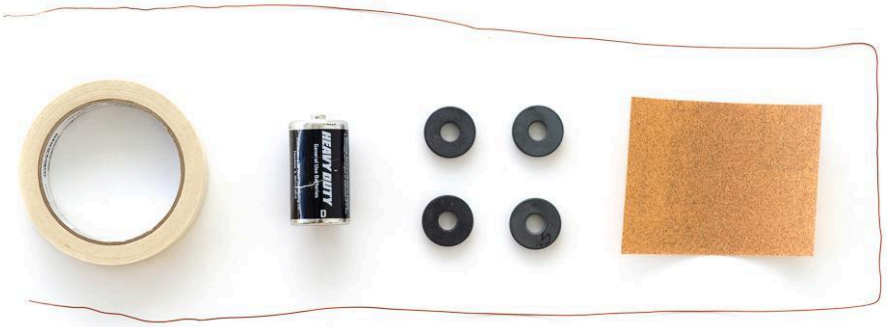
Investigating Motor Force Lab

To be completed in your notebooks

Tools and Materials

- Two to four small disk magnets with the North pole labeled
- One or two 1.5-volt flashlight batteries
- Two to three feet (60 cm to 1 meter) of flexible wire, such as solid or magnet wire
- Masking tape
- Sandpaper



Assembly

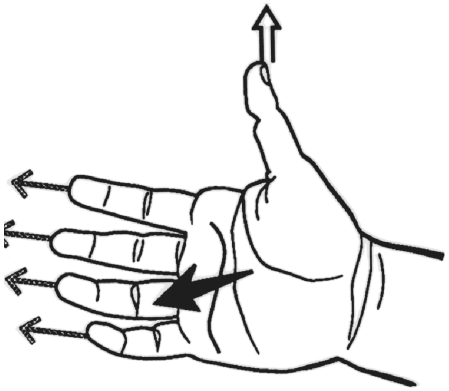
1. Remove the nearly invisible insulating enamel from magnet wire from the ends of the wire using sandpaper.
2. Tape a battery (or two) near the edge of the table. If you are using two batteries, tape them so that they are in a series, with the positive terminal of one battery touching the negative terminal of the other battery.
3. Notice the shape of the magnet wire above. Near each battery's terminal, tape the ends of the wire to the table. Allow the remainder of the wire to dangle over the table edge in a loop.
4. Group the disk magnets into a single cylindrical pile.

To Do and Notice

1. Over the side of the table, have one person hold the grouped magnets next to the bottom of the loop of wire.
2. On top of the table, have the other person touch one end of the wire to the positive side of the battery (or batteries) and simultaneously touch the other end of the wire to the negative side. The wire loop will jump one direction or another.
3. **Do not leave the wires attached to the battery for more than a few seconds.** Leaving the wires attached, and letting current flow, will drain the battery quickly. It will also cause the wire to get very hot very quickly.
4. If you reverse the direction of the current's flow, the wire will jump in the opposite direction. To reverse the current, attach the lead that was connected to the positive end of the battery to the negative end and vice versa.
5. See what else happens if you flip the orientation of the magnets or hold them somewhere else near the wire.

Continue to the other side

6. To predict the direction of movement, you can use a mathematical tool called the *right-hand rule*. Put your right hand near the section of wire that goes between the disk magnets. Make your hand flat, with your thumb sticking out to the side—your thumb should be at a right angle to your fingers. Place your hand so that your thumb points along the wire in the direction that the current is flowing (current flows from the positive terminal of the battery to the negative terminal) and so that your fingers point from the north pole of the disk magnets toward their south pole. Your palm will then naturally "push" in the direction of the magnetic force on the wire.
7. When done with your experiment return all of your equipment to the basket as it was given to you.



Questions:

1. In order to be moved by the magnet what must be around the current carrying wire? Explain your answer.
2. Make a sketch of your experimental set-up and draw the current going clockwise through the loop. Using the *right-hand rule* described above to determine the direction that the loop would move if the north pole were closest to the loop and label that direction.
3. What could you change about the physical parts of your experiment (wire loop, battery or magnet) to increase the motion you produced?