Maker

Space

Circuits #2

Books	*Ashes*	*Jolted: Newton Starker's Rules for Survival*
	Michael Vey: The Prisoner of Cell 25	*Make: Electronics: Learn by Discovery*
	Make: Wearable Electronics: Tools and Techniques for Prototyping Interactive Wearables	*Violet Raines Almost Got Struck by Lightning*
	Squishy Circuits	
Electronics	MaKey MaKey	LilyPad Arduino
	Squishy Circuits	Electronic Snap Circuits
LilyPad Arduino	LilyPad battery holder	Conductive thread
	LilyPad power supply	Programmer
	Programmer cord	12 Needles
	80 LEDs in various colors	4 Fabric squares
	2 Embroidery hoops	Scissors
MaKey MaKey	MaKey MaKey board	Red USB connector
	7 Alligator clips	6 White wires
	Directions	
Squishy Circuits	Battery holder	Piezeoelectric buzzer
	Mechanical buzzer	Electric motor
	25 LEDs (5 red, 5 white, 5 blue, 5 green, 5 yellow)	
Electronic SNAP Circuits	2 Battery holders	Board
	Music IC	Alarm IC
	Space War IC	Amplifier IC
	2 Four snap wires	1 Five snap wires
	9 Two snap wires	1 Seven snap wires
	3 Three snap wires	1 Six snap wires
	6 One snap wires	2 Jumper wires (1 black, 1 red)
	Speaker	Whistle chip
	Propeller	2 LEDs (1 green, 1 red)
	Photoresistor	Microphone
	2.5V Lamp	
	6V Lamp	Antenna coil
	0202uF Capacitor	0.1uF Capacitor
Other Supplies	AAA batteries	AA batteries
	Double-sided tape	Tape
Documents	Check-out & Return Procedures	Inventory List
	Activities & Ideas	40 Developmental Assets for Teens

Updated 11/7/2016

Maker Kit
Check-Out & Return Procedures

- An Inventory List is included. Check before and after use.
- If kit is incomplete, please e-mail or call Melendra Sanders at msanders@nckls.org or 1-800-432-2796 ext. 143.
- Loan period: **1 month**
- Kits will be sent, and can be returned, via courier.
- For those libraries not on courier, transportation can be arranged through the rotating book van. However, since the check-out period is for 1 month, either pick-up or return will be the responsibility of the library.
- Partial kits will not be checked out. Even if you are only utilizing a portion of the kit, the kit will remain as a unit.
- If you have created an activity that goes with the theme, please include a description (and photograph if possible) when sending back the kit. In this way, ideas are shared and everyone benefits. Ideas and activities can be added directly to the folder.
- All copying of activity sheets is the responsibility of the library.
- Copies can be made of all program materials to fill patron requests.
- If you have suggestions on how to improve this service, please share your thoughts with NCKLS.
- Excessive damage to the kit will be the responsibility of the library.
- **Please fill out the evaluation form before sending back.**
- Return all items to the original boxes before packing materials.
- Secure lid to bin using the plastic ties included in folder.
- Do not add packing material to the bins.
- If you have suggestions on how to improve this service, please share your thoughts with NCKLS.
- If you have any questions or concerns, e-mail or call Melendra at msanders@nckls.org or 1-800-432-2796 ext. 143.

Circuits #2
Program Activities & Ideas

Activities on the Computer:

Squishy Circuit:

Squishy Circuit "How to" Videos:
http://courseweb.stthomas.edu/apthomas/SquishyCircuits/videos2.htm
Sparkfun Squishy Circuit: https://www.sparkfun.com/news/626
Imagination Station Squishy Circuits: http://imaginationstationtoledo.org/content/2013/03/squishy-circuits-with-play-dough/
MAKE: Squishy Circuits: http://makezine.com/projects/squishy-circuits/
Squishy Circuits--Sylvia's Mini-Maker Show: http://makezine.com/2012/01/17/squishy-circuits-sylvias-mini-maker-show/
Hands-on Science with Squishy Circuits: http://www.ted.com/talks/annmarie_thomas_squishy_circuits
Exploratorium Squishy Circuits: http://tinkering.exploratorium.edu/squishy-circuits

