

NGSS Scratch Electricity Lesson

This course is for grades 3-5

1.1 Suggested Timeline: 1x 55-minute class period

1.2 Materials needed- Chromebooks or laptops and WIFI access

1.3 Standards

| Common Core Standards | Disciplinary core ideas | Learning objective |
|--|------------------------------|---|
| RST.6-8.3 Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. (MS-PS1-6) | PS3.A: Definitions of Energy | Developing and Using Models Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions |

Objectives:

Build a simulation in MIT’s Scratch program to observe the flow of electrons in a simple circuit

Key terms

| | |
|------------------|---|
| current flow | An electric current is a flow of electric charge. In electric circuits this charge is often carried by moving electrons in a wire |
| electrons | The electron is a subatomic particle, with a negative elementary electric charge. |
| Potential energy | Potential Energy is stored energy. Examples of potential energy are oil sitting in a barrel, or water in a lake in the mountains |

Coding Terms

| | |
|-----------|---|
| Events | In programming , an event is an action that occurs as a result of the user or another source, such as a mouse being clicked, or a key being pressed |
| Sprites | An object in Scratch which performs functions controlled by scripts. |
| Broadcast | A broadcast is a message that is sent through the Scratch program, activating receiving scripts. Broadcasts are sent with the blocks Broadcast () |

Key Concepts

- The battery is a potential energy source.
- Only until the switch is thrown and the circuit completes do electrons (current) flow from the one side of the battery through the circuit and light the bulb.
- Electrons flow in 1 direction from the positive side of the battery to the negative side.

You tube link

<https://youtu.be/M8zt14WBRjc>

Start Coding Project Here

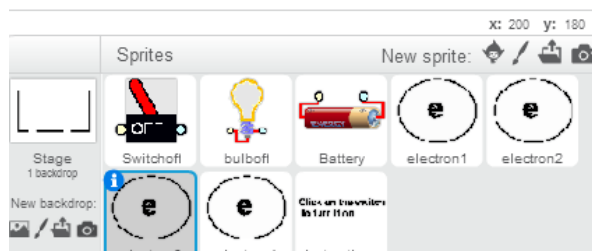
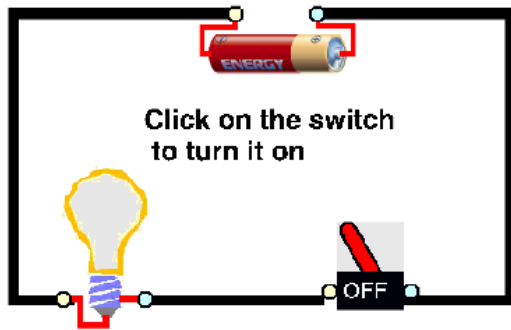
This Scratch Project¹ will animate the electron flow in a simple electric circuit. This will reinforce the concept of current flow.

Students will drag and drop Scratch code blocks for each sprite (character).

1. Open a browser and go to this Scratch URL
<https://scratch.mit.edu/projects/106686714/#editor>

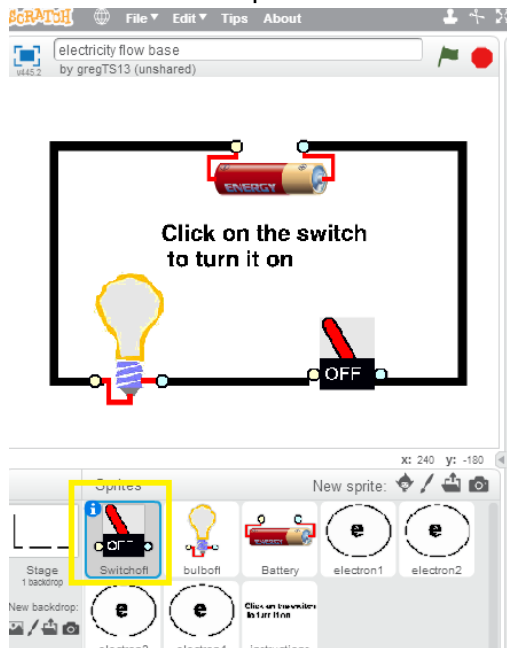
The sprites are all pre- placed to save time, and also saves with the artistic efforts.

¹ **Scratch** is a project of the Lifelong **Kindergarten** Group at the **MIT** Media Lab.

