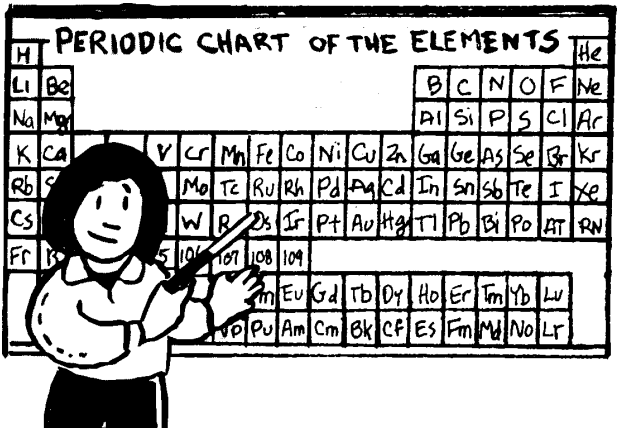
A GOOD YEAR BOOK™

SCIENCE CHALLENGE

190

Fun and Creative Brainteasers for Kids

LEVEL 2



E. John De Waard and Nancy De Waard

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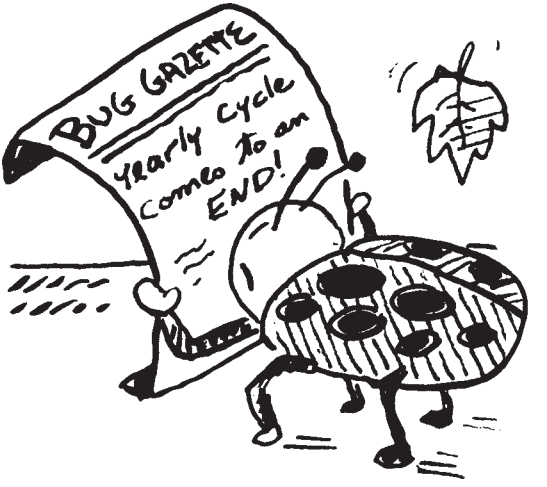


Fact!

Insects have six legs and usually two pairs of wings. Spiders are wingless and have eight legs, and many capture food with webs. What is a winged, six-legged creature in a web?

3

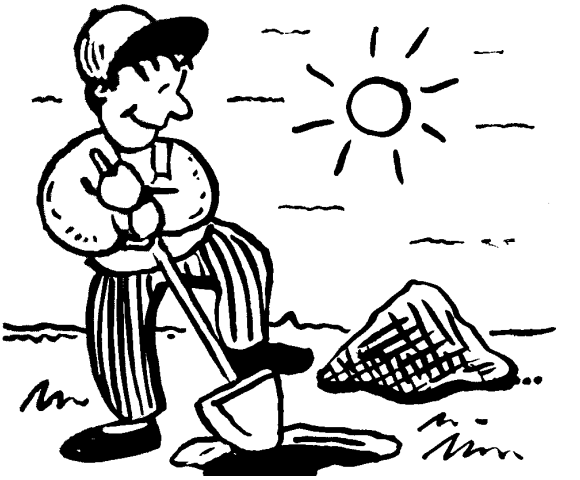
An insect captured in a spiderweb

science challenge

Level 2

Look!

You are digging a hole in a field. The dirt is in layers that change in color from black to red to white as you dig deeper. Which layer is the oldest? How do you know?



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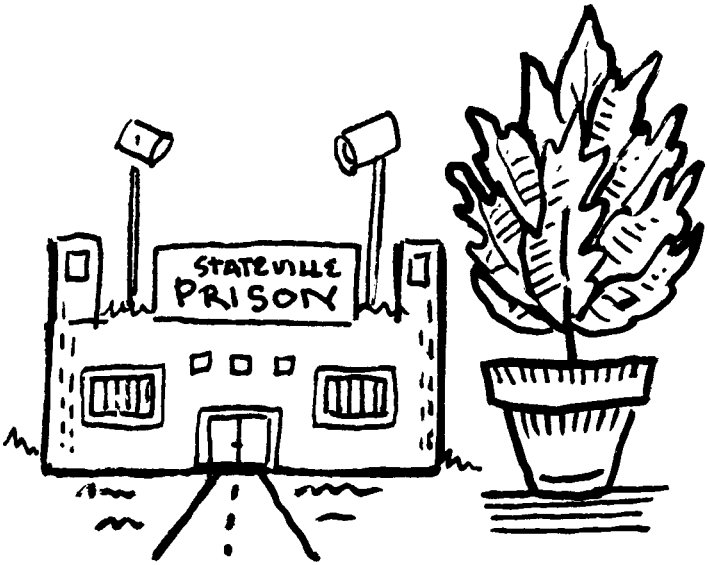
The white layer is the oldest. Because the layers were laid down one on top of another, the lowest layer (white) must have been laid down before the others and is the oldest.

Who Knew?

How are plants and prisons alike?



5

They are both made of cells.

science challenge

Level 2

Really?

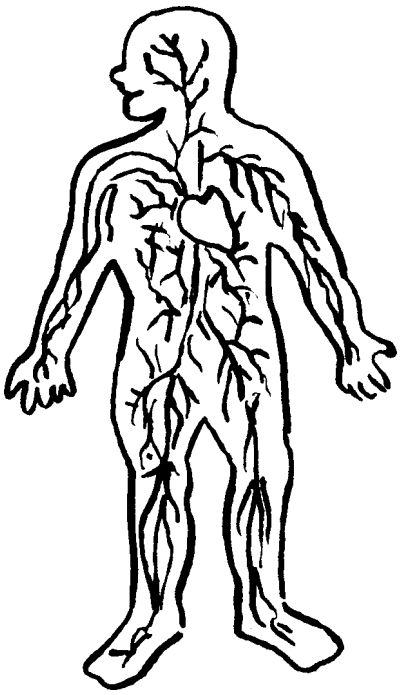
Mnemonics can help you remember complicated facts. For example, the mnemonic for the colors of the spectrum, in order, is Roy G. Biv. Use this to name the colors of the spectrum.

6

Red, orange, yellow, green, blue, indigo, and violet

Weird!

The human circulatory system contains about 60,000 miles of blood vessels. If all of the body's blood vessels were placed end to end, how many times could they circle the earth?



7

About 2-$^1/_2$ times. The earth is about 25,000 miles in circumference.

Fact!

In science, words are chosen carefully to describe things accurately. For example, one small part of a meter is called a centimeter. What part of a meter is a centimeter?

As one cent is one one-hundredth of a dollar, a centimeter is one one-hundredth of a meter.

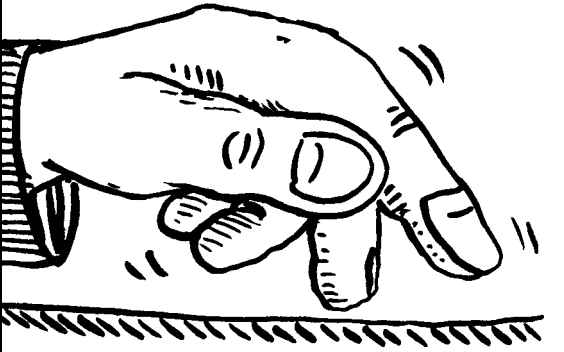
Look!

Living things have many things in common. They also have unique properties. What can cats do that no other animal can do?

Have baby cats (kittens). This illustrates the biological principle of "like comes from like."

Listen!

The point at which bones come together is called a joint. For example, your elbows have joints that act like hinges, called hinge joints. What type of joint is in your hip?



A ball-and-socket joint that allows your leg to move in many directions. Most hinge joints allow movement in only two directions.

Neat!

Carl has found a fascinating chemical compound. Using things he found in his kitchen, he was able to change it from a solid to a liquid to a gas. What is it and what makes it change?

11

Water (H_2O). He took an ice cube from the refrigerator (solid), let it melt (liquid), and then boiled the water on the stove, turning it into steam (gas).

Look!

When you ride your bike through a puddle, water and mud fly off the spinning wheels. The earth is spinning much faster than any wheel. Why aren't you thrown off the earth into space?

There is another, stronger force holding you to the surface—gravity.

Fact!

When a volcano erupts, molten rock flows out over the surface. This type of rock is known as igneous rock. Where does igneous rock come from?