MaKey MaKey:

MaKey MaKey Quick Start Guide: http://makeymakey.com/howto.php
MaKey MaKey Guides: http://makeymakey.com/guides/
MaKey MaKey Ideas Forum: http://www.makeymakey.com/forums/index.php?board=6.0
MaKey MaKey Music Examples Video: https://www.youtube.com/watch?v=wkPt9MYqDW0
Sparkfun MaKey MaKey Quickstart Guide: https://learn.sparkfun.com/tutorials/makey-makey-quickstart-guide
Fast Company: MaKey MaKey Video: http://www.fastcompany.com/3013992/makey-makey-will-make-you-love-the-internet-of-things

LilyPad Arduino:

LilyPad Arduino Craft Video: Introduction: https://www.youtube.com/watch?v=Yj639_ez6TM
LilyPad Arduino Project: https://www.sparkfun.com/tutorials/312

Other Ideas:

Electrolysis of Water: http://www.education.com/science-fair/article/water-electrolysis/
Make Lightning: http://www.education.com/science-fair/article/make-your-lightning/
MaKey MaKey Pet Cam
Make a Lemon Battery
LilyPad Plush Monsters
LilyPad Sparkly Bracelets

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Circuits #2

Book Trailers

Ashes by Ilsa J. Bick

https://www.youtube.com/watch?v=uLFtxMf-vUU
https://www.youtube.com/watch?v=MiGDRd_6aNk
https://www.youtube.com/watch?v=_T4NHd0rqn4
https://www.youtube.com/watch?v=ujEpOiy2zZ4
https://www.youtube.com/watch?v=pSnS7yvgTyM
https://www.youtube.com/watch?v=FAEB2V-gYiU

Michael Vey: The Prisoner of Cell 25 by Richard Paul Evans

https://www.youtube.com/watch?v=hA2ixnvnM8o
https://www.youtube.com/watch?v=piiKX0Gz9DI
https://www.youtube.com/watch?v=5II5u9CVJlk

Maker Space

PET CAM

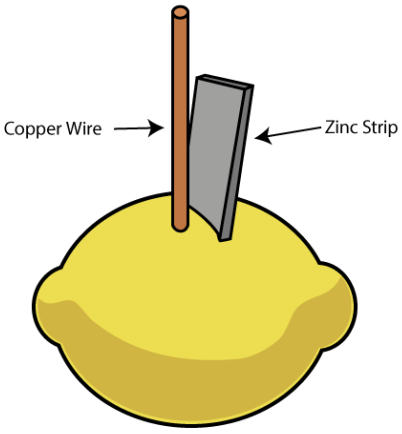
Materials:
Computer or Laptop
Photo booth program on computer
Tinfoil
MaKey MaKey board and clips
Glass bowl
Water

I used photo booth on my computer, but you can use any photo program you want as long as it can be triggered by a key input. I had mine setup to work with the left mouse click. I laid a sheet of tinfoil on the floor, which was then connected to the ground. I then connected an alligator clip to the left mouse click, and to a glass bowl, which was placed on the tinfoil. I filled the bowl with cat milk (you can also use water). Since glass does not conduct electricity, this setup does not close the circuit. Cats however, do conduct electricity, and when they come along and step on the grounded tinfoil, and sticks their tongue in the milk – photo booth is triggered.