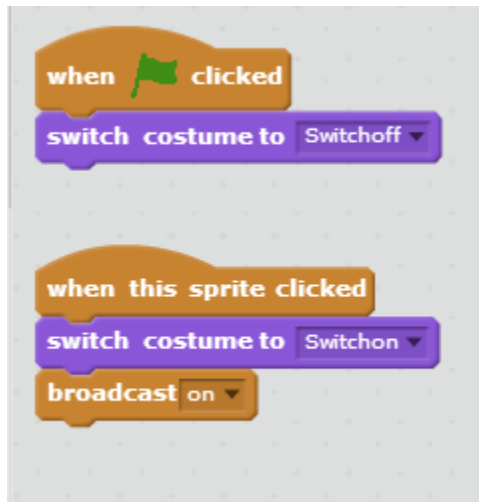


Step 1.

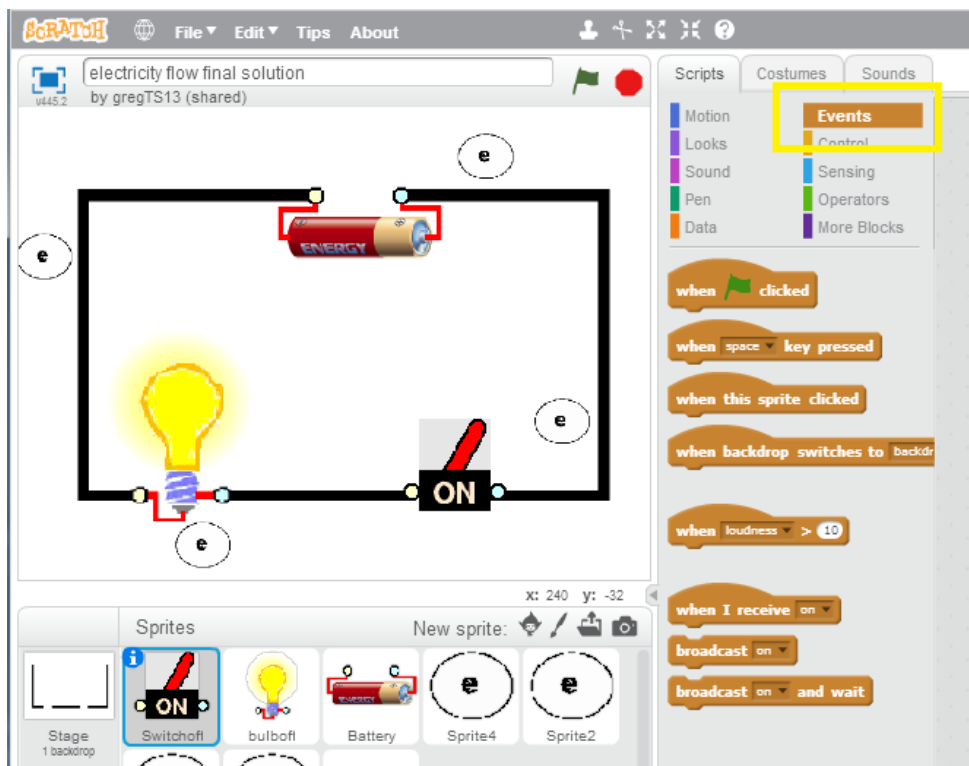
Select the switch sprite



Add this code for the switch sprite



First switch to the **EVENTS** panel by click on **EVENTS** in the center of the *Scripts* tab



