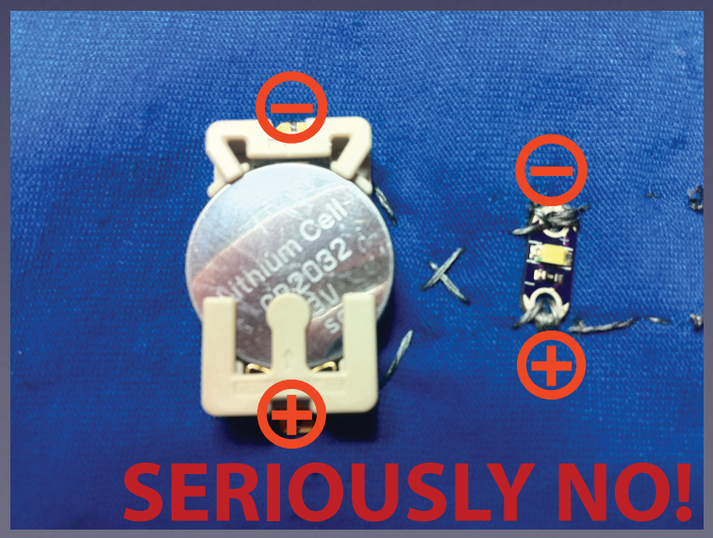


(Check the back of your piece too)

(1) Long conductive thread tails can lead to accidental shorting! Lop off leads close to knots.

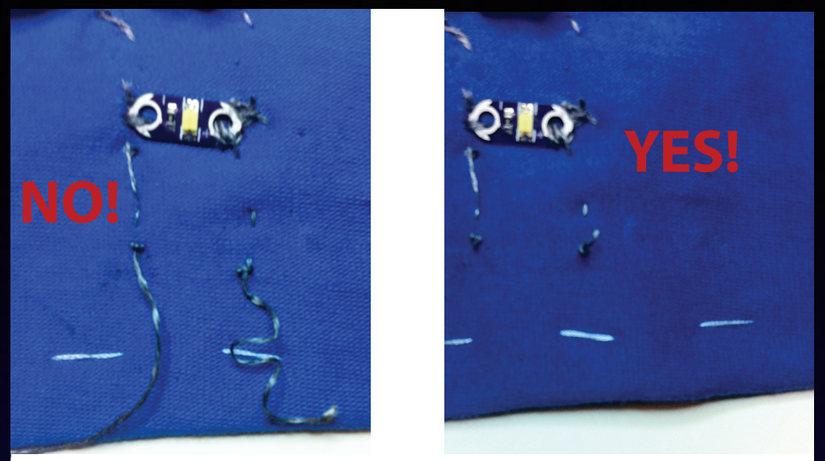


(2) Are the LEDs facing the right way? Make sure (+) LED leads connect to the (+) of the battery (and same for (-) leads).



(3) Are the there any crossed leads? This will cause shorting and draining of battery (and maybe a fire!). Never cross (+) and (-) leads.

So, you're LEDs don't light up...



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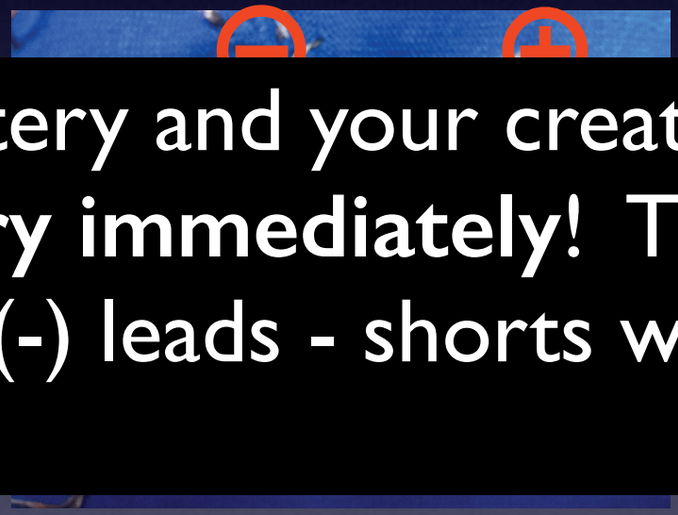
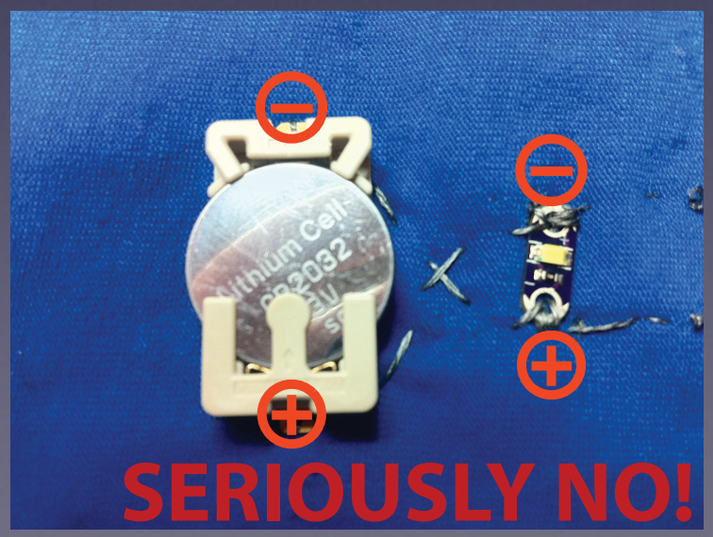
(1) Long conductive thread tails can lead to accidental shorting! Lop off leads close to knots.



(2) Are the LEDs facing

If you put in the battery and your creation doesn't light up take out the battery immediately! Then check connections for crossed (+) and (-) leads - shorts will drain the battery and can start fires!



(3) Are the there any crossed leads? This will cause shorting and draining of battery (and maybe a fire!). Never cross (+) and (-) leads.

Tips & Tricks

(1) Is battery in the right way?

(2) Conductive thread can be tricky (and limited)- use only a little bit at a time!

(3) Lay out LEDs before you sew - make sure you can sew (+) and (-) leads to the battery from where you've placed your LEDs - we have legal pads you can draw on!

(4) The more conductive thread between the battery and the LED, the dimmer the LED will be - usually, this is unnoticeable, but can be an issue for really long circuits.

(5) You may not want to use all the LEDs - for example the RED LEDs can make other LEDs in your circuit dimmer, depending on your specific circuit layout.

(6) Don't forget when you're sewing stuff: your beanie needs to stretch!

Other Materials

(1) other fabric
(2) regular thread
(3) Lovely assistants!

Go to it!

Wrap Up

Resources

These slides (and possibly a video of the talk) will be online at www.avriot.com in the next few days

Big thanks to the NSF AARF!

Other resources (also on back of 1-sheet):

(1) www.sparkfun.com (sewable LEDs)
(2) www.instructables.com
(3) Maker Magazine
(4) Hack-a-day
(5) Jameco