Make a Lemon Battery

Materials:

- A lemon, or other citrus fruit
- 18 (or smaller) gauge copper wire
- Wire stripper/clipper
- Steel paper clip, small **galvanized** nail (one that is covered in zinc), or a piece of zinc (ideal)



Procedure

1. Use the wire strippers to first **strip** about 2 1/2 inches of plastic insulation off the copper wire. Then, **clip** that piece of stripped wire off of the main roll.
2. Carefully straighten the steel paper clip. Use the wire clippers to cut it to the same length as your copper wire.
3. Use the sandpaper to rub out any rough spots in your wire or paperclip. You are going to be touching the wire ends to your tongue, so you want them to be smooth. If you are using the zinc covered nail or piece, scratch it lightly with the sand paper to expose a fresh surface.
4. Roll the lemon gently on a table to break the cell walls and loosen up the juice inside. The sour juice is needed for the **chemical reaction** that you are about to start.
5. Carefully stick the copper wire about 1 inch into the lemon.
6. Make sure your tongue is moist with **saliva**, or spit. Touch your tongue to the copper wire.

7. Stick the paperclip, zinc covered nail or zinc strip into a spot in the lemon about 1/4 inch away from the copper wire. Make sure the wires don't touch. The wires need to be close to each other because they will be swapping matter in the chemical reaction. If they are too far apart, the matter might lose their way.
8. This time, touch your moistened tongue to both wire ends. *What do you notice?*

Results

When you touched your tongue to just the copper wire, you most likely would not have noticed anything unusual. When you touched your tongue to BOTH of the metal ends, you might have felt a tingle, or noticed a metallic taste.

Why

The tingle or metal taste you noticed shows that your lemon battery was generating an **electric current**. That means tiny **electrons** were moving across the surface of your tongue. Electrons are subatomic particles that zoom around an atom's center and make up the part of the atom that is negatively charged.

The lemon battery you made is a type of battery called a **voltaic battery**. These types of batteries are made of two different metals, which act as **electrodes**, or places where electrons can enter or leave a battery.

So why were we able to stick electrodes into a lemon and get a battery? All voltaic batteries need their metals to be placed in an **electrolyte**. An electrolyte is a substance that can carry electrical current when dissolved in water. The tiny bit of salt in your saliva makes your saliva an electrolyte, and the sour **citric acid** does the same thing for lemon juice. Batteries stop working when there is not enough of the electrolyte to react with the metal or not enough metal left to react with the electrolyte.

Going Further

You can generate more electrical current by connecting multiple lemon batteries. Just make a second battery and connect the zinc or steel piece of one battery with the copper wire of the other battery using another piece of copper wire to act as a bridge.

You can use your enlarged lemon battery to power a low-power device like a digital watch or calculator. Remove the regular battery from the digital watch or calculator. Then, hook up the copper electrode of your lemon battery with battery slot's positive contact. Connect the zinc or iron electrode with the negative contact. *Can you get the device to work?*

If you are looking to test a variable, try making batteries using different fruits and vegetables. Which ones produce the biggest tingle on your tongue? Which ones generate the most electric current?

Maker Space

for more activities, check out...

Getting Hands On With Soft Circuits:
A Workshop Facilitator's Guide

Download a copy:
media.mit.edu/~emme/guide.pdf

Order a copy:
media.mit.edu/~emme/order_guide

an activity by Emily Lovell, Jie Qi, and Natalie Freed

PLUSH MONSTERS

creatures with character

Summary

Students are exposed to microcontrollers and the concept of programmability. Each student will make a plush monster companion, using a sewable pre-programmed microcontroller to control the behavior of one or more LEDs.

Learning Goals

Students will...

- understand what a microcontroller is and how programming can add dynamic behavior to an e-textile project.

Preparation

- Gather the materials.
- If you plan to give students the handout or monster templates, print copies in advance.

Activity

1. If examples are available, begin by sharing those with the students.
2. Explain that a circuit is a continuous loop through which electricity can travel. Our circuits all have a power source, and for our purposes this will be a coin cell battery. Additionally, circuits can have outputs, such as lights and motors. As we design a circuit, our goal is to guide the electricity out of the battery, through any output components (like lights), and then back to the battery.
3. Point out that batteries and LEDs have a "positive" and a "negative" side. This is called *polarity*.
   - Positive is also referred to as +, *power,* or by using the color red. The positive side of an LED is known as an *anode* and corresponds to the longer metal leg.

