Magnetism

A Reading A–Z Level P Leveled Book
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Magnetism

Written by Elizabeth Austin
Illustrated by John Kastner

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Introduction

Look around your home and try to find a magnet. A magnet is a metal object that sticks to other metals. You might have some magnets among your toys. There are probably magnets on your refrigerator. But did you know that there may be hundreds of magnets in your home? You cannot see most of them. But they are inside your television, telephone, and stereo. They are inside electric motors that power your blender and hair dryer. Computers are full of magnets. And all the electricity that runs these things comes from **magnetism**.

Magnetism and Magnets

Magnetism is an invisible **force**. A force is anything that pushes, pulls, or moves an object. Magnetism is a special force that only pulls on some metals, such as iron. A magnet will not push or pull plastic or tin.

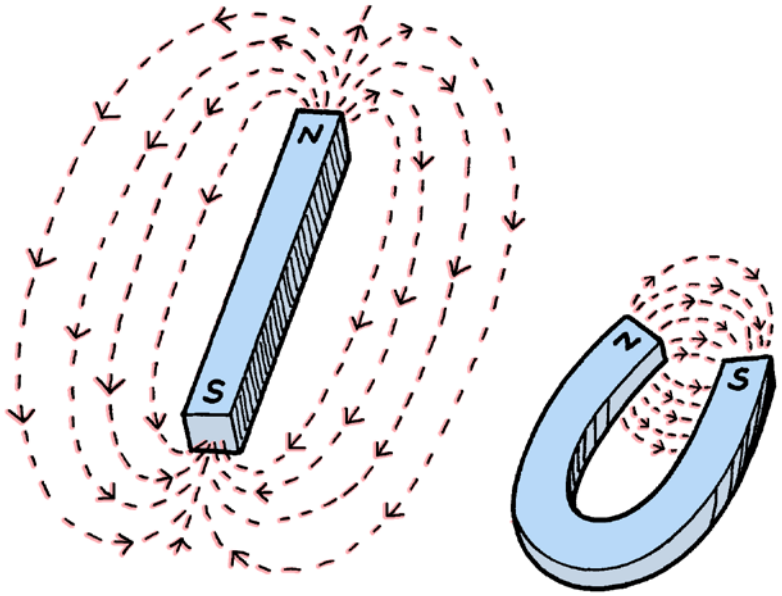
Magnetism flows in one direction through a magnet, no matter what shape the magnet is. It flows in one end and out the other. The ends of a magnet are called **magnetic poles**. Every magnet has a north and a south pole. The force flows out the north pole and back in the south pole.

You can use two magnets to feel magnetism flowing. The north pole of one magnet will stick to the south pole of the other. Now, try to push the two north poles together. It feels almost like trying to connect two hoses that are both spraying water. The magnetic force pushes the north poles apart, because the magnetic forces are flowing against each other. Two north poles will always **repel** each other. So will two south poles.

The Earth's iron core is **magnetic**. The whole planet acts like a giant magnet. If you dangle a magnet by a string, one pole will point north and the other will point south. This is exactly how a compass works. This gave the north and south poles of a magnet their names.

Do You Know?

Earth's north and south magnetic poles are not quite at the true North and South Poles. The north magnetic pole is in northern Canada. The south magnetic pole is in the Pacific Ocean south of Australia. Since Earth's core moves around, the magnetic poles move, too. They can even flip completely around. If this happened today, your compass needle would point south!