Igneous rock comes from deep in the earth and is formed under enormous heat and pressure. Igneous rock underlies all of the continents and make up many islands, such as the Hawaiian chain.

Weird!

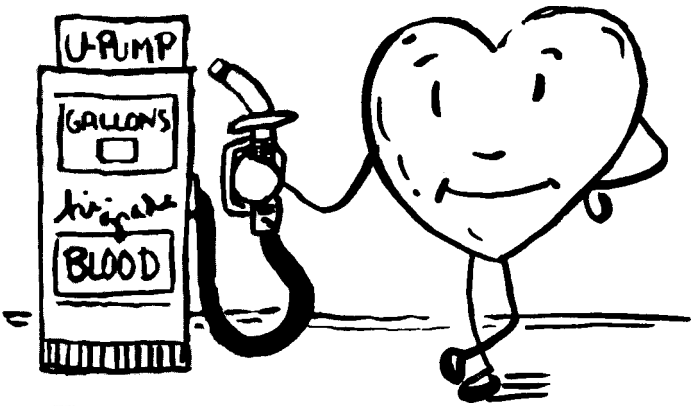
What do you call a 24-hour period when rabbits eat all the vegetables in your garden?

14

A bad hare day

Who Knew?

The average adult woman has about ten pints of blood in her body. In one day the heart circulates this supply about 3,000 times. How many gallons of blood does the heart pump per day?



15

Ten pints times 3,000 equals 30,000 pints. One gallon equals eight pints. Therefore, 15,000 pints ÷ 8 pints to a gallon equals 3,750 gallons.

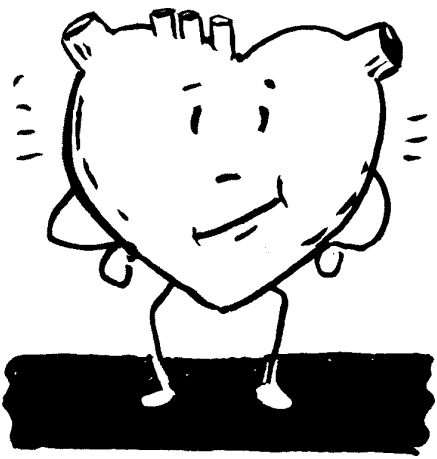
Fact!

The basic metric system unit of length is the meter. It is easy to work with because it is subdivided into units that are multiples of ten. What is one-tenth of a meter called?

A decimeter. The prefix deci *indicates one-tenth.*

Fact!

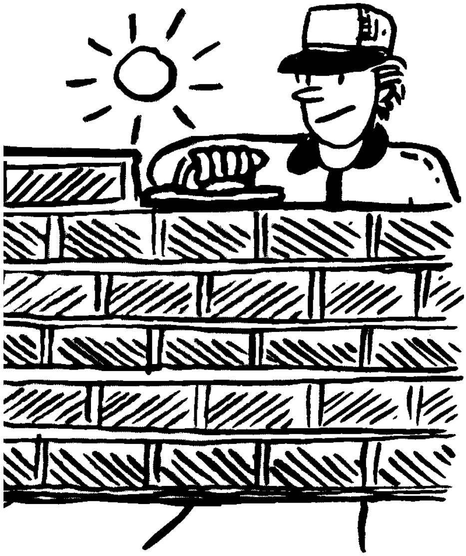
Arteries, which have high pressure, carry blood away from the heart. Veins carry it back, even though the pressure in the veins is quite low. What keeps the blood in veins going one way?



Most veins have one-way valves that prevent the blood from flowing backward. If these valves were not present, you might faint every time you stood up quickly because the blood would rush from your head.

Really?

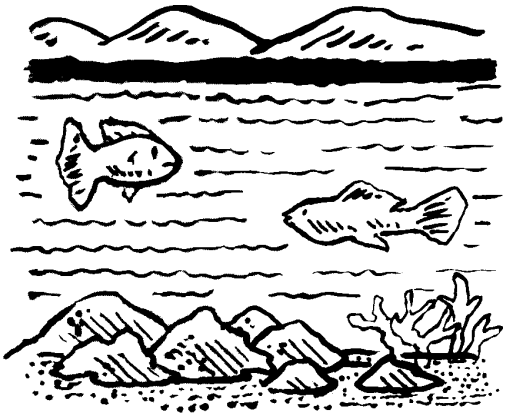
All complex structures are made up of smaller parts. For example, a building can be built of concrete blocks or bricks. What is the basic unit from which all living things are made?



The cell

Fact!

Soil and rock particles often settle to the bottom of a body of water. These deposits are called sediments. As sediments build up, the pressure turns them to rock. What are these rocks called?

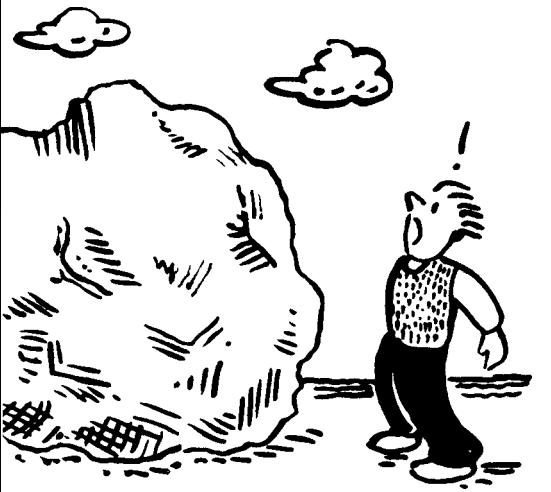


Sedimentary rocks. Rocks such as limestone and sandstone can indicate that the area where they are found was once underwater.

19

Listen!

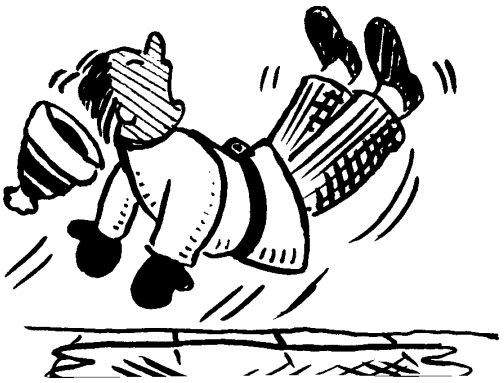
The mass of an object is the measure of how much matter is in that object. The mass of an object is always the same. What is the basic unit of mass in the metric system?



The kilogram. Many people are confused by the fact that this is the only basic unit that has a prefix. Many incorrectly assume that the basic unit is the gram.

Weird!

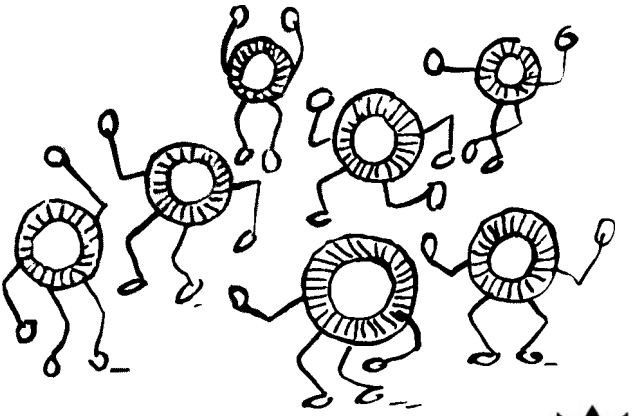
When you walk to the store in the summer, your shoes push you along easily. On a snowy day in winter, those same shoes may slip, slide, and cause you to fall. What causes the difference?



Friction or lack thereof—in the summer the soles of your shoes create a great deal of friction with the sidewalk. In the winter, if the sidewalk is covered with snow or ice, the surface is very smooth and the shoes create little friction with the surface.

Really?

Living things often have many similar cells that work together in performing a task. For example, heart muscle is made of one kind of cell. What are these groups of similar cells called?



22

Tissues

Neat!

Many organisms contain complex structures that are made of different tissues. These structures each perform one function. For example, the stomach consists of muscle, lining, blood vessels, and other tissues that work together to digest food. What are these groups of tissues called?

