

Need a drink? Soil Moisture and Salinity Monitor

(CBL Module #3 Fall 2022)

Circuits Stuff You'll Learn/Review Today:

- Continuous Resistors: What makes a resistor? What are physical characteristics of a resistor? (e.g. explain $R = \rho L/A$ in lay terms of soil, salinity, and body composition)
- Review: voltage dividers (again!) used to sense the environment, this time changing resistance due to changing salinity (ρ).
- Applications (choose your own path through, star of the show is soil moisture monitor)
 - a. **Soil Moisture Monitor**
 - i. Your design (voltage divider, but choose appropriate resistor)
 - ii. Use galvanized nails for soil probes (alternatively, try carbon rods?)
 - iii. Three indicator LEDs: green for moisture OK; blue for too wet; red for needs water.
 - iv. Real time display or plot of R_{soil} vs. Time. It's up to *you* to develop Arduino code.
 - b. **Body Composition Resistance**
 - i. Have students grip multimeter probes tightly. Set to ohm-meter setting. Record approximate resistance for each student. And you too! Can have a little 'competition' to see who has the highest/lowest resistance.
 - ii. Ask them to run around to get a bit sweaty (usually this increases conductivity as salts and water are released in sweat. Remeasure resistance value. Compare to previous value, ask students why the change?
 - c. **Salinity Monitor (optional, time permitting)**
 - i. Add increments of salt to water, display resistance (or better yet, conductivity!) vs. Time.
 - ii. What are real-world applications? Brainstorm together

Arduino Code

Use your Arduino provided (or adapt your own from previous labs)! Update/upgrade as appropriate. It is up to YOU to make sure you know how the code works BEFORE you work with your mentee! This is a great opportunity to expand/enhance your ability to code too.

CAUTION: You are working with water, salt, and circuits. They do not mix well, in general. Done with caution and care, this is perfectly safe to do.

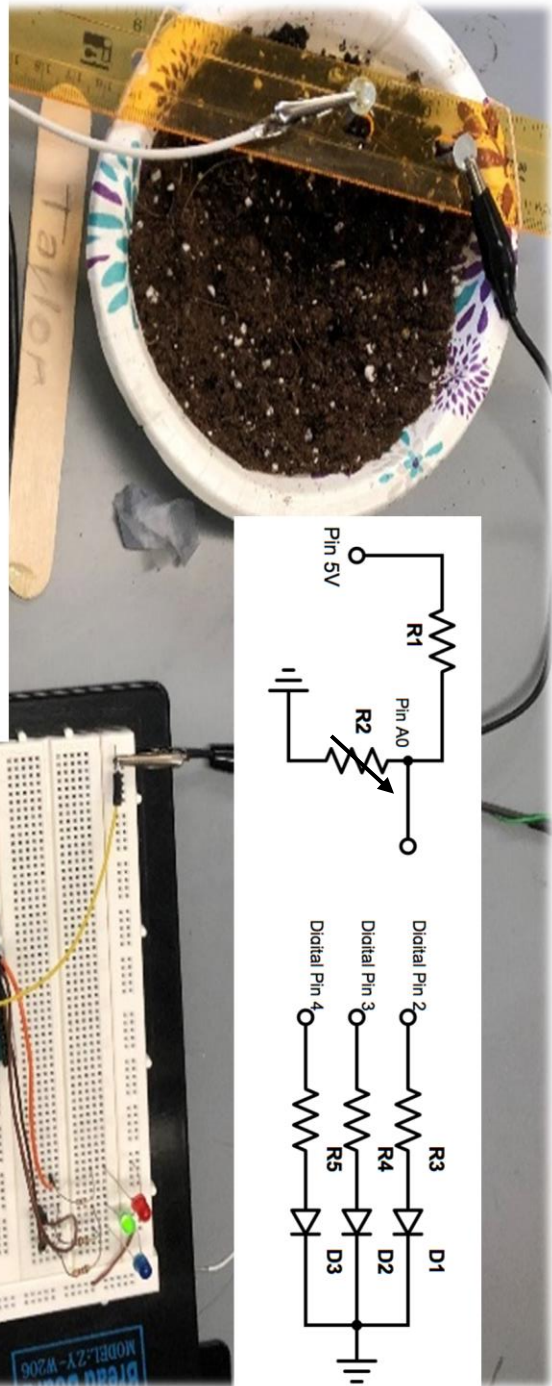
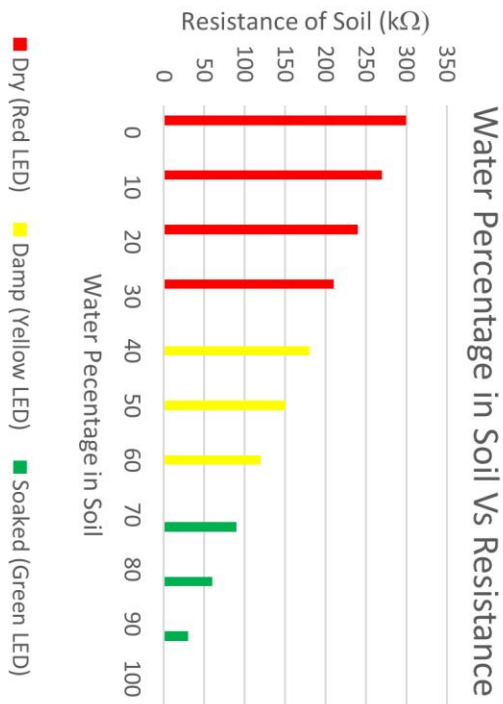