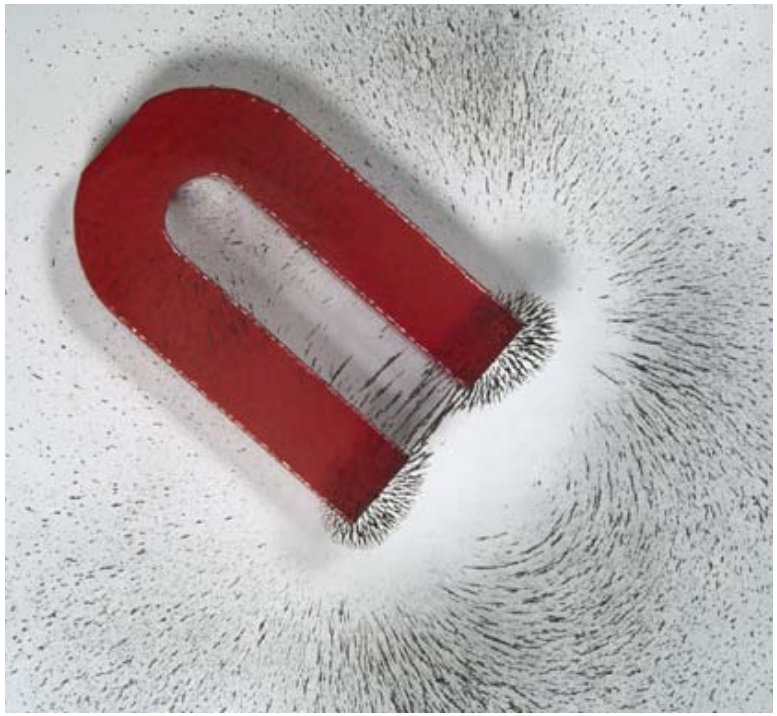


Magnetic Field

The magnetic force flows out the north pole of the magnet. Then, it loops around outside the magnet and flows back in the south pole. Magnetism flows through space in **lines of force**. The invisible shape formed by the lines of force around the magnet is called the **magnetic field**.

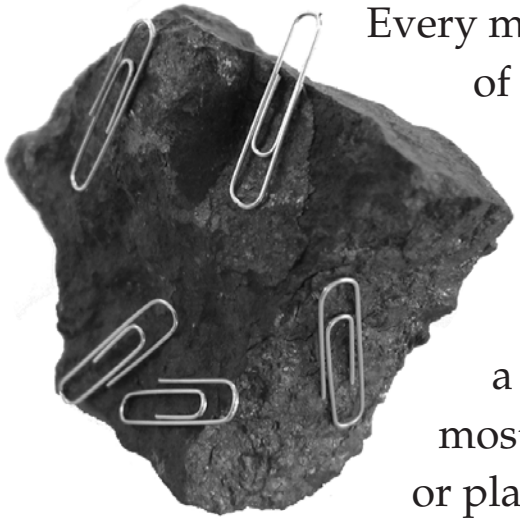
Any iron or other magnets inside a magnetic field will be pulled toward the magnet. Stronger magnets have more lines of force and larger magnetic fields.

To see a magnetic field, place a magnet on a piece of paper. Sprinkle iron filings around the magnet. The filings will gather along the lines of force in the shape of the magnetic field.



How Are Magnets Made?

The first magnets were made of a natural rock called **lodestone**. People used pieces of lodestone in compasses. But they did not know how they worked.



Every material is made of extremely tiny pieces called **atoms**. Most atoms spin. This spinning creates a tiny, tiny force. In most things, like rocks or plastic, the atoms spin every which way. The tiny forces never add up. But when something becomes magnetized, the atoms spin in the same direction. All the tiny forces add up to create a magnetic force. Eventually, people learned how to line up the atoms in some metals to create new magnets.

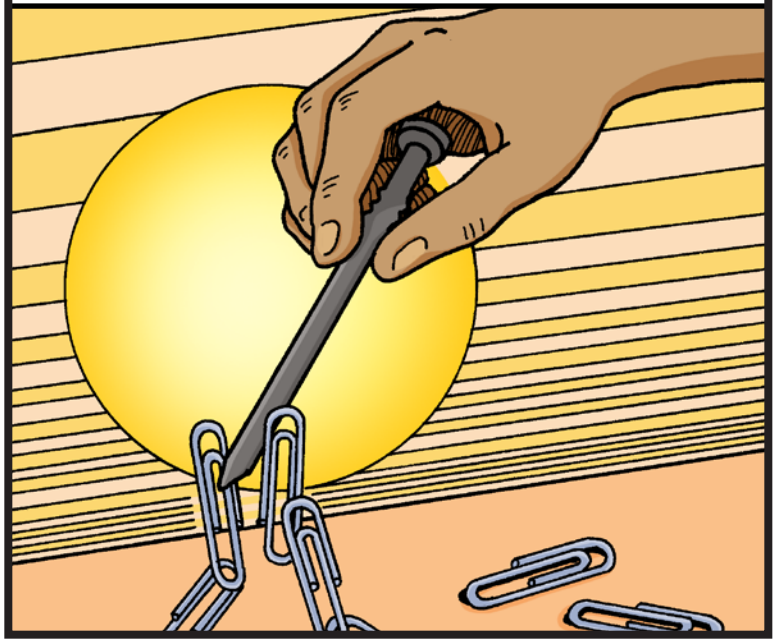
Some things, such as iron, become magnetized more easily than others. A piece of ordinary iron is placed inside a strong magnetic field. The magnetic force makes the iron atoms line up and spin in the same direction. This makes a new magnet. The more atoms that spin in the same direction, the stronger the magnet becomes. Sometimes if you drop a magnet, some of the atoms get knocked out of line, and the magnet gets weaker.

Try This

Make your own magnet!

You will need a large iron nail, a strong magnet, and several paper clips.