Now drag over the following blocks to the right most pane - the script pane

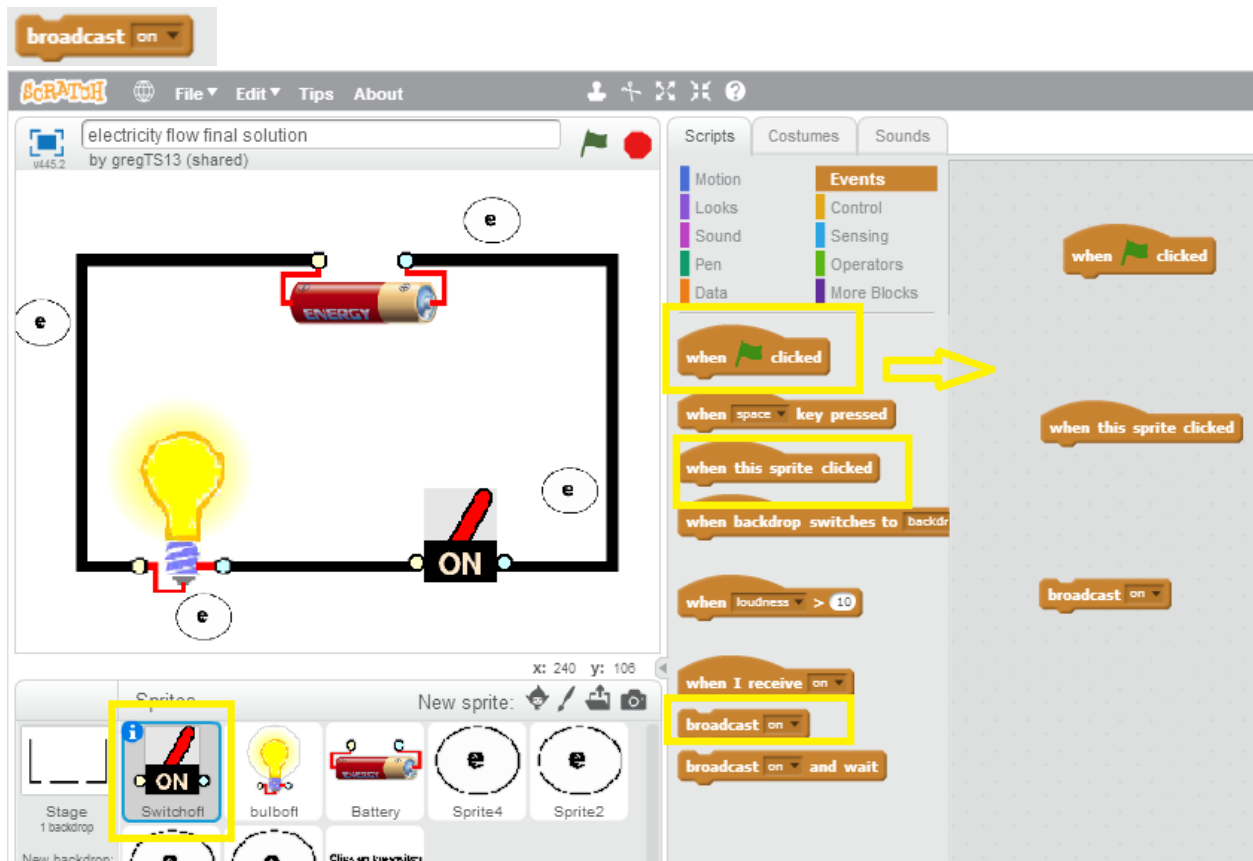
When Green flag clicked



When this sprite clicked



Broadcast



Change the Scripts panel tool to the **Looks** menu by click on the word **Looks**

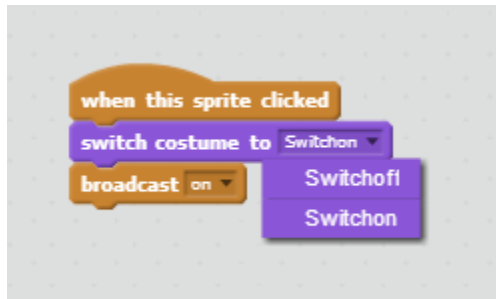
And drag over the

Switch costume block

And

Switch costume block again

Change the 2nd block to **Switchoff** by clicking on the inverted triangle in that block to get a pull down selection menu