Figure 1. Soil moisture monitor with blue LED illuminated. Photo courtesy of Elen Stepanyan.

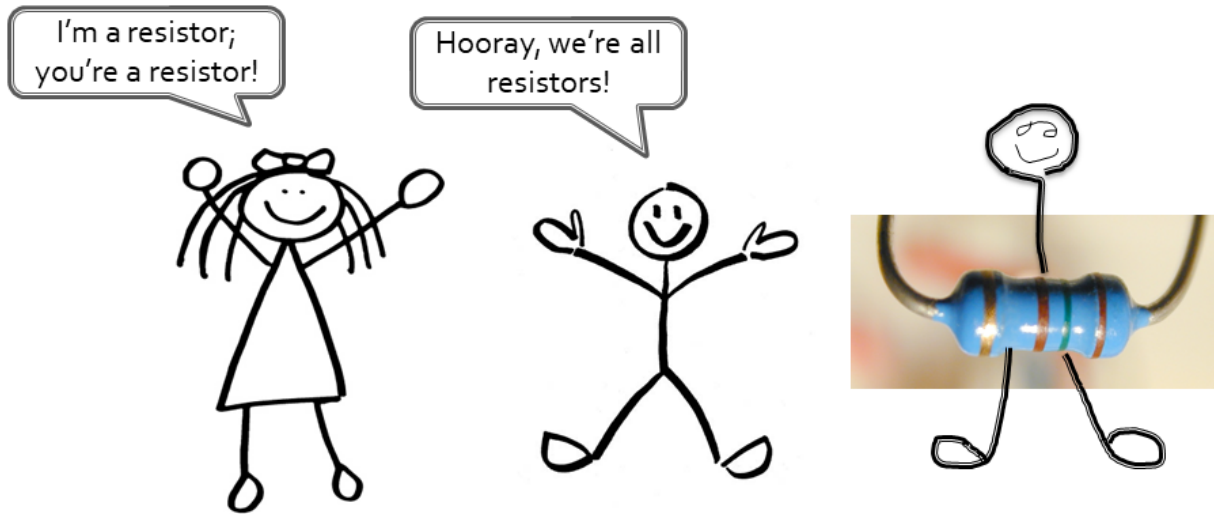


Figure 2. Body composition resistance. Our bodies act like resistors too! Measure your resistance before and after running around