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Title: Electricity and Magnetism.

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Authors: Georges, Jason; Irons-Georges, Tracy

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Abstract: Electricity and magnetism are everywhere and have many uses. Electricity that does not flow is called static while that which flows is called an electric current. Magnetism is an invisible force that brings some materials together or pushes them away. It is usually found in materials containing iron. Magnets are mostly made out of iron and have two ends called poles. They can attract pieces of iron that are not magnetic. (Copyright applies to all Abstracts)

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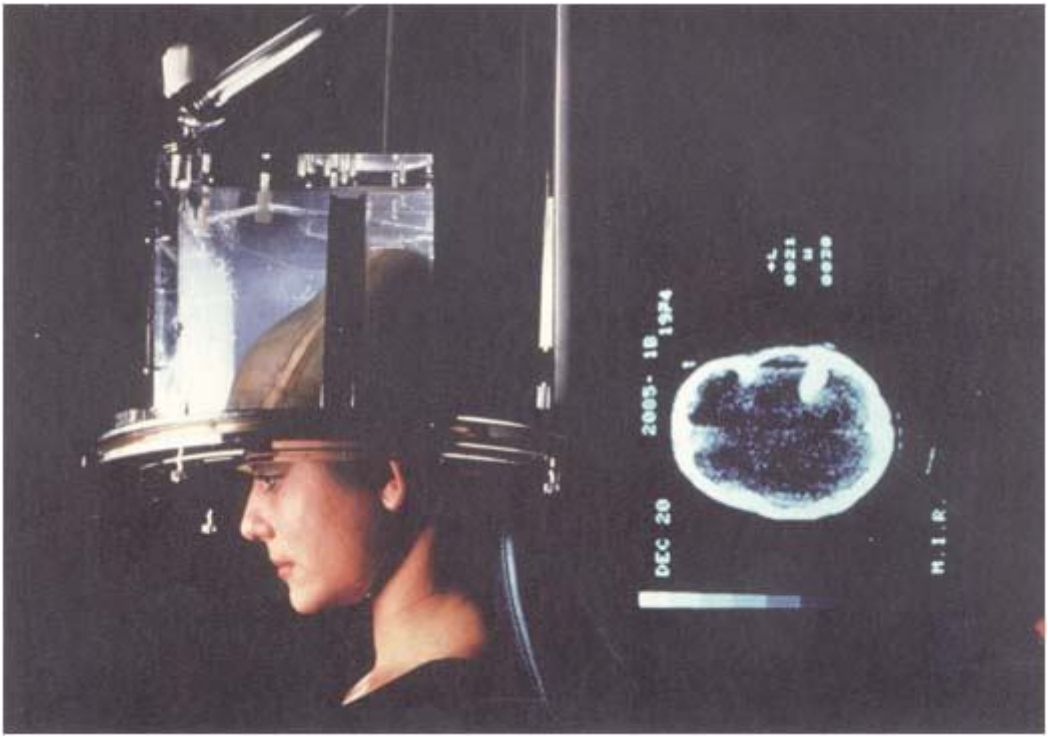
Electricity and Magnetism

Electricity and magnetism are everywhere today. They make it possible for radios, televisions, computers, and many other electronic devices to exist. Medicine uses electricity and magnetism to help treat illnesses in humans and animals. Electric motors use magnetism to convert electricity into motion. Generators use magnetism to create electricity. Electric forces exist in nature too. They form the bonds between atoms and molecules. They determine phases of matter. Electric forces let solids be solids and liquids be liquids.



Electricity flows between neurons in the brain.