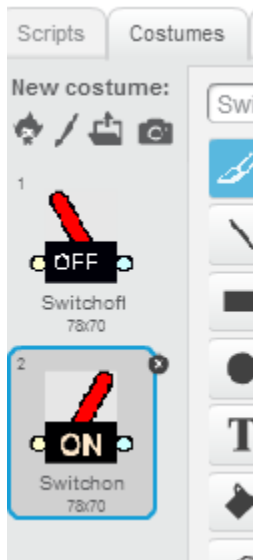


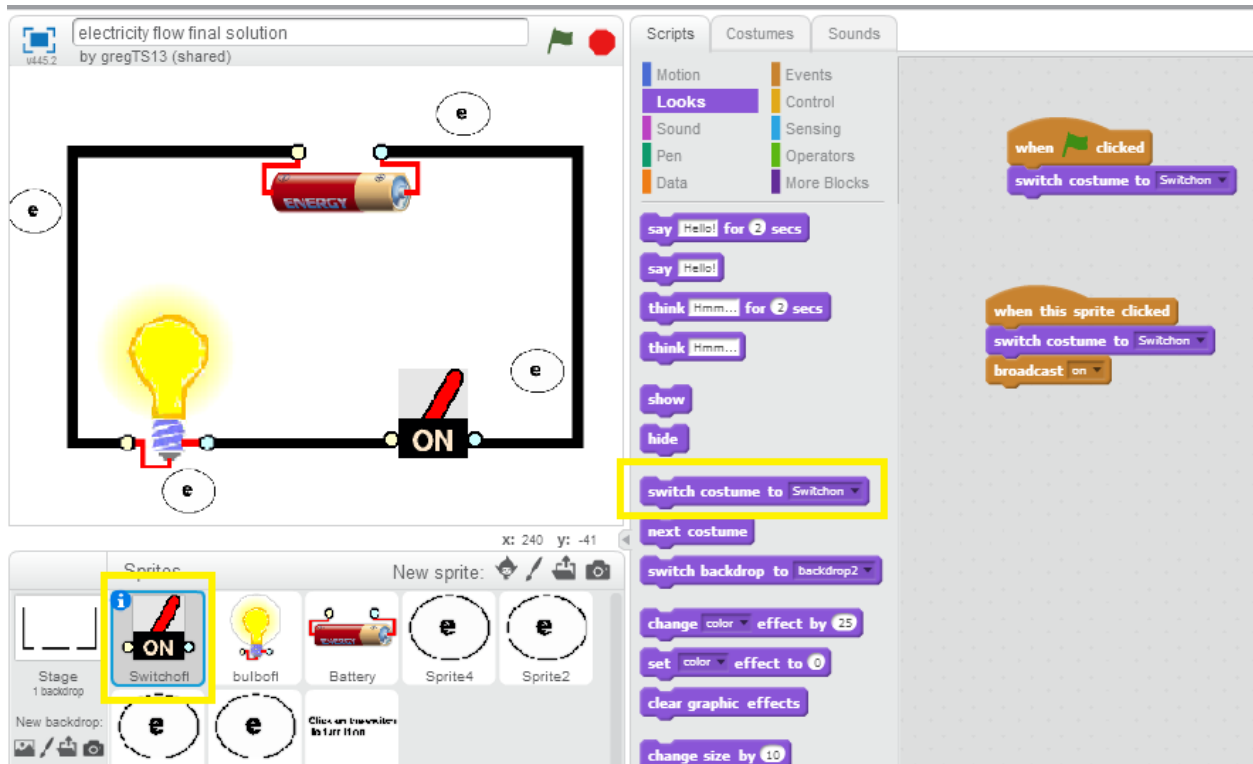
Select **switchoff** for this part

And

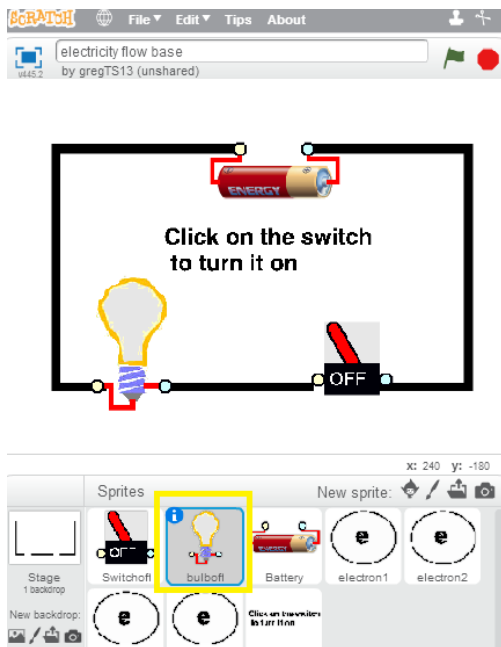
Under the green flag, select **switchon** costume

This will start the switch in the off position and when clicked change to the **switchon** costume
See the **costumes** tab to see the 2 images