Organs

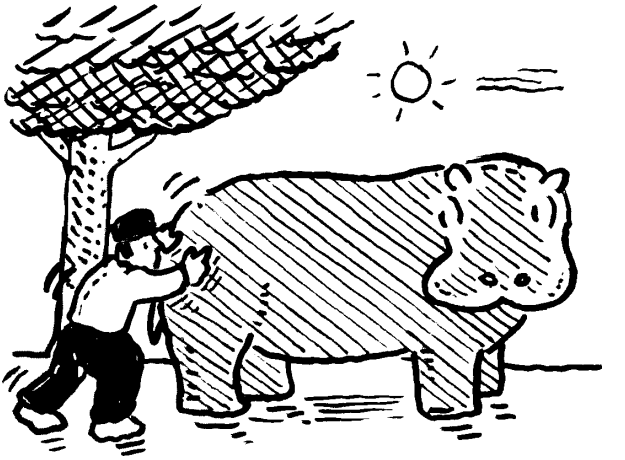
23

science challenge

Level 2

Fact!

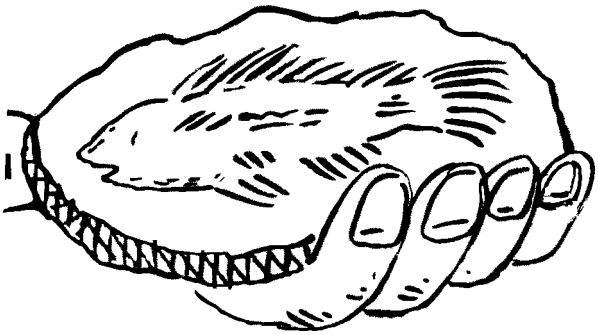
Some objects are harder to move than others. A brick is harder to move than a block of plastic foam of the same size. The brick has more inertia. What causes inertia?



Inertia is caused by mass. Inertia is resistance to changes in motion. Mass resists changes in motion, and the more massive an object, the more it resists being moved.

Cool!

Limestone was delivered to Nancy's house to cover her driveway. She noticed that many of the rocks had split, and there were images of fish in them. What did Nancy find, and how did the image get there?

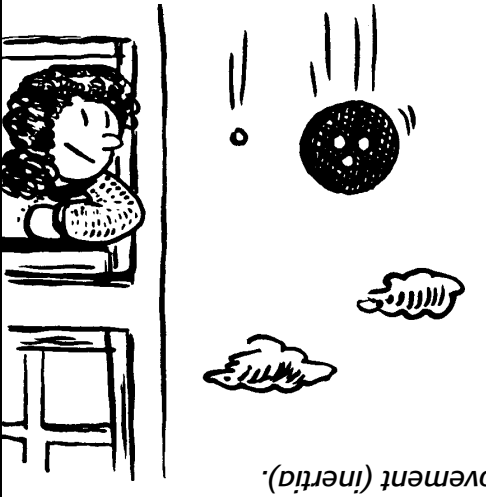


25

Nancy found fossils. Dead fish were covered by layers of sediment. When pressure changed the sediment to rock, the fishes' images became part of the rock layer.

Look!

A bowling ball and a marble are dropped at the same time from the third floor of a building. Which one will hit the ground first?



26

Neither. They will both hit the ground at about the same time. Gravity accelerates both objects at the same rate. While the bowling ball has a large force acting on it (its weight), it also has a proportionally larger resistance to movement (inertia).

Weird!

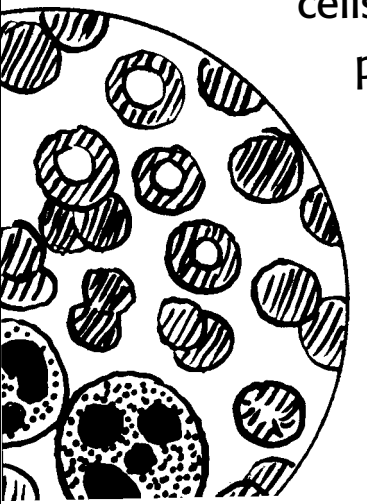
Most living things are either producers or consumers. Producers make food from raw materials such as water and carbon dioxide. Consumers eat producers. Are people producers or consumers?

27

People and animals are consumers.
Plants are producers.

Who Knew?

Human blood is about 55% liquid and 45% blood cells. Red blood cells carry oxygen, white blood cells fight disease, and platelets help the blood clot. What is the liquid part of blood called?



Plasma

Weird!

Caroline was washing out plastic soda bottles before recycling them. She used hot water and then put the caps back on. A short time later she noticed that all of the bottles were crushed. What happened?

Air pressure crushed the bottles. The hot water warmed the bottles and the air in them. When the air cooled and contracted, the pressure in the bottles dropped to less than that of the outside air, and the weak walls of the bottles were pushed in.

Neat!

If you touch a hot stove, you quickly pull your hand away without thinking. This is a stimulus-response reaction. But some responses take longer. What stimulus changes some animals' fur to white in winter?

30

The shorter days as winter approaches. You might think it would be decreasing temperature, but research has shown it is the decrease in sunlight.

Really?

Hawaii is surrounded by the sea. Yet, in many areas, no fossils are found as you dig down through the rock. Why?

The Hawaiian chain is volcanic in origin. Igneous rock originates far below the earth where no living things exist. In addition, anything buried by eruptions would be consumed by the intense heat before fossilization could take place.

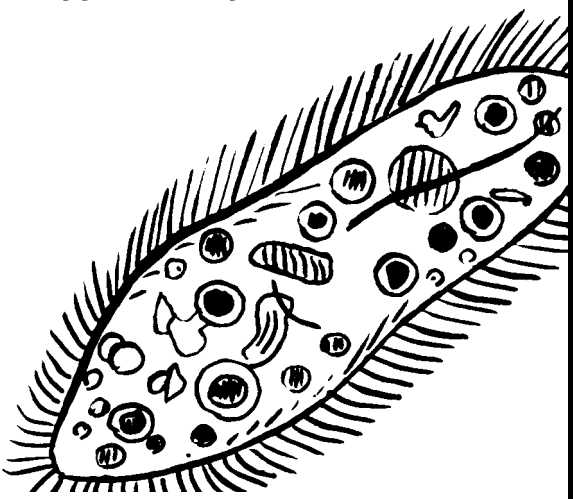
Cool!

Newton's third law states that for every action there is an equal and opposite reaction. Blow up a balloon and let it go. Explain what happens.

As air is accelerated out of the balloon, an equal force in the opposite direction is exerted on the interior of the balloon opposite the opening, causing the balloon to fly around.

Who Knew?

Most complex organisms require two parents to reproduce. However, some plants and animals can reproduce with just one parent. What is this type of reproduction called?



33

Asexual reproduction. Common examples of asexual reproduction are budding and runners in plants.

science challenge

Level 2

Weird!

On cold days you can "see" your breath as you exhale. You actually make tiny clouds when your breath hits the cold air. What does this indicate about what you exhale?

That there is a considerable amount of water in the breath you exhale. This water is visible at cold temperatures because it condenses out of the air as your warm breath is cooled.

Neat!

Horses and camels can carry several hundred pounds. Olympic weight lifters can lift more than their own weight. Who are the weight-lifting champions among animals?

The ants. They can lift numerous times their own weight. To be equally strong, an Olympic weight lifter would have to lift three large automobiles at once.

Look!

Natural blonds can have up to 140,000 hairs on their head. Individual blond hairs are very thin so blonds tend to have more. What is the average number of hairs on a person's head?

36

120,000. Redheads tend to have fewer, as few as 90,000, and brunettes, being the largest group, are closest to the average.

Fact!

Hundreds of years ago a monk named Mendel crossbred tall pea plants with short ones. Then he planted the resulting seeds. Did Mendel's plants become tall, medium, or short?

They were all tall. If you cross these tall plants with each other, the recessive trait (short plants) will show up again, but in only one out of four offspring.

Cool!

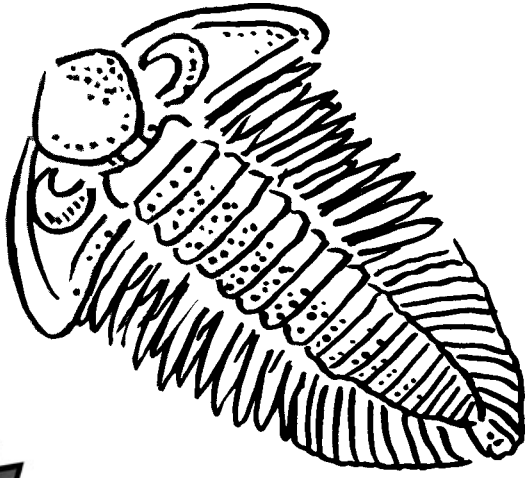
One of the Apollo 15 astronauts dropped a feather and a hammer from the same height on the moon. They fell to the moon's surface at his feet. Which one hit first?

