

# Soil lights

How might we use the charge of soil particles to create an electrical current?

## Background

Did you know soil particles have surface charges which can generate an electrical current using soil as the electrolyte and two disparate metals as electrodes. Electricity is created by the presence and flow of electrons from positive to negative points. We can use metals such as zinc and copper to create electricity in damp soil which has free electrons. In this case, zinc gives up electrons more easily than copper. The reaction of the zinc with the copper in the presence of the free electrons results in a current.

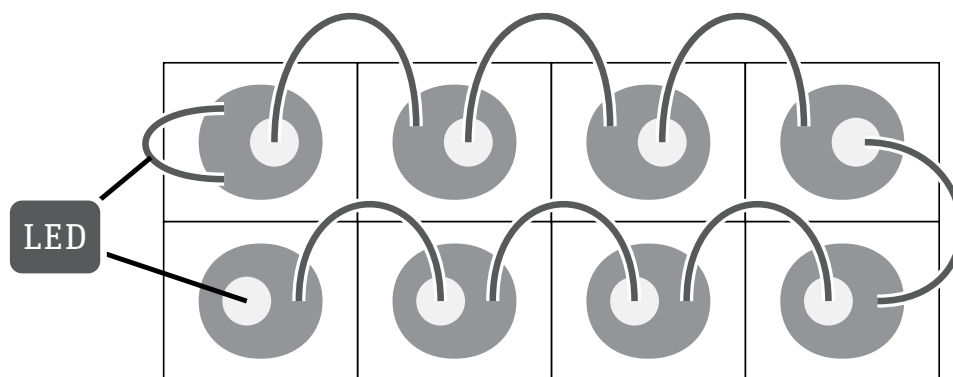
## Materials

- Ice cube tray
- Local soil samples
- Water
- 8 galvanized or iron screws/nails
- 8 copper wire or tape pieces, 4–5 inches long
- 1 LED 5 mm low voltage light bulb

*Note:* Use sandpaper to rub the screws/nails or wire, if old, to create a fresh surface.

## Instructions

1. Cut 8 pieces of copper wire 4 inches long. Wrap a length of copper wire around the top of each screw/nail leaving 2 inches hanging, except for one. You should have 7 wrapped screws or nails and 1 unwrapped screw/nail and 1 copper wire piece.
2. Dampen the soil mixture so that it is wet, but not too wet. Fill 8 cells with the damp soil as seen in the diagram below.
3. Push a copper-wrapped screw/nail into one cell of soil and the loose copper wire end into the adjacent cell of soil.
4. In the same cell of soil as the copper wire end, push in the next copper-wrapped screw/nail and continue to connect the cells in this way, until the screws/nails are arranged in a U formation. This means there should be two adjacent cells that are not connected.
5. In the final cell with just a copper wire end inserted, insert the screw/nail that has no copper wire attached to it. In the adjacent unconnected cell, insert a loop of copper.
6. Using the single screw/nail and the copper wire loop as your contacts, close the circuit with your bulb that has two connection points. The bulb will show that a current is flowing when lit.



## Reflection

1. Describe the texture of your soil. Does it contain sand, silt, clay, and organic matter? If so, what type of soil is it?  
*Note: See soil texture lesson on [OhioCornEducation.org](http://OhioCornEducation.org) to help determine soil texture.*
2. Does the soil mixture create enough electrical current to light the LED bulb? If so, how does the brightness of your bulb compare to others?
3. How might you remediate the soil mixture to create the best possible current for your LED bulb?
4. Explain below what is happening in your soil battery and demonstrate how the current works to light your bulb.