Simple Motor

TIME	TASK	DESCRIPTION	NEEDS
5 min	**Introduce The Day**	- We will introduce the day's activities.	- Have notes in your handout.
10 min	**Quick Read**	- Read about Circuts, Transitors and Power sources	- Have notes in your handout.
5 min	**Explanation**	- Students will write an explanation of what the Circuts, Transitors and Power sources are.	- Have notes in your handout.
10 min	**Review Color Function Guide**	a. Blue – Power Source b. Pink – Input c. Orange – Wire d. Green – Output Rules- Arrow go the same way so the	- Have notes in your handout.
20 MIN	**LABORATORY Part 1**	**Group 1:** Create a Fan with a button control to turn it off and on. Be prepared to explain it. How does it work? What are real world examples of this?	- Have notes in your handout.
		Group 2: Create a Dimmer switch to turn a light on an off slowly. How does it work? What are real world examples of this?	
		Group 3: Create a Pulse light How does it work? What are real world examples of this?	
15 min	**LABORATORY Part 2**	**Group 1:** Create a Throwing Arm control to turn it off and on. Be prepared to explain it. How does it work? What are real world examples of this?	- include the direcctions for the Throwing Arm in the handout. Have Cups
		Group 2: Art Robot turn a light on an off slowly. How does it work? What are real world examples of this?	- include the direcctions for the Art robot with a marker
		Group 3: Create a Throwing Arm How does it work? What are real world examples of this?	- include the direcctions for the Throwing Arm in the handout. Have Cups
5 min	**Prepare Explanation Video**	- Student will write an explanation of how they built their robots and will explain how it works using words like Circuts, Power Source, and Resistors	- Have notes in your handout.
5 Min	**Record Explanation Videos**	- Student will record their explanation videos	- Have notes in your handout.

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5 min	Clean up	- Students will put all pieces away	

QUICK READ

Flick a switch and get instant power—We loved to use electric motors even when we don't know we are using them! You can find them in everything from electric lights to to remote-controlled cars—and you might be surprised how common they are. How many electric motors are there in the room with you right now? There are probably two in your computer for starters, one spinning your hard drive around and another one powering the cooling fan.

Electricity, magnetism, and movement

The basic idea of an electric motor is really simple: you put electricity into it at one end and an axle (metal rod) rotates at the other end giving you the power to drive a machine of some kind. How does this work in practice? Exactly how do your convert electricity into movement? To find the answer to that, we have to go back in time almost 200 years. Suppose you take a length of ordinary wire, make it into a big loop, and lay it between the poles of a powerful, permanent horseshoe magnet. Now if you connect the two ends of the wire to a battery, the wire will jump up briefly. It's amazing when you see this for the first time. It's just like magic! But there's a perfectly *scientific* explanation. When an electric **current** starts to creep along a wire, it creates a magnetic field all around it. If you place the wire near a permanent magnet, this temporary magnetic field interacts with the permanent magnet's field. You'll know that two magnets placed near one another either attract or repel. If electricity can travel from the battery through the device we call it a **Circuit.** In the same way, the temporary magnetism around the wire pushes and pulls the motor allowing it to continue to spin.

How an electric motor works—in practice

There are two ways to overcome this problem. One is to use a kind of electric current that periodically reverses direction, which is known as an **alternating current (AC)**. In the kind of small, battery-powered motors we use around the home, a better solution is to add a component called a **commutator** to the ends of the coil. It simply means to change back and forth in the same way that commute means to travel back and forth.) In its simplest form, the commutator is a metal ring divided into two separate halves and its job is to reverse the electric current in the coil each time the coil rotates through half a turn. One end of the coil is attached to each half of the commutator. The electric current from the battery connects to the motor's electric **terminals**. These