38

Neither. They both hit at the same time, illustrating that gravity accelerates every object equally. On earth, air resistance would slow down the feather. However, there is no air on the moon and both objects reacted to gravity alone.

Fact!

Some of the earliest animals that have been found as fossils had bodies that were divided into three lobes. What are these extinct animals called?



Trilobites. Look at the name—Tri (three)-lobe-ite.

Who Knew?

What do you call an eye specialist from southwestern Alaska?

40

An optical Aleutian

Really?

A big problem in California and other places is landslides. Hillsides erode when heavy rains occur. What held the hillsides in place and what caused them to move?

Friction between the soil particles kept them in place. When rain soaked in and lubricated the particles, gravity forced them to move downhill. Another factor is the roots of plants, which also stabilize hillsides. However, when a developer clears the land to build houses, this often kills all the plants and destabilizes the hillside.

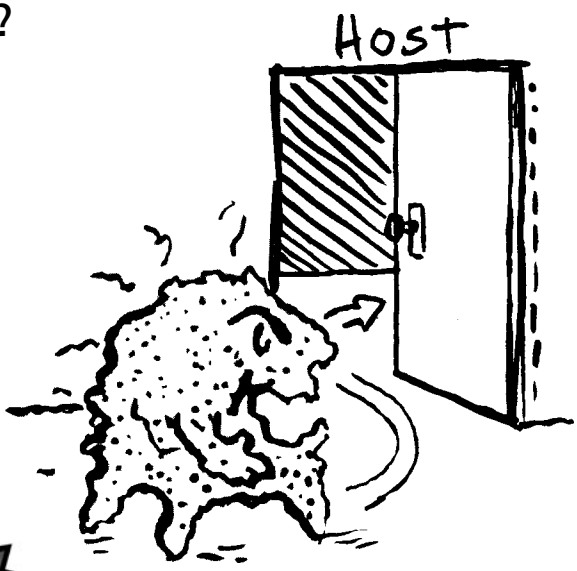
Neat!

Take a pencil with a slip-on eraser over one end. Lay it across your finger. Can you balance the pencil across your finger? Explain how this happens.

Yes. The heavy end with the eraser can be balanced by a longer section of the pencil. The short section with the eraser weighs the same as the long section without the eraser. When balanced, your finger is at the point where the weights on either side are equal. This point is called the pencil's center of gravity.

Weird!

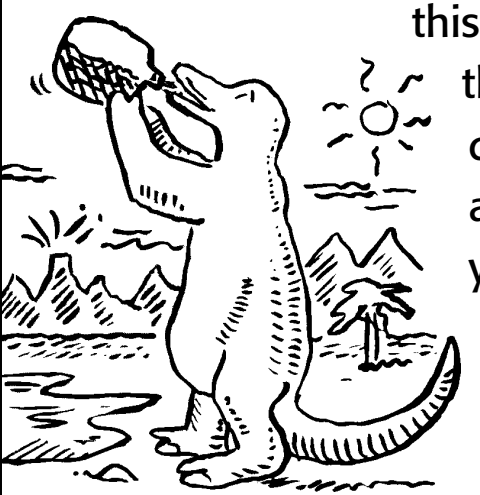
Small pieces of living matter, smaller than any cell, can only reproduce by entering other cells. When they do this, they often make the host sick. What are these small pieces of living matter?



Viruses. Viruses are not cells as they do not contain any of the structures of cells and cannot live on their own.

Weird!

Matter cannot be created or destroyed by ordinary chemical reactions. This is a basic scientific law. How does this law apply to the water that a dinosaur drank and the water you drink?



The same molecules of water you drink today could very well have been drunk by a dinosaur millions of years ago. The water on earth today is the same water that was here long ago; it gets recycled over and over again.

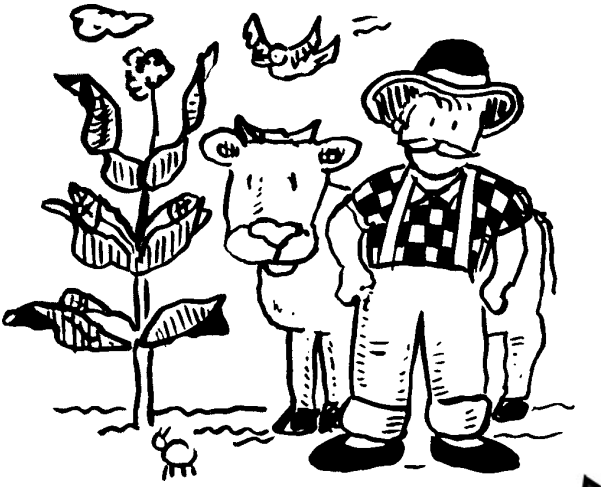
Really?

An Olympic long jumper can jump about five times his height—about 30 feet. Good, but not even close to the animal world's champion! What animal is the jumping champion?

The flea. An ordinary flea can jump about 200 times the length of its body. To equal this, a human would have to jump approximately 1,200 feet—over one-fifth of a mile!

Really?

All living things are kept alive by chemical reactions within them. Some reactions are more important than others to all life. What is the most important chemical reaction to all life?



Photosynthesis. Without photosynthesis providing energy to both plants and the animals that eat them, almost all life would cease.

Neat!

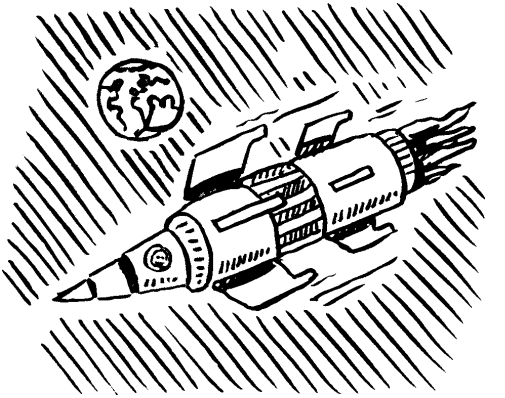
Many diseases are caused by bacteria. However, bacteria are not all bad and can be quite helpful. For example, many foods are made using bacteria. Name two foods made using bacteria.

47

Cheese, yogurt, sauerkraut, and sour cream are just four examples. The holes in Swiss cheese are caused by carbon dioxide given off by bacteria as they convert milk solids into cheese.

Fact!

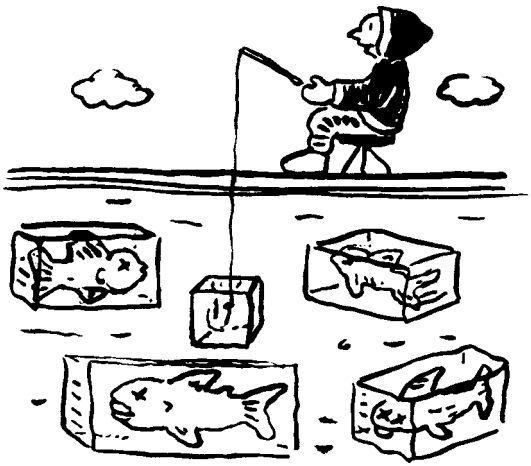
The space shuttle requires huge amounts of energy to overcome the earth's gravity and go into orbit. Going to the moon requires even more energy. Knowing this, can astronauts ever go to Mars?



Going to Mars won't require that much more energy. Correctly aimed and accelerated, a Mars mission will "coast" most of the way through the vacuum of space. The two crucial factors are time (many months) and fuel for the return trip.

Cool!

Water on earth exists in three phases—solid, liquid, and gas. Solid and liquid water are unusual because the solid is less dense than the liquid. How could you prove this?



Float an ice cube in a glass of water. This property is very important. If ice were more dense, lakes would freeze from the bottom and kill everything in them.

science challenge

Level 2

Look!

The largest part of most soils is pieces of broken rock. Many rocks are broken up when water seeps into cracks and freezes. How does freezing water break up rocks?