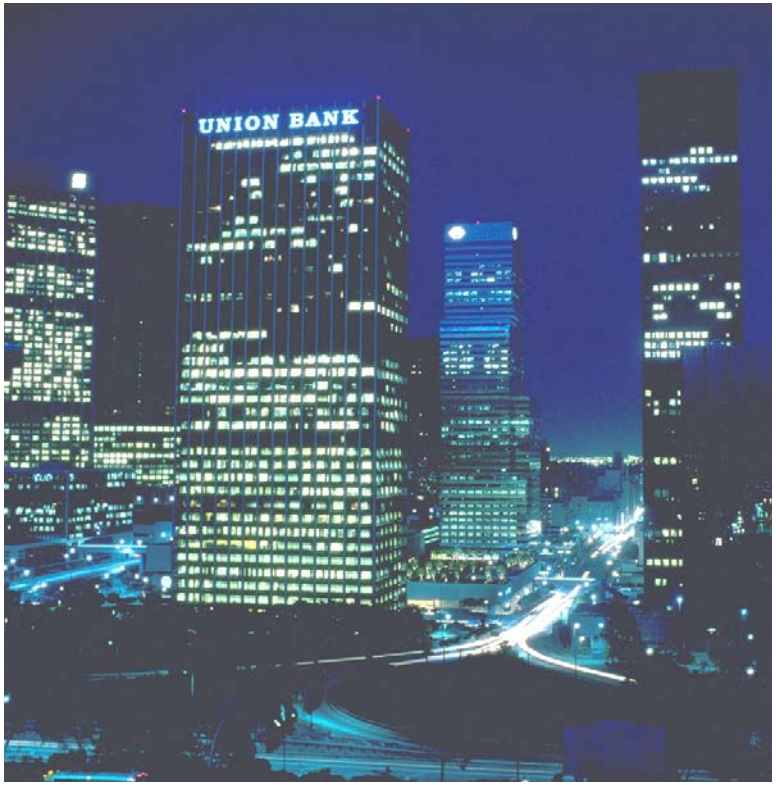
1. Hold the nail by one end and slide it across the magnet in one direction. Keep sliding it over and over. The magnet's lines of force will start to line up the atoms in the nail.
2. After 20 to 30 times, touch the nail to the paper clips. Does the nail pick up the clips? How many can it pick up at once? Keep stroking the nail along the magnet to make the nail's magnetic force stronger. See if you can pick up all the paper clips at once.



Generator

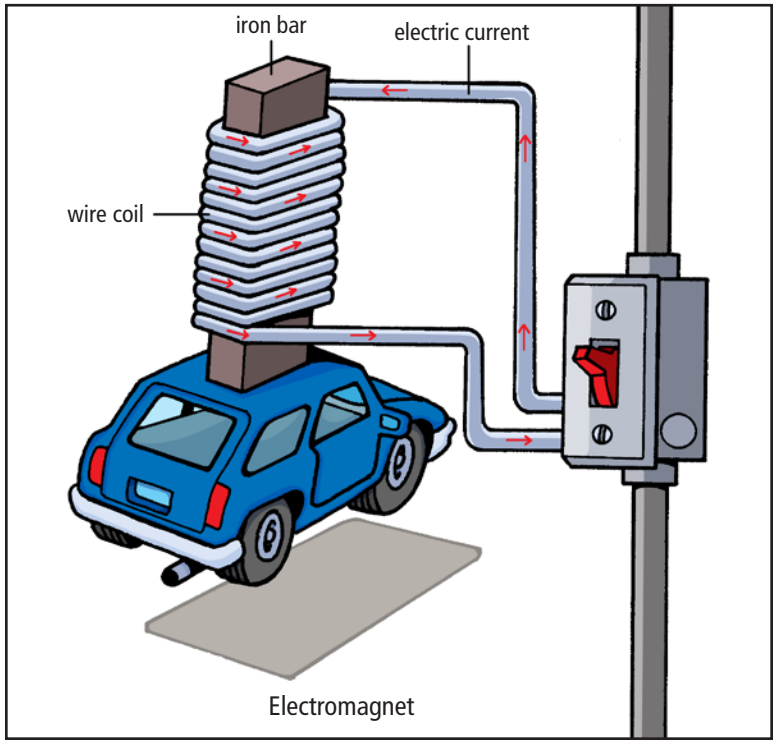
Magnetism and Electricity

Magnetism and electricity are very closely related. Magnets can make electricity. And electricity creates magnetic fields. This is because both magnetism and electricity affect the way atoms spin.



All the electricity you use comes from machines called **generators**. Generators make electricity by spinning magnets around coils of wire. The magnetism creates an electric current in the wire. The difficult part is getting the magnets spinning. Power plants use running water, wind, or steam from burning fuel to turn the magnets.