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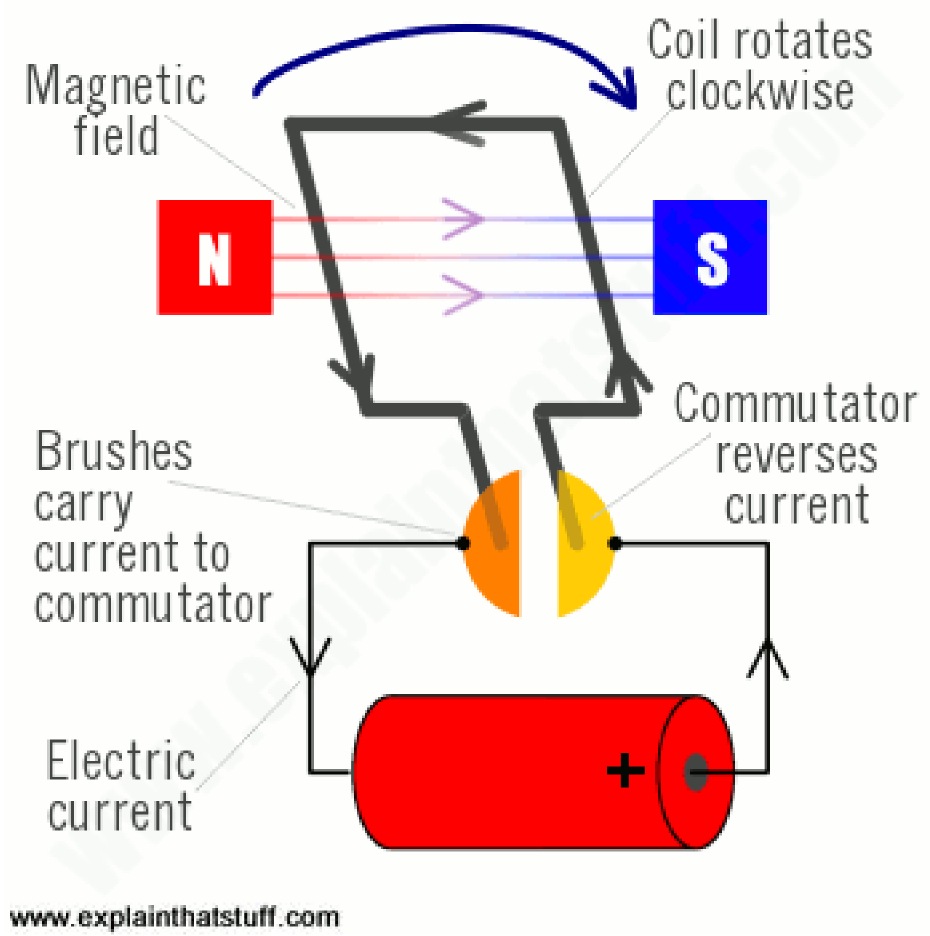
feed electric power into the commutator through a pair of loose connectors called **brushes**, made either from pieces of graphite (soft carbon similar to pencil "lead") or thin lengths of springy metal, which (as the name suggests) "brush" against the commutator. With the commutator in place, when electricity flows through the circuit, the coil will rotate continually in the same direction.



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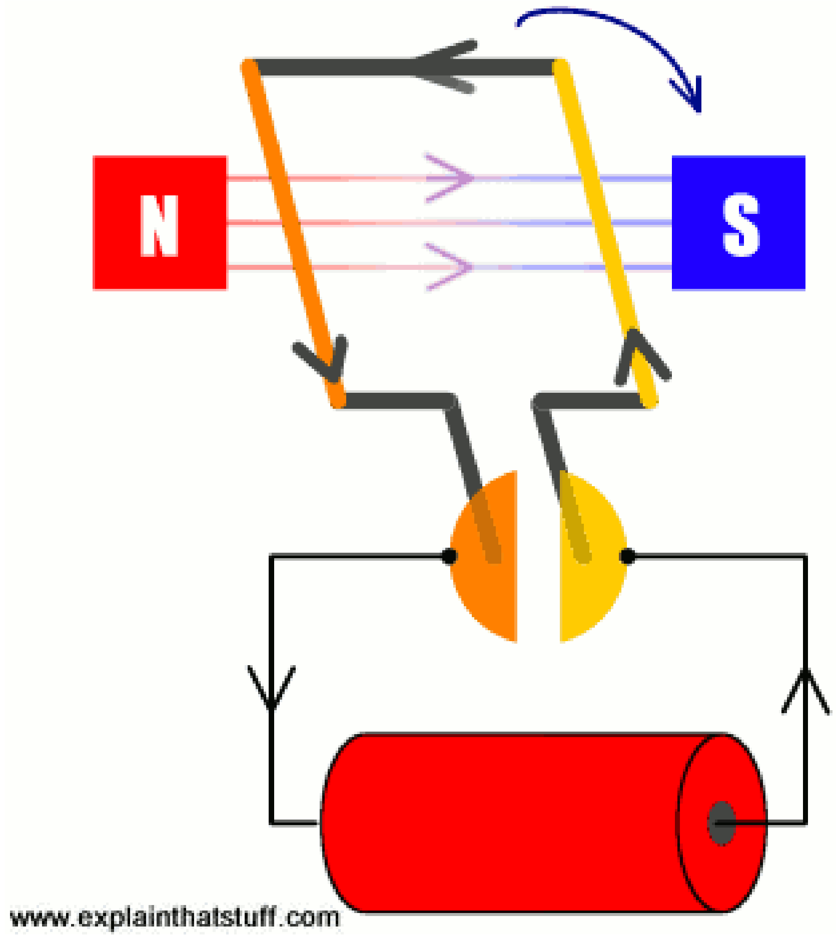

A simple, experimental motor such as this isn't capable of making much power. We can increase the turning force (or **torque**) that the motor can create in three ways: either we can have a more powerful permanent magnet, or we can increase the electric current flowing through the wire, or we can make the coil so it has many "turns" (loops) of very thin wire instead of one "turn" of thick wire. In practice, a motor also has the permanent magnet curved in a circular shape so it almost touches the coil of wire that rotates inside it. The closer together the magnet and the coil, the greater the force the motor can produce

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EXPLANATION

Directions: Use the space below to explain the follow:

(1) How does a motor work?

(2) What does the Comunicator 4\do?

(3) What is a circuit?

(4) How do magnets matter in the process?

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