50

Water expands when it freezes. If the ice is confined, as in a crack in a rock, it exerts tremendous pressure outward. This pressure, along with daily heating and cooling during the warmer seasons, eventually weathers most exposed rock.

Who Knew?

One phase of matter has a definite volume but an indefinite shape. It takes the shape of its container. What phase of matter is this?

A liquid. That a liquid has a definite volume can be demonstrated if you try to compress it. However, the fact that liquids flow shows their indefinite shape.

Who Knew?

There are many harmful bacteria. They produce chemicals called toxins that can poison you. But you can protect yourself. How can you prevent bacteria from harming you?

You can prevent them from entering your body by practicing good hygiene; killing bacteria in food by cooking; slowing their growth with refrigeration; and killing them outright with antiseptics.

Listen!

To live a healthy life, you must supply your body with three basic types of nutrients plus vitamins and minerals. What are the three basic nutrients in your food?

Proteins, carbohydrates, and fats. Typically, proteins are the building blocks of new tissue; fats and carbohydrates supply energy.

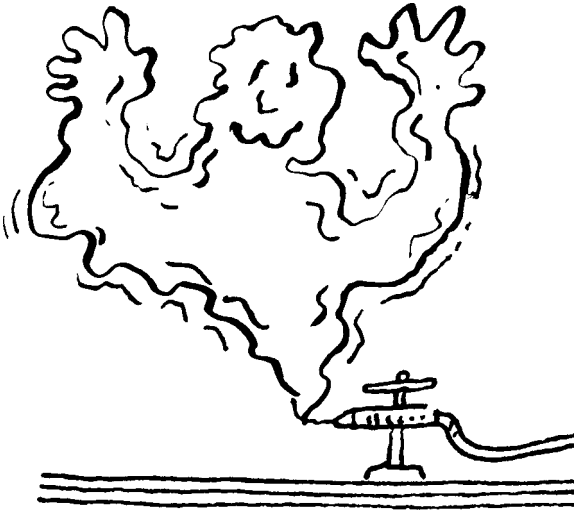
Really?

Carbohydrates are a primary source of energy for the body. Carbohydrates, such as starches and sugars, come from plants. Where did the plants get the energy they stored in the carbohydrates?

From the sun. The process of photosynthesis binds the energy from sunlight into the carbohydrates.

Weird!

Of the three phases of matter, one has neither a definite shape nor a definite volume. Which phase of matter fits this description?



55

A gas. Gases expand outward and fill any container they are in. They also take the shape of the container.

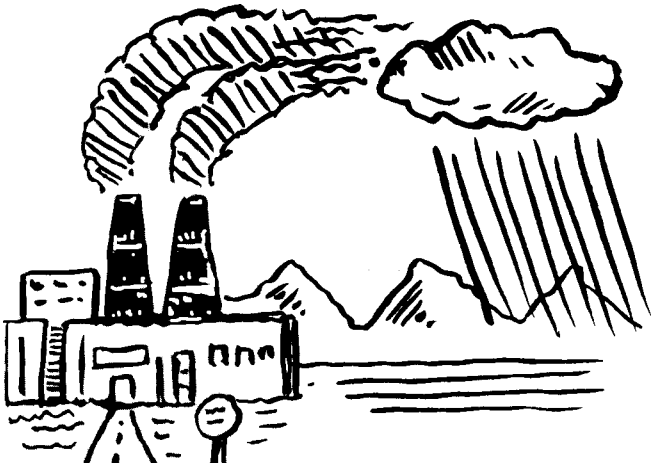
Look!

The daily cycle of day and night can cause rocks to expand and contract. This can cause rocks to flake. Would you expect more weathering on a north or a south slope? Why?

The south slope. This slope would receive more direct sunlight and experience greater temperature extremes. Thus, it probably would weather more.

Listen!

When burned, carbon and sulfur form oxides. These oxides can combine with water and form acids. This happens often in clouds. What do we call what falls from these clouds?



57

Acid rain. Too much acid rain can change the chemistry of lakes, damage plants, and erode buildings and rocks.

Really?

Most insects live for one year. They develop over the winter, emerge as adults in the spring or summer, mate, lay eggs, and die. What insect has the longest life span?

58

Not counting the queens of insect colonies, the seventeen-year locust (periodic cicada) is longest lived. It lives for seventeen years, most of it underground as a nymph.

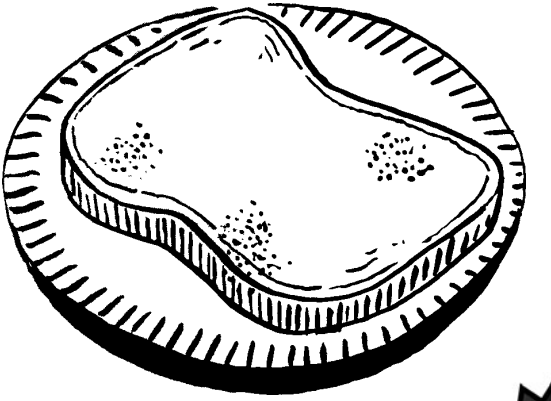
Fact!

One phase of matter has a definite shape and volume. The book you are reading is this phase of matter. What is the name of this phase of matter?

It is a solid. Solids may also have other characteristics such as density, color, luster, and hardness.

Who Knew?

The green mold you find on old bread is a fungus. This fungus gives off a substance that keeps bacteria from growing near it. It is used as a medicine. What is the name of this medicine?

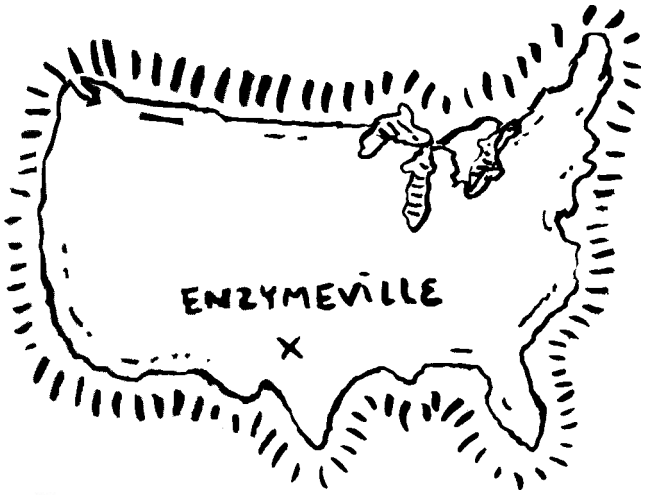


60

Penicillin. It is made by penicillin fungi and was one of the first of a whole new class of medicines called antibiotics.

Fact!

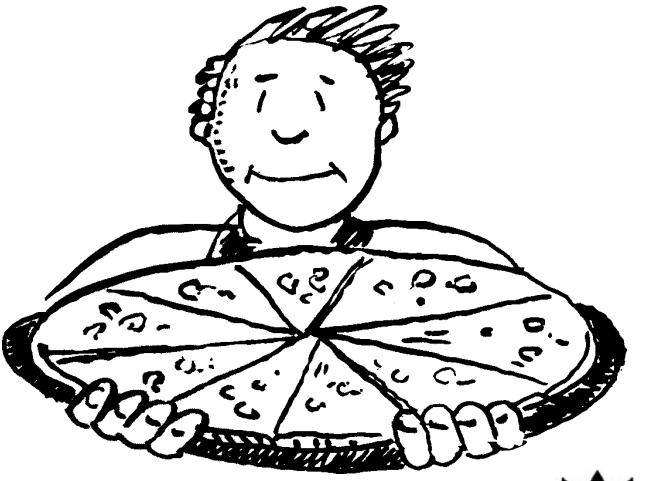
Enzymes inside your body help digest food. They break the food molecules into smaller pieces that can be used by the body. Where do enzymes come from?



They are secreted by organs in the digestive system. Some examples are amalase from the salivary glands and pepsin from the stomach.

Weird!

If you love pizza, you've got to love fungi. One fungus goes into every pizza and another is a favorite topping. Name the two fungi associated with pizza.



62

Yeast is used to produce the dough for the crust, and mushrooms are a popular topping.

Really?