Electric Charges

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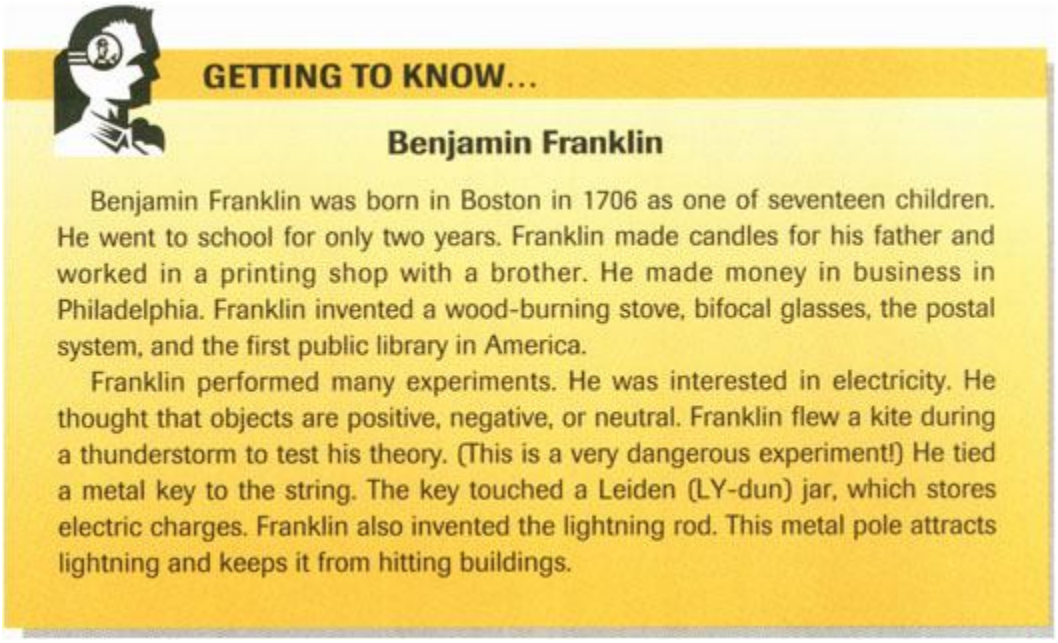
Electric ChargesThe electromagnetic force between particles is one of the basic forces of nature. An electric charge occurs when an atom has too many or not enough electrons. Materials can become electrically charged, or electrified (ih-LECK-truh-fide), in many different ways. Electricity that does not flow is called static (STAH-tick) electricity.

Friction between different materials can build up static electricity. Running a comb through hair will charge the comb with static electricity. Then the comb can pick up little pieces of paper. An inflated balloon rubbed on wool will stick to the wall or ceiling of a room. You can electrify your body with static electricity by rubbing your shoes on a wool

rug. The static charge is removed, or discharged, when you sneak up on your friends and zap them. Under the right conditions, you can even see a spark!

There are two different kinds of charged particles, positive (PAH-zuh-tiv) and negative (NEH-guh-tiv). A negative charge comes from electrons. A material that has extra electrons is negatively charged. A positive charge comes from protons. A material that loses electrons is positively charged. There are more protons in the material than there are electrons. A neutral atom has the same number of protons and electrons.

Rubbing a balloon on hair will make the hair stand up. The balloon has picked up a negative electric charge from the hair. The hair will have a positive electric charge. Hair is attracted to the balloon because charges that are opposite attract each other. Two negatively charged balloons will move away from each other. Charges that are the same push away, or repel, one another.



GETTING TO KNOW...

Benjamin Franklin

Benjamin Franklin was born in Boston in 1706 as one of seventeen children. He went to school for only two years. Franklin made candles for his father and worked in a printing shop with a brother. He made money in business in Philadelphia. Franklin invented a wood-burning stove, bifocal glasses, the postal system, and the first public library in America.

Franklin performed many experiments. He was interested in electricity. He thought that objects are positive, negative, or neutral. Franklin flew a kite during a thunderstorm to test his theory. (This is a very dangerous experiment!) He tied a metal key to the string. The key touched a Leiden (LY-dun) jar, which stores electric charges. Franklin also invented the lightning rod. This metal pole attracts lightning and keeps it from hitting buildings.

GETTING TO KNOW

Electric charge is conserved. This means that an electric charge cannot be created or destroyed. An object becomes electrified because the electric charge is transferred from one object to another. One object gains some negative charge. The other object gains the same amount of positive charge.

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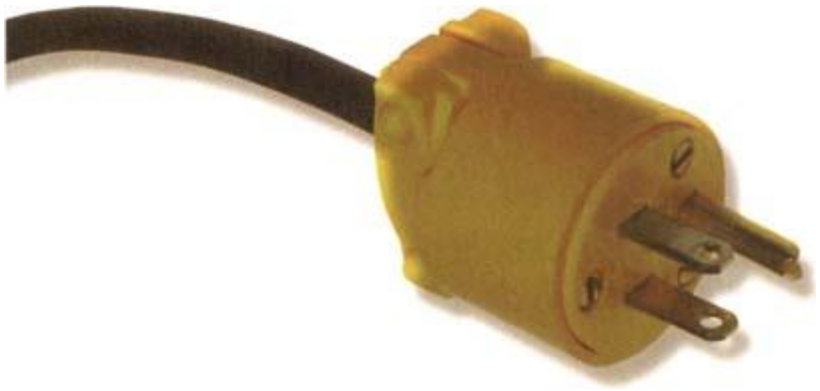
CurrentElectricity that flows, or moves, is called an electric current. An electric current is usually made of a stream of electrons moving from one place to another. A circuit (SUR-kut) is the complete path of an electric current. Metal wires are often used to conduct, or pass on, electric current. Electrons flow easily through metals. Copper is a metal that can be stretched into wires. It is a good conductor of electricity because electrons flow easily through it. Copper wires are used to conduct electricity in houses and other buildings.
The amount of electric current flowing through a material is measured in units called amperes (AM-purz), or amps. Wires can handle only a certain amount of electricity.