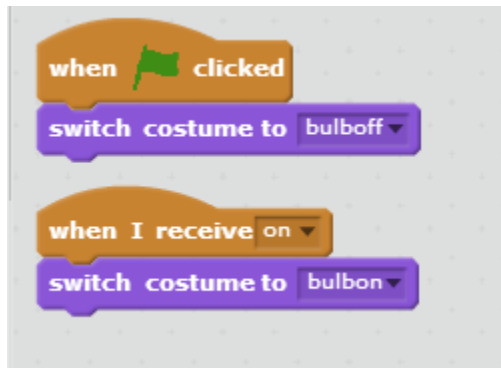




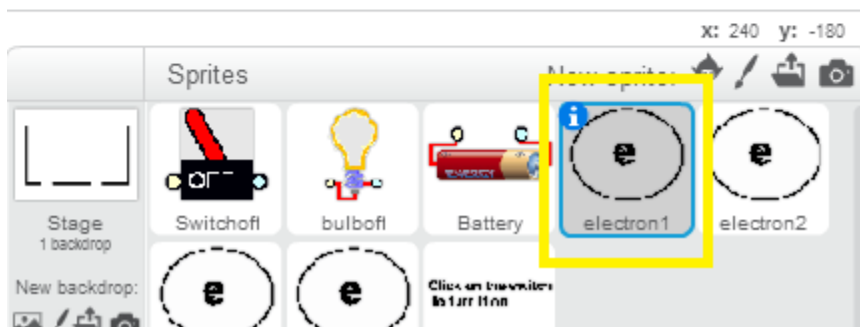
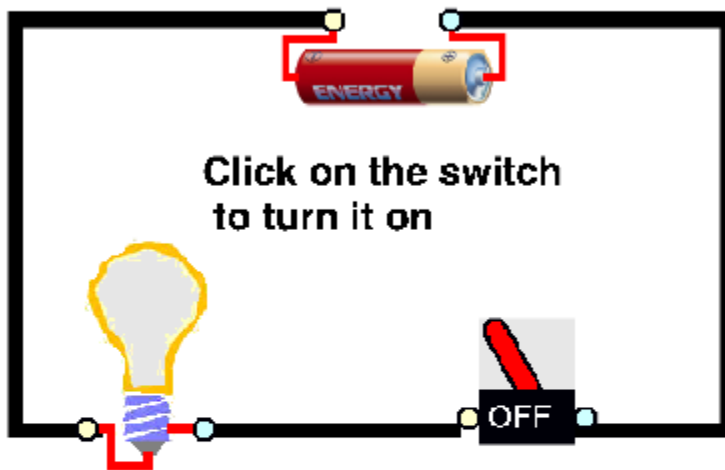
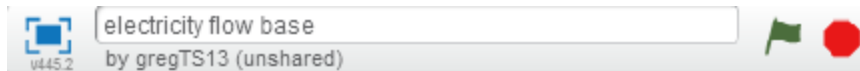
Step 2. The bulb sprite