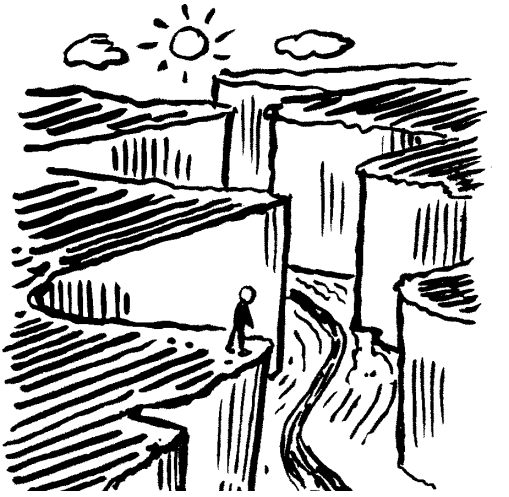
In spring and summer, your porch light attracts moths. Some are quite large. But they are tiny compared to the world's largest moth. How big is the largest moth?

63

Atlas moths, which live in Southeast Asia that have wingspans of up to 12 inches.

Cool!

The Grand Canyon is the greatest example of weathering on earth. In some places it is about a mile deep. What caused this huge cut in the earth's surface?



Flowing water, presently represented by the Colorado River. For millions of years, water has flowed down this valley, slowly cutting the canyon even deeper.

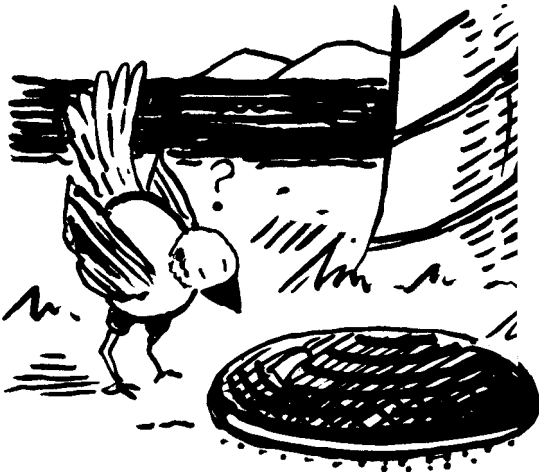
Who Knew?

One of the most important cycles is the water cycle. During this cycle, water evaporates into the air and returns as rain. This requires energy. Where does this energy come from?

The sun

Really?

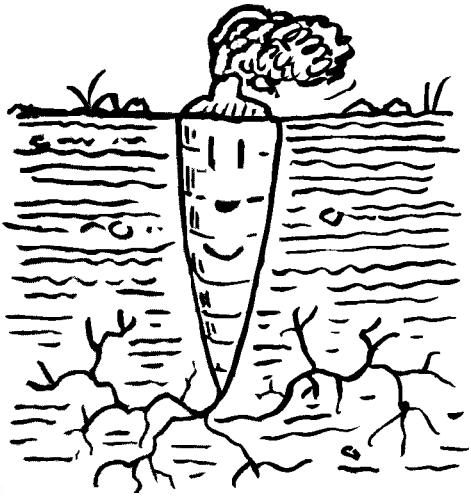
Plants come from seeds of all sizes and shapes. What is the world's largest seed, and where does it come from?



It is the seed of the double coconut palm tree from the Seychelles. Some can weigh up to 45 pounds, and they take 10 years to ripen.

Look!

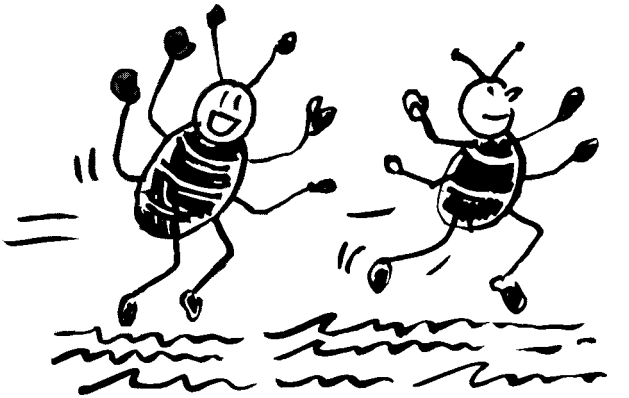
The roots of some plants are very different from others. For example, a carrot is a root that supports the plant above. However, a carrot root also serves another function. What is it?



Like other root crops, such as potatoes and beets, a carrot stores food in its root.

Weird!

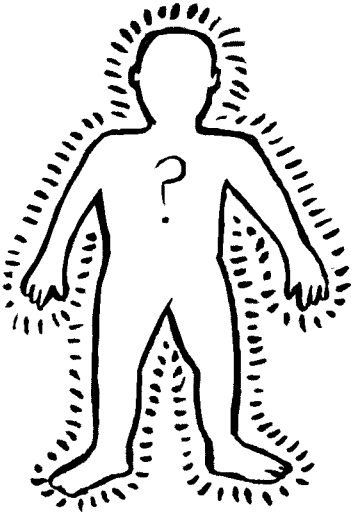
If you go to a pond, you will probably see insects skipping across the surface of the water. If you tried this, you would immediately sink. How can insects walk on water?



The attraction of water molecules for each other causes a film on the surface (called surface tension). The insects are light enough so that their feet do not break the film and they can walk on it.

Who Knew?

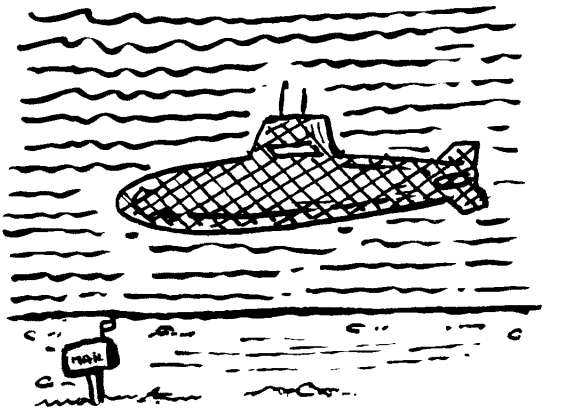
Our immune system works constantly to keep us healthy. An important part of the immune system is the body's largest organ. What is the body's largest organ?



The skin. The skin is our first line of defense. As long as it is unbroken, many disease organisms can't affect us.

Fact!

If you dive into water, the pressure gets greater the deeper you go. Submarines that dive deep have to be built of very strong materials. Why aren't deep sea animals crushed?



The pressure inside their bodies is the same as that outside. Thus, the effect of the pressure is zero. If you were to raise them to the surface rapidly, they would explode!

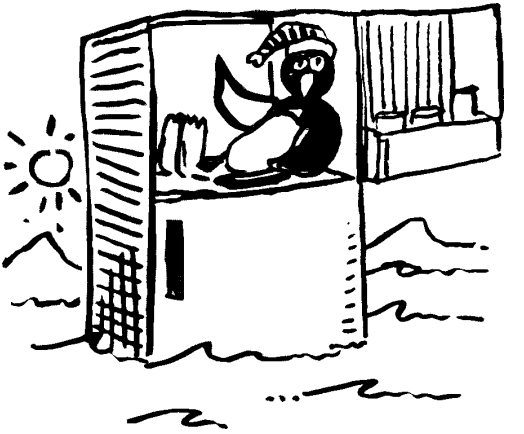
Listen!

Foods containing large amounts of carbohydrates give energy quickly. If you eat a candy bar and get warm, where did that heat energy originally come from?

The sun. Carbohydrates are made by plants through photosynthesis. Photosynthesis stores the energy of sunlight in the carbohydrates when they are made.

Cool!

You may think it was cold last winter. However, there are places like Siberia where the temperature can be 50 degrees below zero for weeks. Where is the coldest spot on earth?



Antarctica. Recorded temperatures in Antarctica have exceeded -100°F for weeks at a time. The coldest recorded temperature was -128.6°F at the Russian Vostok station in Antarctica.

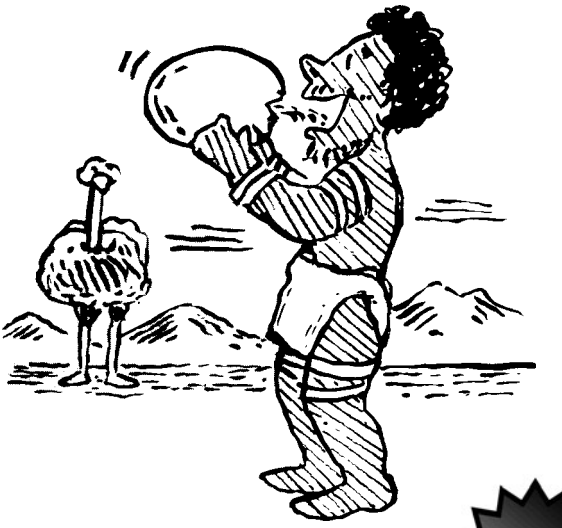
Fact!

