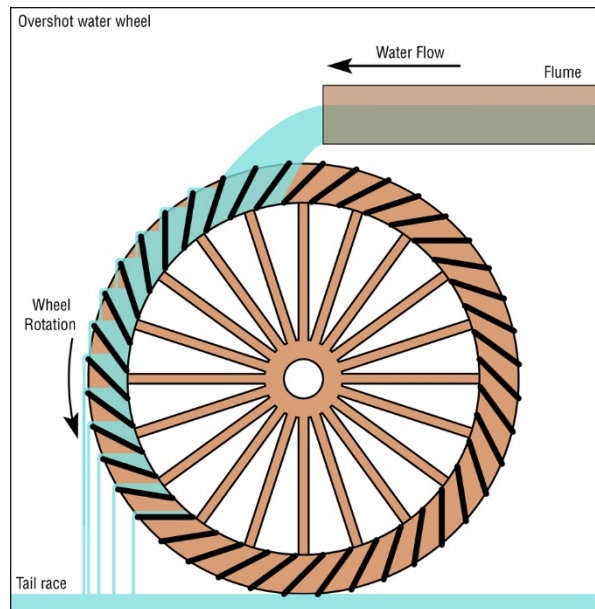# SCIENCE FUN #3:
LET'S MAKE A ROBOT USING AN ELECTRICAL MOTOR!!

We all use motors in our daily life. They are in our cars, trucks, even in our houses and in this classroom.?

But wait, what exactly is a motor? A motor is a device or machine that uses energy to move things. Motors can be very simple, like a water wheel. Here flowing water rotates a wheel that then is used to grind wheat to make flour (way back in the olden days!).

And of course, motors can be pretty complicated, like what you see in a car. Here we use gasoline to power the motor that then makes the car go.

The important thing is that for a motor to work, it needs energy. The energy can come from many things, like flowing water, gasoline, even electricity.
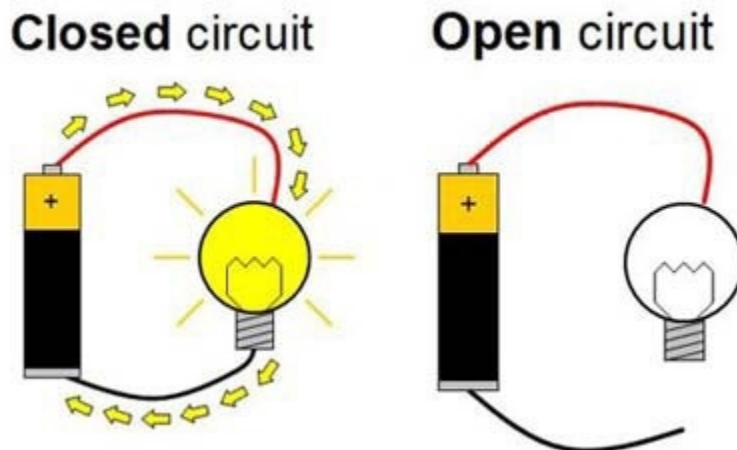

This week we will make a drawing robot using a motor and a battery (the batter provides energy as electricity).

SCIENCE FUN #3:
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BUT before we can make a robot, we need to first understand electricity. What is electricity?

In simple terms, electricity is the movement of electrons through some thing we call a "conductor". In some materials electrons move easily (like copper and aluminum) and in others they don't (like plastic or wood).

When electrons move, they carry energy and this can be used to power things (like light bulbs). BUT (and this is REALLY IMPORTANT) for electrons to flow, they have to move in a CLOSED circuit. That is, the electrons have to be able to go back to where they started. If they can't, it's called an OPEN circuit. If the circuit is CLOSED then the electrons can be used to power things like light bulbs. When the circuit is OPEN, then there is no movement of electrons and no light.

So what we want to do is create a CLOSED circuit where a battery serves to drive a motor that we will use to make a drawing robot!

So, here's what you need to make the robot drawing machine
- A plastic cup
- One AA battery and battery holder
- A small motor
- Tape
- 4 pens

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STEP 1. Tape the small motor on TOP of the plastic cup.

STEP 2: Tape the battery holder to the SIDE of the cup.

STEP 3: Take the ends of the wires from battery holder and put through the tiny holes of the motor like so. REMEMBER you need to make a CLOSED CIRCUIT so only put one wire in each hole! Twist the wires around the holes to make sure they don't fall out. Also place a small piece of tape over the connected wire to make it even more secure.

STEP 4: Tape the pens to the SIDES of the cup with the tips pointing DOWN:

STEP 5. Now, place the battery in the battery holder. **IF** you made a closed circuit, the motor will start working! Place the robot on a piece of paper and watch it draw!

Step 6. HAVE FUN! .

TROUBLESHOOTING:
If the motor is not working you probably have an OPEN circuit. Check all the connections and make sure none are loose.

Questions for you to answer:
1. Where did the energy come from to make this robot work?
2. Does the robot work when the battery is removed? Why or why not?