Add this code for that sprite to illuminate it when the switch is on

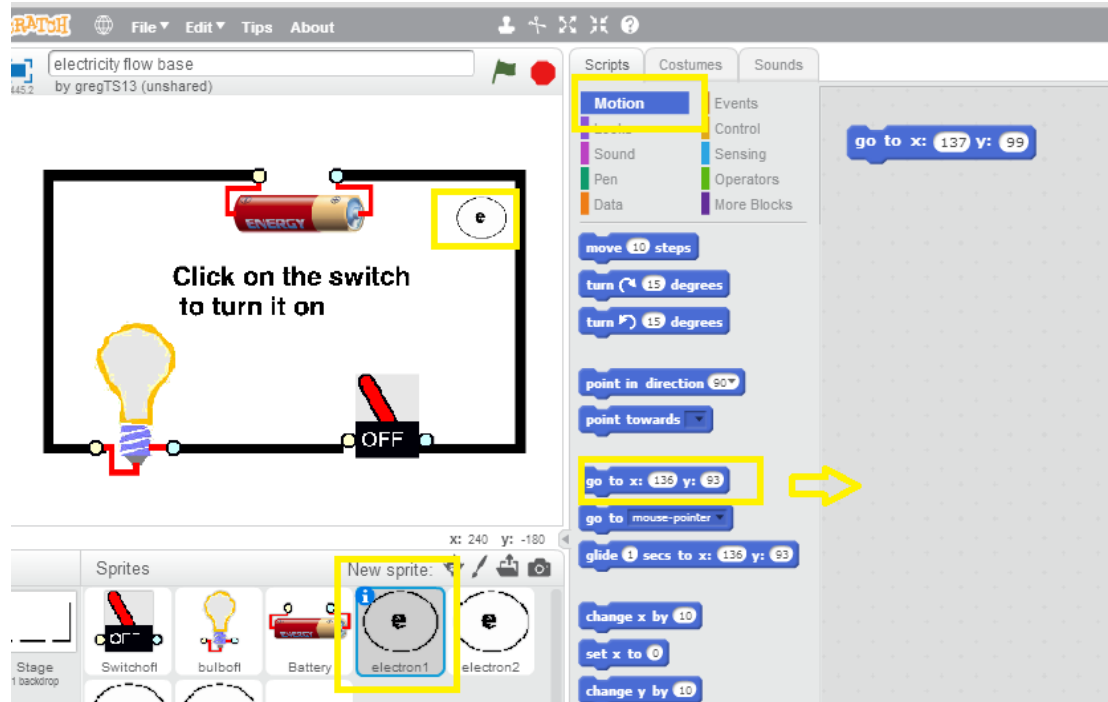


Select electron 1



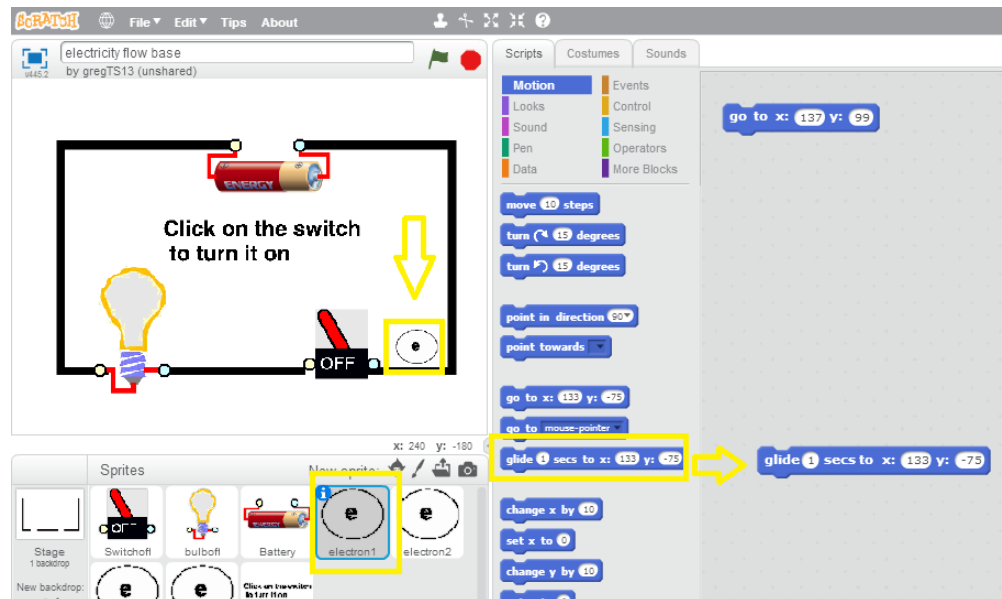
Drag the electron to the top right hand side of the output screen.
From the Scratch tool bar, select **Motion**