Tools & Materials

For each student:

- battery
- battery holder
- 1 piece of felt (9" x 12")
- 1 or 2 LEDs (lights)
- *LilyTiny* sewable microcontroller

For the group to share:

- conductive thread
- fabric scissors
- hot glue gun and glue sticks
- needle nose pliers
- sewing needles
- embroidery floss
- polyester stuffing
- needle threaders or beeswax
- buttons and/or felt scraps for embellishment

Maker Space

SPARKLE BRACELET

high-low tech
hlt.media.mit.edu

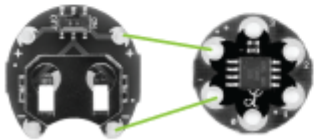
step 1: design

Design your bracelet. Decide on a look and a color scheme and figure out where your LEDs will be. Make a sketch.

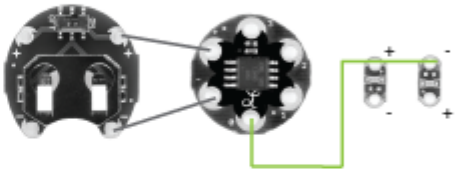
step 2: behavior

You'll connect your LEDs to one of the numbered tabs on the LilyTiny. Choose the LED behavior (and tab number) that you want: a slow fading glow (0), a heartbeat (1), a steady blink (2), or a a candle-like twinkle (3).

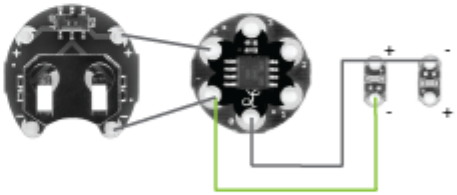
step 3: circuit design



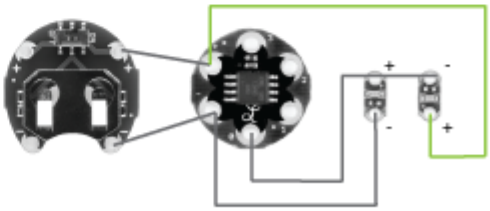
Make a sketch of your circuit. First, draw the connections between the battery (+) and (-) and the LilyTiny (+) and (-).



Next, draw the connections between your LEDs and the LilyTiny pin you chose in the last step, tab (0) in the above diagram. Connect the (+) side of one LED and the (-) side of a second LED to this tab.



Now connect the (-) side of the first LED to (-) on the LilyTiny.



Finally, connect the (+) side of the second LED to (+) on the LilyTiny. This is the basic electrical layout for the circuit.

Maker Kit Evaluation
Circuits #2

1. **Please place an X in the column next to any piece of the kit that you used:**

		X		X
Books	*Michael Vey: The Prisoner of Cell 25*		*Jolted: Newton Starker's Rules for Survival*	
	Make: Electronics: Learn by Discovery		*Make: Wearable Electronics: Tools and Techniques for Prototyping Interactive Wearables*	
	Ashes		*Squishy Circuits*	
	Violet Raines Almost Got Struck by Lightning			
Circuit Kits	MaKey MaKey			
	Squishy Circuits			
	LilyPad Arduino			
	Electronic Snap Circuits			
Documentation	Check-out & Return Procedures			
	Program Activities & Ideas			
	Inventory List			
	40 Developmental Assets for Teens			

2. **How many programs did you conduct with the kit and how many total people attended?**

   # of programs: _____ # of attendees: _____

3. **Please rate the kit on a scale of 1-5 (1=poor, 5 =excellent):**

   1 2 3 4 5

4. **Any comments about the kit or suggestions for improvement?**