Electricity can create special magnets called **electromagnets**. A wire is wrapped around a regular piece of iron. Then an electric current from a battery or outlet flows through the wire. The electric current makes a magnetic field. This magnetizes the iron. But the iron only stays magnetized as long as the electricity is on.

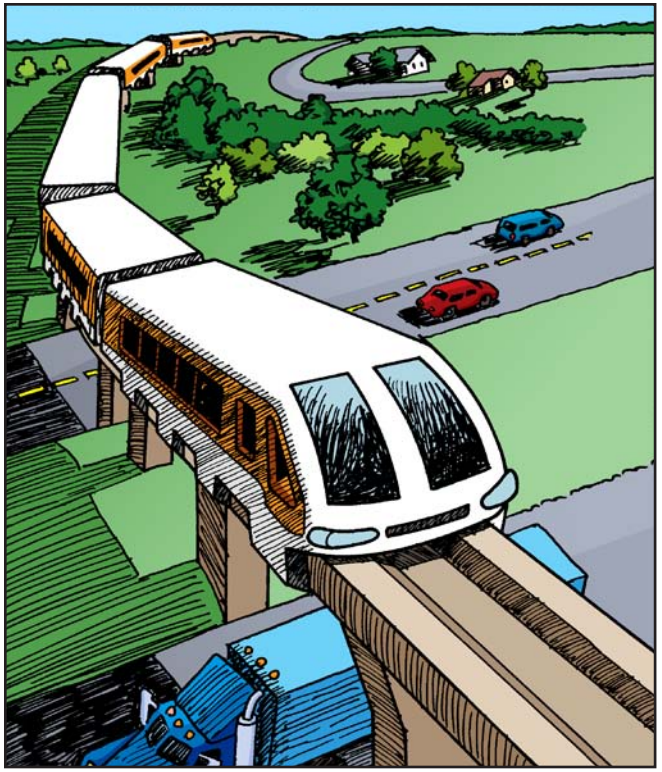


Using Magnetism

The earliest use of magnetism was the compass. A small, freely moving magnetic needle pointed to Earth's magnetic north pole. This helped guide travelers and explorers. Modern travelers still use compasses.

Electricity comes from spinning magnets inside generators. And electric **motors** work like generators in reverse. They use electric current to spin magnets. The magnets are attached to fans, cutting blades, or wheels. This is how fans, blenders, and remote-control cars work.

Magnets can also **encode** information, or store it in a special code. Cassette tapes, videotapes, computer disks, and credit cards all use strips of tiny magnets. The magnets are the size of grains of powder. There can be millions of magnets on one tape, disk, or credit card. Each tiny magnet points in its own direction. The different positions of the magnets create a code. Tape players, VCRs, and computers sense the tiny magnetic fields and read the code. Putting a credit card, tape, or disk near a powerful magnet can mess up or erase the code.



Some high-speed trains run on electromagnets. The trains have powerful electromagnets on the bottom. The track also has powerful electromagnets. The two electromagnets face each other so that they repel each other. The magnetic force is so strong that it lifts the train off the track. The train floats above the track. It actually flies as it travels. This makes a fast, smooth ride.

Special machines called *MRIs* can look inside a person's body. The person lies inside a tube cut right down the center of a very powerful magnet. The lines of force flow through the person's body. The magnetism is so strong that it causes the atoms in the body to spin in the same direction. Special sensitive instruments can tell how fast the atoms spin. Computers figure out what kind of atoms they are based on how they spin. This gives doctors an idea of what is going on inside a person's body.

Doctors can find atoms that are not supposed to be there. They can see cancer and other diseases. MRIs give doctors a look inside the body without having to cut the body open.

Conclusion

While magnets may seem simple, there is no end to their uses. Every time you watch a tape, turn on the air conditioner, or even turn on a light, you are using magnets. Someday you may ride on a high-speed train or use an MRI. Playing with magnets can be lots of fun. The magnetism you play with is the same force that has made modern life possible.

Glossary

atoms the smallest parts of an element(p. 10)

electro-magnets temporary magnets made by passing an electric current through a wire wrapped around a piece of iron (p. 15)

encode to put information in a special code (p. 17)

force the strength or energy that moves objects (p. 5)

generators machines that create electricity in coils of wire using spinning magnets (p. 14)

lines of force invisible lines of magnetic force that flow through and around a magnet (p. 8)

lodestone naturally magnetic rock (p. 10)

magnetic able to attract certain metals, such as iron (p. 7)

magnetic field invisible shape of the lines of force around a magnet (p. 8)

magnetic poles the ends of a magnet where the magnetic force flows in and out (p. 5)

magnetism a force that pushes and pulls certain metals (p. 4)

motors machines that turn electricity into motion using coils of wire to spin magnets (p. 16)

repel force away (p. 6)