And drag the current **goto xy** block to the script panel



Move the electron to the bottom right hand side of the output screen

And from the Scratch tool bar, drag the glide 1 sec block to the script panel



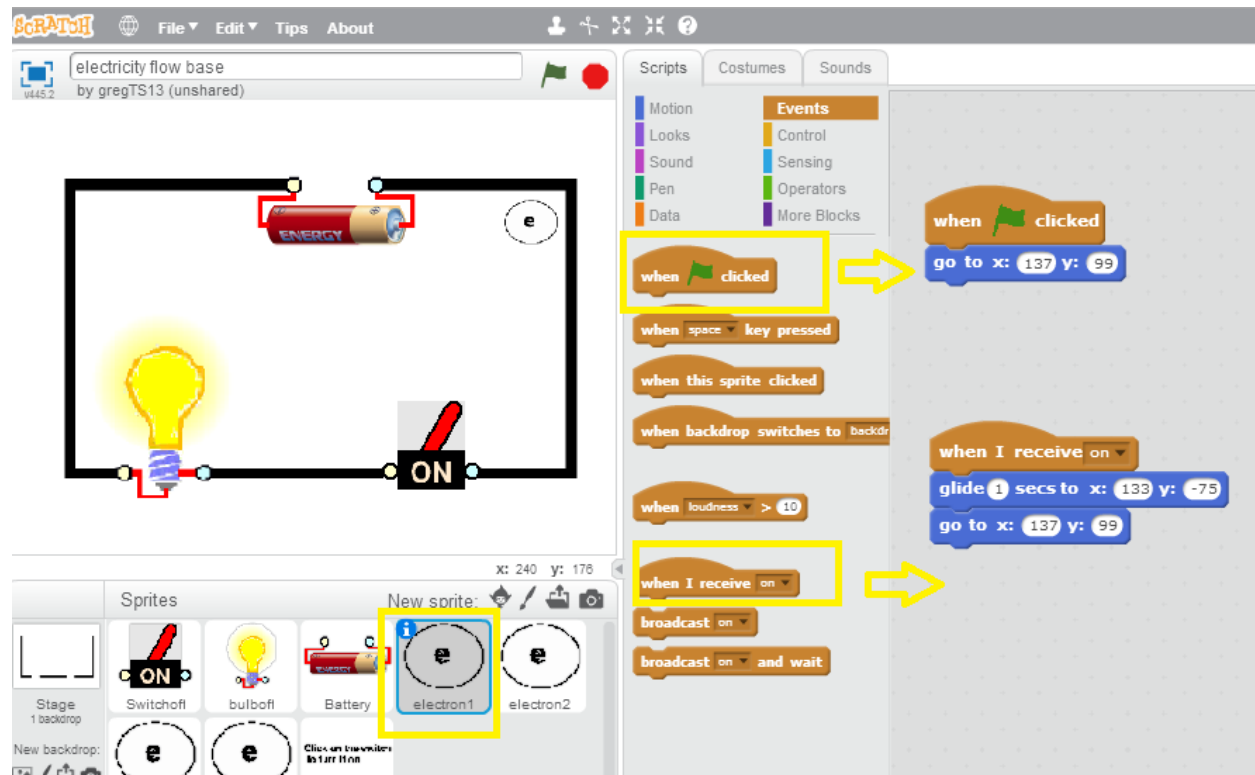
Change to the *Events* tool selection bar

And drag over

When green flag clicked and stack over the **goto xy** block

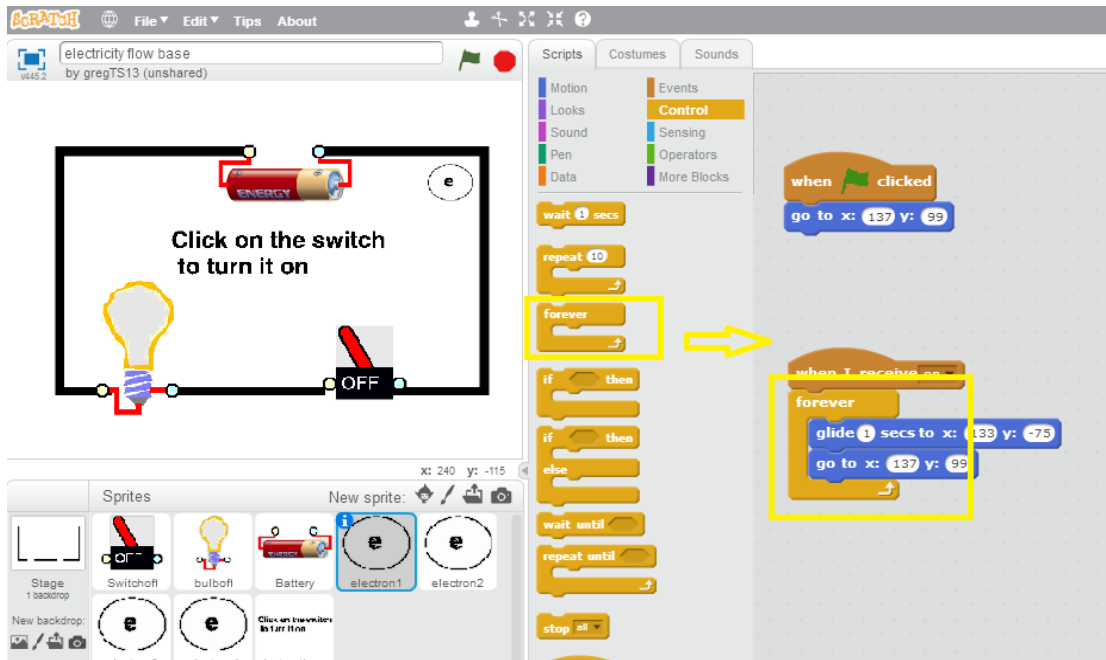
Drag over the when I receive block and stack over the **glide block** as shown