Rain often cools things down. However, during or after a rain, the temperature of the air sometimes goes up. Explain how this can happen.

It took energy, usually sunlight, to evaporate the water into the air. When the water condenses and falls as liquid rain, it releases the extra energy it had as a gas. This energy can raise the temperature of the air.

Really?

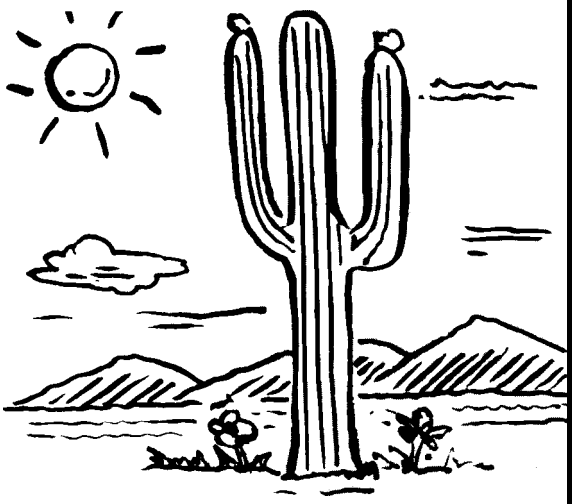
The largest bird eggs come from the ostrich. They average six inches long and weigh three pounds. Ostrich eggs have been used as water jugs. What is the smallest bird egg? How small is it?



Hummingbird eggs are the smallest; those of the bee hummingbird are about the size of a pea.

Fact!

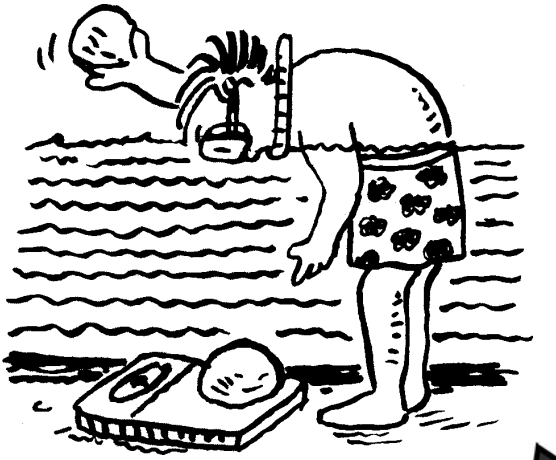
Almost all life is dependent on photosynthesis. It is the process that combines water and carbon dioxide into carbohydrates that feed living things. What other essential chemical is created by photosynthesis?



Oxygen. Oxygen is released into the air as a by-product of photosynthesis.

Weird!

If you throw a rock into a lake, it sinks. But you will find that the rock weighs less underwater than on land. What happens when the water around an object has a force greater than the object's weight?



It floats. The amount of buoyant force is equal to the weight of the water displaced by the object.

Who Knew?

The outer layer of your skin is constantly renewed. Millions of cells die and flake off daily. How does the renewal of your skin help protect you against disease?

Many diseases are caused by bacteria that penetrate the skin. When the skin cells are sloughed off, the bacteria on the surface go with them.

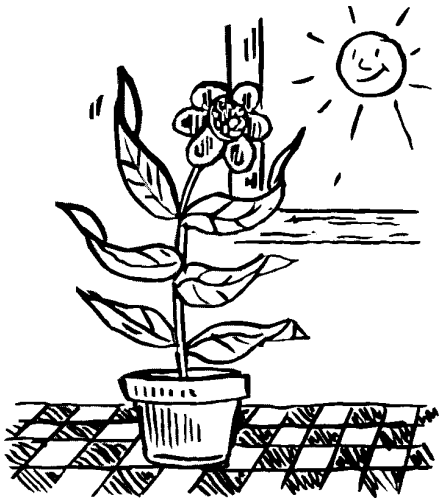
Fact!

The deeper you go underwater, the greater the pressure. Pressure is produced by the water above. What is the difference in pressure at 3 feet underwater compared to 1 foot underwater?

It is three times as great. This pressure is exerted in all directions, not just down.

Listen!

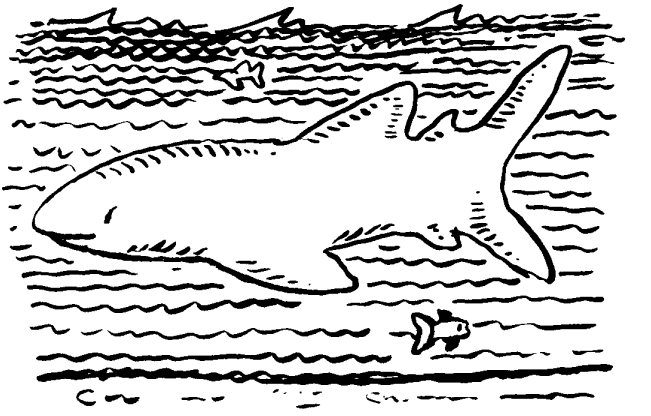
Plants respond to stimuli such as gravity, water, and light. These responses are called tropisms. A plant's response to gravity is called geotropism. What would a plant's response to light be?



Phototropism. Photo indicates light, as in the name photosynthesis, a chemical reaction that requires light.

Really?

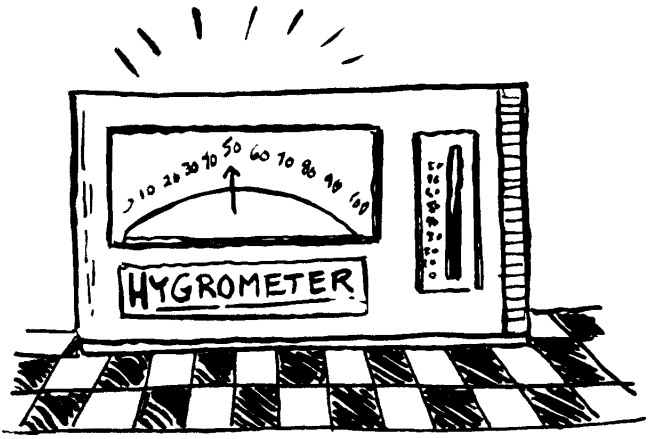
Animals that live in water can reach enormous sizes because the buoyant force of water supports them. What is the largest fish in the world?



The whale shark. They can be up to 40 feet long and weigh up to 15 tons. Remember that the blue whale, the largest animal that has ever lived, is not a fish but a mammal.

Fact!

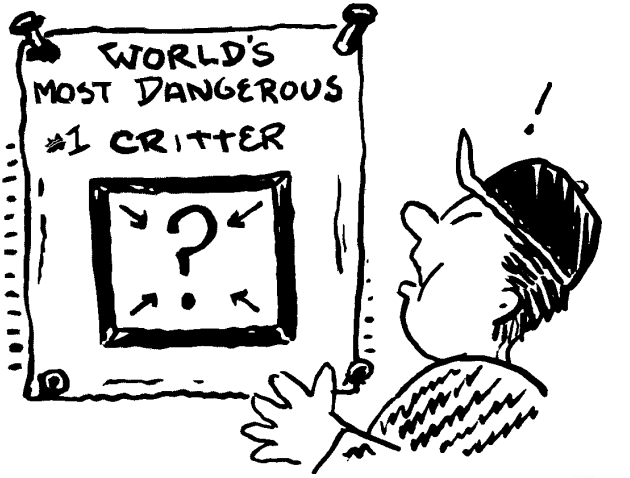
Relative humidity compares the amount of water vapor in the air with the amount it could hold. It changes with temperature. If the relative humidity is 100%, what's the weather like?



If the temperature is above freezing, it is probably raining.

Listen!

