Play-doh Circuitry

This activity is inspired by a Ted Talk (https://www.ted.com/talks/annmarie_thomas_squishy_circuits) by AnnMarie Thomas that described how to use home-made dough to make circuits! We have since experimented with regular play-doh, and found it to be quite conductive as well.

What's the Activity About?
We couldn't have robotic telescopes without electric circuits and sensors that close the telescope domes when it's cloudy or rainy or when the sun comes up! With this activity we will be exploring circuits and sensors with play-doh and some electronic parts.

Topics Covered:

- What is a circuit?
- How are circuits used in Skynet Telescope Domes
- Building different kinds of circuits and using a light sensor (photoresistor) as a switch.

Materials Needed:

- Light Emitting Diodes (little light bulbs) 
- Photoresistor 
- Battery snap 
- 9 Volt battery 

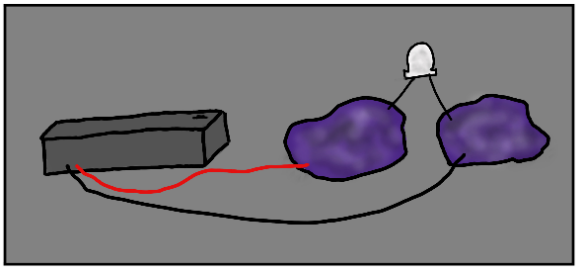
- Play-doh (home-made dough recipes are on the Squishy Circuit web page)

Setting up the Activity:
All you need is a table top.

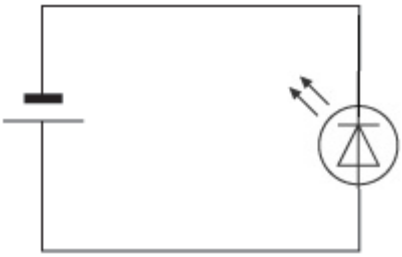
Introducing the Activity:
The context: All of the optical telescopes on the Skynet Robotic Telescope Network have electric circuits and sensors. Some of these circuits switch on motors that close the telescope domes when it's cloudy, rainy or when the sun rises, and open the domes when it is clear and dark.

Tell your youth that they will be building some circuits. The first goal is to light an LED! You might define a circuit like this: a circuit is a "circle" of material that allows electrons to flow. The flow of electrons is called **current**. You need a **battery** to push the electrons and a **conductor**; material that lets electrons pass through it freely. Copper wire is a good conductor. But so is play-doh! Play-doh will be your wire. You are going to get the flow of electrons to light up a light emitting diode or LED.

Doing the Activity:
Gather your materials and build a simple circuit. See the diagrams below. The picture on the left shows what the circuit looks like, play-doh and all. The diagram on the right is a circuit diagram using internationally recognized symbols for the components. **CAUTION: Do not connect the battery directly to the LED! Too much current will pass through the LED and it will burn out!** Use the play-doh.



Simple Circuit. Credit: Squishy Circuit Classroom Guide



Simple Circuit Diagram.

LEADER NOTES: For current to flow, there must be a complete path from one pole of the battery, through the play-doh, to the LED, and back to the other pole of the battery. If the LED doesn't light up, try switching the LED around. LEDs have polarity and will only allow electrons to flow one way. The positive side (longer wire) goes to the positive side of the battery (red wire).

Time to experiment! Encourage youth to try making different circuits. Things to try:

1. Push the two pieces of play-doh together. What happens? Why: The easy path for electrons is through the play-doh! They don't go through the LED at all.
2. Make a play-doh switch to turn the light on and off.
3. Add a third ball of play-doh and introduce the photocell into the circuit. What happens to the LED brightness when you cover the top of the photocell with your finger?
4. Build series and parallel circuits with multiple lights.
5. Sketch a circuit diagram and see if someone else can build it.

Wrap-up:
Tie the circuit experiments back to the Skynet Telescopes by discussing how participants might use and improve such a circuit for use on the telescope. Also, ask participants to brainstorm ways to use a light sensing circuit (EG: Attach a buzzer to the circuit and use it as an alarm system).

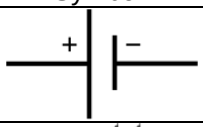
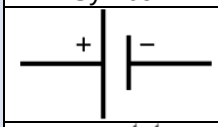
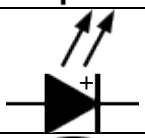
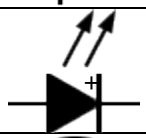
Extensions:
Youth with blindness or low vision can participate fully in this activity. You just need a way to convert the light from the LED into sound. Here are a couple of ways to do that.

1. There's an App for That! Listen to light with the "Light Detector" (iPhone app).
2. Connect a speaker to a solar cell and point the solar cell at the light. One of our SJS Project Leaders, Vivian Hoette developed this. You need an amplifier/speaker (Radio shack- #277-1008, alligator clips, audio plug (Radio Shack #42-2434), and solar cell (Edmund Scientific #3039810).

Resources:

- **Squishy circuits:** http://courseweb.stthomas.edu/apthomas/SquishyCircuits/buildingCircuits.htm.
- **More activities with conductive dough:** http://www-tc.pbs.org/teachers/includes/content/scigirls/activities/tech/doughcreatures.pdf
- **explanation of parallel and series circuits for kids:** http://www.bbc.co.uk/bitesize/ks3/science/energy_electricity_forces/electric_current_voltage/revision/4/
- **Light Detector App**: https://itunes.apple.com/us/app/light-detector/id420929143?mt=8

Circuit symbols for drawing circuit diagrams. Cut out and distribute.

Symbol	What it is	Symbol	What it is
	Battery		Battery
	Light Emitting Diode		Light Emitting Diode
	Photo cell or photo resistor		Photo cell or photo resistor
	Switch		Switch

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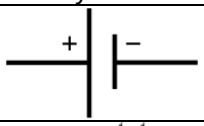
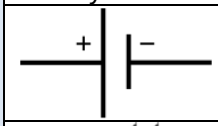
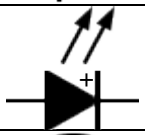
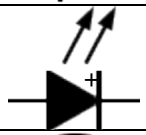
	Battery		Battery
	Light Emitting Diode		Light Emitting Diode
	Photo cell or photo resistor		Photo cell or photo resistor
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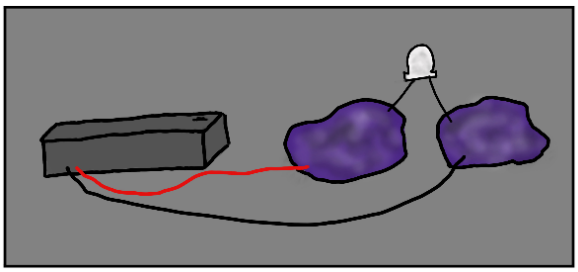
Circuit Illustrations. Copy and distribute.



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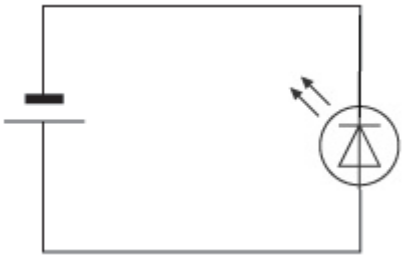

Simple Circuit Diagram.