Duplicate the goto block and stack below the **glide** block



Now change to the **Control** tool selection

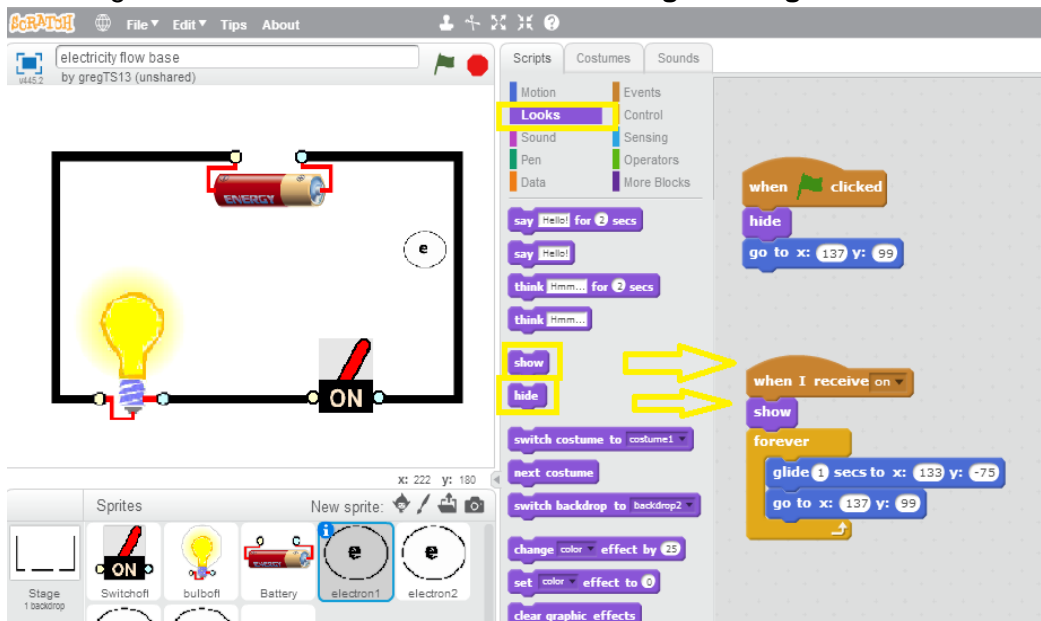
Drag over the **forever** block jaws and wrap the **glide** and **goto** blocks as shown



Now change the tool selection to **LOOKS**

And drag over the **show** block under the **when I receive** block

And drag over the **hide** block under the **when the green flag is clicked** block as shown below

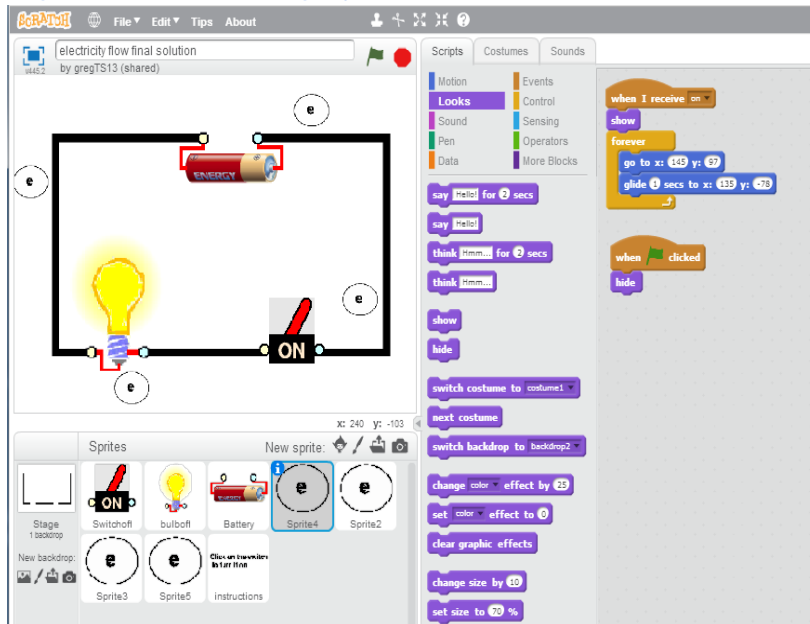


Click the **green flag** at the top of the project

And click on the **switch sprite in the stage** to turn it **ON** from **OFF**
And observe electron1 gliding from the top left down the right side of the screen.

Final Working Solution

<https://scratch.mit.edu/projects/106684221/>



Post Coding Questions

1. How does this simulation differ from a real circuit?
2. What are events in Coding?
3. What does the broadcast block do in this code?
4. What happens if the switch is left in the off position?
5. What happens if the switch is left in the on position?