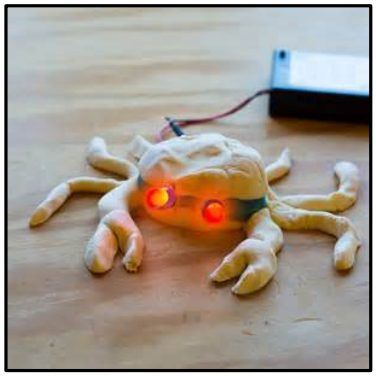
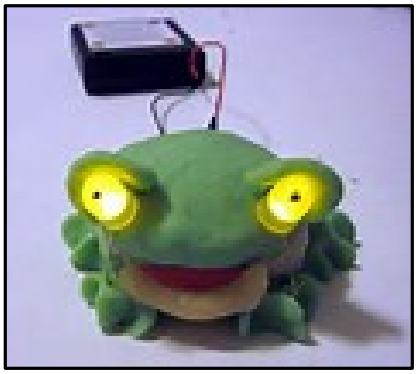
Squishy Circuits





Richland Energy Services provides students of all ages the opportunity to build electrical circuits and discover the meanings of conductivity, resistance, insulation, short circuits, and more using squishy circuits. Email us or call (509) 942-7431 to schedule a presentation.

Squishy circuits model Richland Energy Service's electrical distribution system.

Squishy circuits help students discover answers to questions such as:

- What is electricity?
- What is a closed circuit?
- What is a short circuit?
- What are insulators and conductors?

Squishy circuits help students identify closed circuits and demonstrate understanding using the activity page.

Recipes for conductive and insulating dough are simple and easy to make at home. Adult supervision is advisable.

Squishy circuits is a project designed at the University of St. Thomas for hands-on learning about electrical circuits. For more information on how to create your own squishy circuits and where to buy the electronic components, visit the Squishy Circuits webpage.

Squishy Circuits help demonstrate answers to these questions:

What is electricity?

Everything is made of atoms. Atoms have two basic parts, the positively charged nucleus and negatively charged electrons. Electrons orbit around the nucleus of each atom, and some types of atoms such as copper and aluminum like to share their electrons. The flow of electrons between atoms is called electricity.

What is a closed circuit?

Electricity travels in a closed path called a circuit. Think of it as a circle that begins and ends at the same point. Electricity flows from power lines to your home's electrical panel where fuses or circuit breakers can turn off the flow of electricity in case of an electrical problem. It continues through the wires of your home to the appliances and lights. To complete the return part of the circuit, electricity flows through a different set of wires in the same power cords and lights, through the electrical panel and back to the power lines. You open the circuit each time you switch off the lights.

What is a short circuit?

Electricity is basically lazy. It will always take the path of least resistance as it travels in a closed circuit. Imagine that you have been instructed to run laps as fast as you can around the outside of your house where your parents have set up a ladder for window washing. Is it faster and easier to stop and climb up and down the ladder or to run under it? Powering a light or running a motor takes extra effort for electricity, so if it can find a shorter, less resistive way it will always take the short circuit, leaving you in the dark.

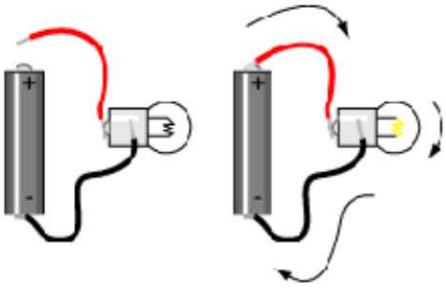
What are insulators and conductors?

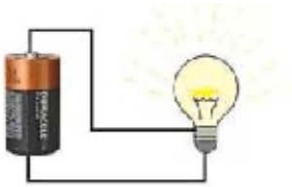
Atoms such as oxygen or molecules such as sugar don't like to share their electrons. These materials stop the flow of electricity. This is useful because you can create safety and buffer zones known as insulators around electricity so you won't get zapped. Think of the plastic coverings on appliance cords and plug-ins and picture how they protect your hands and furniture from electric shocks. You can force electricity to take the more difficult path through your squishy circuit LED lights and motors by using insulating sugar dough sandwiched between conductive salt dough layers. The electricity won't be able to travel through sugar so the next easiest path is through the lights and motors.

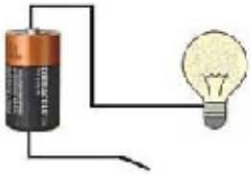
Test Your Knowledge of Circuits

Draw a circle around the <u>closed circuits</u>

Tell how you know







Make Your Own Squishy Circuits

Insulating "Sugar" Dough:

1-1/2 cup Flour, divided

½ cup Sugar

3 TBSP Vegetable Oil

½ cup Distilled Water (regular tap water weakens electric resistance)

Food Coloring (optional)

Procedure:

1. Mix solid ingredients and oil in a pot or large bowl, setting aside ½ cup flour for later.
2. Mix in a small amount of distilled water, about 1 TBSP at a time, and stir until majority of the water is absorbed by the mixture.
3. Knead the mixture into one "lump" adding more water until it has a sticky, dough-like texture.
4. Knead in the remaining flour until desired texture is reached.
5. Store in an airtight container or plastic bag. Dough will create condensation in the bag, which is normal. If stored properly, it will last several weeks.

Conductive "Salt" Dough:

1 cup Water (tap water is just fine)

1-1/2 cups Flour, divided (gluten-free flour can be substituted)

¼ cup Salt

3 TBSP Cream of Tartar (9 TBSP Lemon Juice can be substituted)

1 TBSP Vegetable Oil

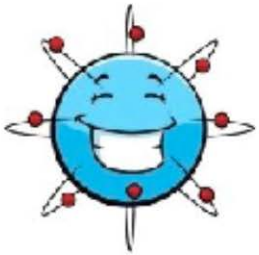
Food Coloring (optional)

Procedure:

1. Mix water, 1 cup flour, salt, cream of tartar, vegetable oil and food color in a pot.
2. Cook over medium heat and stir continuously. The mixture will begin to boil and start to get chunky. Keep stirring the mixture until it forms a ball in the center of the pot.
3. Place the ball on a lightly floured surface (CAUTION: it will be hot).
4. Slowly knead the remaining flour into the ball until you have the desired consistency.
5. Store in an airtight container or plastic bag. Expect some condensation while in the bag.
6. If stored properly, the dough will last several weeks.

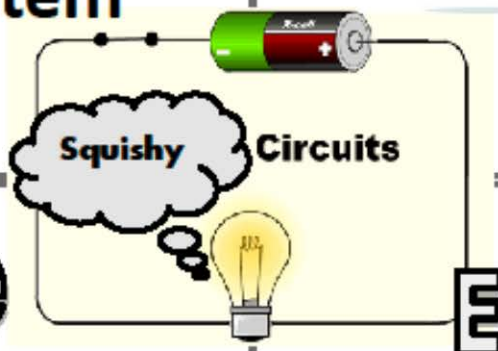
Squishy circuits are models of Richland's electrical distribution system

Power Generators



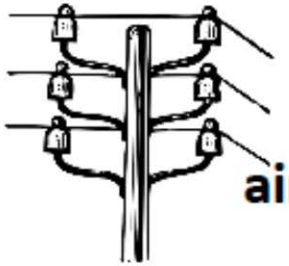
hydroelectric dams
nuclear plants
wind turbines
solar panels

Squishy circuits batteries



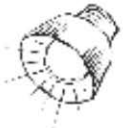
Electric Utility

insulators, power lines & poles



Squishy circuits air, dough & wires

Your House

Lights & appliances

Squishy circuits LED lights & motors