Current

The thicker the wire, the more electricity can flow through it. A wire will heat up if too much electricity flows through it. Sometimes, wires get so hot that they melt the insulation protecting them. This can start a fire. A fuse is used to limit the amount of current flowing through wires. The fuse stops the flow of electricity if the number of amps, or amount of current, gets too high. The fuse breaks in order to protect wires that cannot handle higher currents.

Many different things provide current. Batteries store chemical energy. Electric generators convert mechanical energy into electricity. Solar panels convert solar energy into electricity. Even the forces inside of an atom can be used to produce energy.

FIND OUT MORE ABOUT...

Batteries

Batteries are used to store energy in the form of chemical energy. The chemical energy is stored in a **battery cell.** Each battery cell has two ends, the positive end and the negative end. The chemicals inside a battery are called **electrolytes** (ih-LECK-truh-lites). A chemical reaction inside the battery makes electrons flow from the positive end to the negative end. Different chemicals can provide different amounts of electricity.

Electrical force is often measured in **volts** (V). A volt is the force that makes electrons flow around a circuit. Flashlights and radios often use 1.5 volt batteries. Batteries can produce more voltage (VOLE-tij) if they touch each other end to end. Many flashlights use two or more batteries. Some batteries can be recharged, or charged again, when they run out of power.

Batteries are used as power for many different electronic devices. All kinds of toys use batteries. Electric clocks may have batteries. Tiny batteries are used in watches. Portable computers often use rechargeable batteries. Cars have big rechargeable batteries to start their engines. Some cars even run completely on batteries. They are called electric cars.

FIND OUT MORE ABOUT

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MagnetismMagnetism (MAG-nuh-tih-zum) is an invisible force that brings some materials together or pushes them away. It is usually found in materials

containing iron. A magnet is usually made out of iron. Magnets can attract or repel other magnets. They can also attract pieces of iron that are not magnetic (magNEH-tick). These pieces of iron will become magnetized (MAG-nuh-tized), or made into magnets.

Every magnet has two ends called poles. These poles are called north and south. Poles behave like electrical charges in many ways. North poles are attracted to south poles. South poles are attracted to north poles. Different poles attract each other. The same poles repel each other Magnetic poles are also different than electrical charges.Magnetic poles cannot be separated from each other. It does not matter how many pieces you cut a magnet into. Each piece will always have a north pole and a south pole.

Magnetism

All magnets produce a magnetic field. This is the area around the magnet where the magnetic force can be felt. Magnetic fields travel from the north pole to south pole in magnets.

Magnets can be created with electricity. Every electric current can make a magnetic field. Current flowing through a wire creates a magnetic field around the wire. This can be seen with a compass. A compass needle will change the direction it is pointing if it is moved close to an electric wire. Wire wrapped around a piece of iron can make a powerful magnet called an electromagnet. Magnets can also be used to produce electricity. A magnet that is moved close to a wire can create an electric current in the wire.

Compass

Magnets are used everywhere. Electromagnets can pick up heavy objects. They are also used in speakers to make sound. Magnets and electromagnets help electric motors spin. Generators use magnets to make electricity. Magnetic disks are used to store information for computers. Videotapes and audiotapes record pictures and sound with electromagnets. Scientists use magnetic fields to study and control subatomic particles.

Earth itself is a giant magnet. Like any magnet, the Earth has a magnetic field. The direction of Earth's magnetic field can be seen with a compass. The compass needle always points toward the north magnetic pole. Earth's magnetic field protects the planet from charged particles thrown out by the Sun. These charged particles are called the solar wind. Some other plan-ets have magnetic fields too.

Some phone cards have a magnetic strip.

GETTING TO KNOW...

James Clerk Maxwell

James Clerk Maxwell was born in Scotland in 1831. His mother taught him at home, but she died when Maxwell was eight years old. He was sent to school and did well in mathematics. Maxwell decided to study physics. He went to Cambridge University.

Maxwell began to perform experiments with electricity and magnetism. Physicists wondered how electric charges traveled across space to influence other charges. They found that charges create electric fields and magnets create magnetic fields. Maxwell joined these fields into a single electromagnetic field. He used mathematical equations now called Maxwell's equations. He showed that electromagnetic energy moves as waves. The speed of these waves is the speed of light. Maxwell found that light is made of electromagnetic waves.

GETTING TO KNOW

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By Jason Georges and Tracy Irons-Georges

Source: Rourke's World of Science Encyclopedia