When you think about electricity, you might think about plugging a hairdryer into a wall socket or running a CD player on batteries. However, you have experienced electricity in other ways. When your socks stick to each other in a clothes dryer, or when you rub a balloon on a wool sweater and then stick it to a wall, you are also experiencing a form of electricity (Figure 1).

To understand what electricity is, you have to look at atoms. Atoms are the tiny building blocks that make up everything around you—from the air you breathe to the clothes you wear. Everything is made of atoms. Each atom contains small particles that have an electric charge. Some particles have a charge (\( \text{negative} \)). These particles are called electrons [ih-LEHK-trons]. Other particles have a positive charge (+). They are called protons. Since everything is made of atoms, everything contains charged particles.

Positive and negative charges pull, or attract each other. Most objects—including you, the chair you sit on, and this book—have an equal number of positive charges and negative charges. When the electric charges in an object are equal, or balanced, the object is neutral [NOO-truh]. There are not any extra charges to attract something else. This is why a book does not stick to your hand and you do not stick to your chair.

So, why did the balloon that you rubbed with the wool cloth or your hair stick to the wall? What happens to make an object attract another object? The answer has to do with changing the electric charges in an object.

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**TRY THIS: OBSERVE ELECTRICITY**

**Skills Focus:** observing, communicating

Inflate a balloon, and put it against a wall. Watch what happens when you let the balloon go. Rub the same balloon with a wool cloth or your hair for a few seconds. Then put it against the wall. Observe what happens.

1. What happened to the balloon the first time?
2. What happened to the balloon the second time? How long did the balloon stay on the wall?
3. How can you explain what you observed?

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Figure 1
Thales, an Ancient Greek philosopher, noticed that when he rubbed amber (a yellow resin) with fur, it attracted feathers, threads, and leaves. The word “electricity” comes from the Greek word “elektron,” which means “amber.”
When you rub a wool cloth and a balloon together, both objects become charged. This does not mean that the rubbing creates the electric charges. The rubbing just moves the charges from their normal places. The rubbing knocks some electrons off the wool cloth, causing the cloth to change from being neutral to being positively charged. The balloon picks up the electrons and changes from being neutral to being negatively charged. Figure 3 shows a positively charged ball and a negatively charged balloon.

How Do Electric Charges Work?

We can change the balance of electric charges in an object so that the charges are unequal, or unbalanced. When this happens, we say that the object is charged with electricity.

For example, when you hold a balloon against a wall, it does not stick. It has the same number of positive and negative charges, so the balloon is neutral, or uncharged (Figure 2). Since the balloon is not attracted to the wall, it falls to the floor.

Figure 2
A neutral object, such as this balloon, has an equal number of positive charges (+ signs) and negative charges (− signs).

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Figure 3
A positively charged ball has more positive charges than negative charges. A negatively charged balloon has more negative charges than positive charges.
The Laws of Electric Charges

TRY THIS: MAKE ELECTRIC CHARGES MOVE

Skills Focus: conducting, inferring, communicating

Inflate two round balloons. Tie each balloon with a string. Hang the two balloons close together from a metre stick or pole as shown in Figure 4. Rub one of the balloons with a wool cloth. Observe what happens. Then rub both of the balloons with the wool cloth. Observe what happens.

1. What happened when you rubbed one balloon? Why do you think this happened?

2. What happened when you rubbed both balloons? Why do you think this happened?

Figure 4

A positively charged wool cloth is attracted to a negatively charged balloon. Charged objects behave in certain ways according to the laws of electric charges. One of these laws states that objects with unlike charges attract one another (Figure 5). This means that if one object is negatively charged and another object is positively charged, they will move toward each other.

Figure 5
A negatively charged object attracts a positively charged object.

LEARNING TIP
Counting the + signs and the − signs on the objects shown in the figures will help you see whether the object is positively charged, negatively charged, or neutral.
LEARNING TIP

The laws of electric charges are usually stated this way: Unlike charges attract, like charges repel.

Have you ever noticed that after you rub your hair with a balloon, the balloon can pick up small pieces of paper? Try it and see! A charged object—either positively charged or negatively charged—attracts a neutral object (Figure 6).

Another law of electric charges states that objects with like charges repel each other. This means that two positively charged objects, or two negatively charged objects, will push away from each other (Figure 7). Can you use the laws of electric charges to explain what happened to the two balloons in the Try This activity?

CHECK YOUR UNDERSTANDING

1. Use words and pictures to name and describe the two types of electric charges.
2. Read each description. Is the underlined object charged or neutral? Explain how you know.
   - Your sock is sticking to your shirt.
   - Two books are stacked on your desk.
   - You shuffle your feet across a carpet and get a zap when you touch a metal doorknob.
   - You are brushing your hair and notice that it begins to stand on end.
3. Use each pair of terms in a sentence.
   - attract, unlike charges
   - repel, like charges