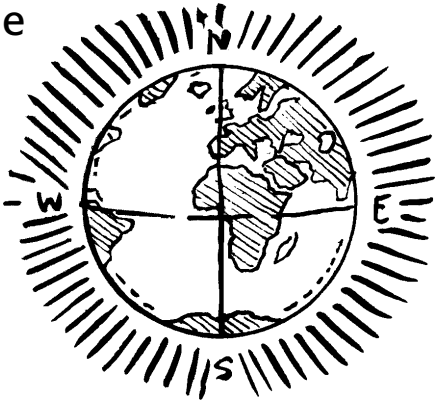
There are many dangerous animals in the world. Sharks attack humans, as do poisonous snakes. However, these attacks are rare. What is the most dangerous animal?



The mosquito. Mosquitoes carry many diseases and have been responsible for the death of more people than all of the wars in history.

Neat!

You can locate any part of the world with just two numbers. One is distance from the equator along a north-south line. The other is distance east or west of that line. What are the names of these two numbers?



Longitude and latitude. Longitude represents how far north or south of the equator you are. Latitude represents how far you are laterally, east or west, from the prime meridian in Greenwich, England.

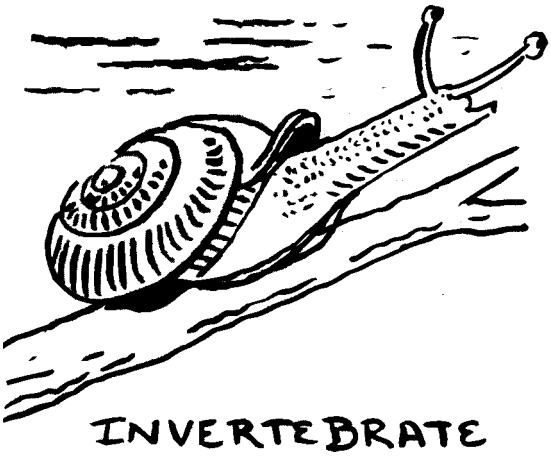
Really?

Many animals migrate. Canadian caribou travel several hundred miles each year. Geese fly the width of North America in spring and fall. What animal has the longest migration?

The arctic tern. This bird migrates each year from the Arctic to the southern tips of South America and Africa—14,000 miles!

Fact!

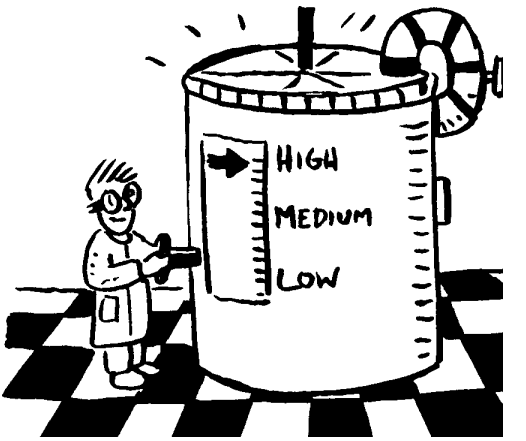
One convenient way to classify animals is by whether they have backbones or not. If animals without backbones are called invertebrates, what should animals with backbones be called?



Vertebrates. Remember that the bones that make up the backbone are called vertebrae.

Listen!

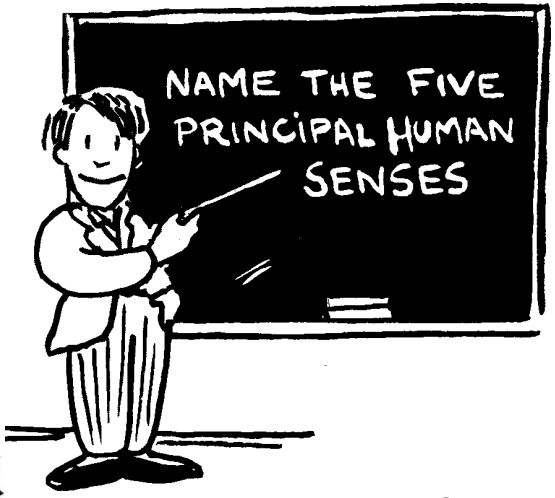
One characteristic of gases is that they have an indefinite volume. When you squeeze them, they get smaller. If you put twice as much pressure on a gas, what will happen to its volume?



The volume will decrease by one-half. This is a basic scientific law called Boyle's law.

Who Knew?

All of what we know about the world comes from our senses. Humans have five principal senses. What are the principal senses of humans?



87

Sight, touch, smell, taste, and hearing

science challenge

Level 2

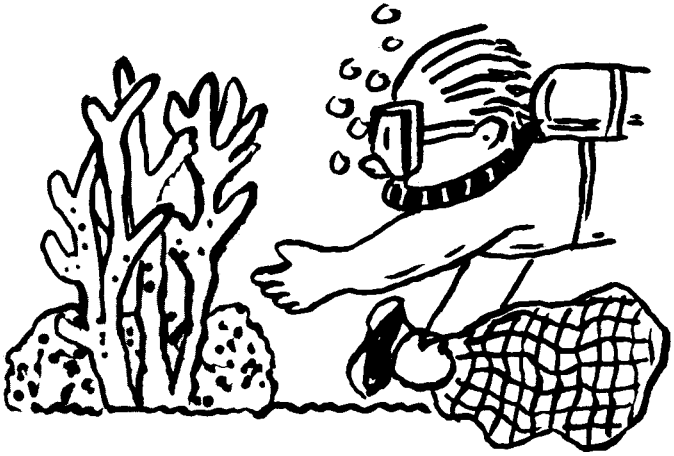
Weird!

Hold a sheet of paper by two corners. Now bring the sheet up close to your mouth and blow over the top. What happens?

The loose end of the sheet moves up. This happens because moving air exerts less pressure than the still air beneath the sheet. It is an illustration of Bernoulli's theorem and explains how an airplane's wing produces lift.

Neat!

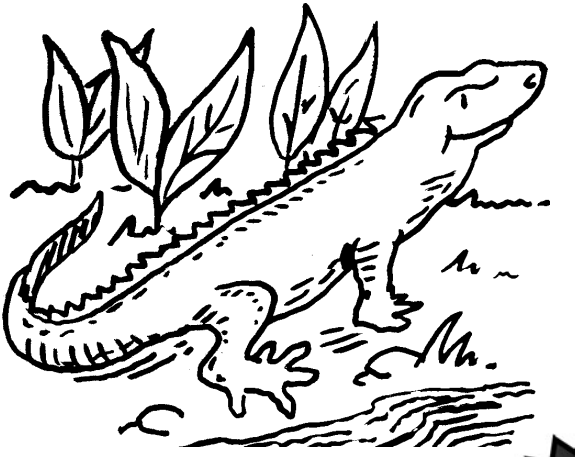
Although most sponges you see are made of plastic, natural sponges are living things. Natural sponges live under the sea and are harvested by divers. Are sponges plants or animals?



They are invertebrate animals.

Really?

Reptiles live all over the world where the climate permits. In North America, they are represented by many snakes, lizards, and even alligators. What is the world's largest reptile?



90

The saltwater crocodile. Large specimens reach 19 feet in length and 1-$^{1}/_{2}$ tons.

Fact!

Longitude is measured by the angle between the horizon and an object more or less above the North Pole. This tells you how close you are to the equator. What object in the sky is used to make this measurement?

The North Star

Look!

A day and a year are two natural divisions of time you can observe directly. Both of these units are based on the earth's relationship to another body. What is that other body?

The sun. A day is the interval it takes for a point on the earth's surface to rotate from directly under the sun around to the same point again. A year is the amount of time it takes for the earth to complete one orbit around the sun.

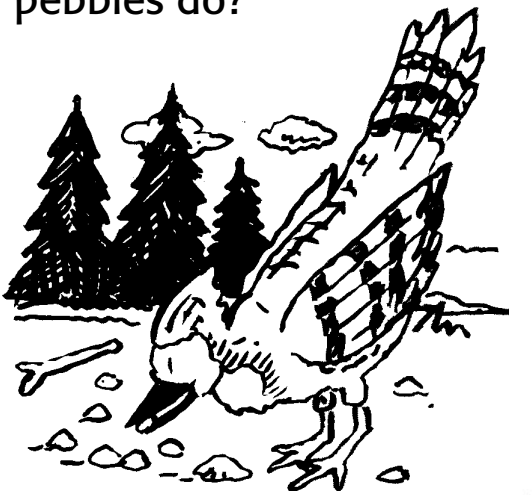
Neat!

Most seeds can live for several years until conditions are right for growth. Plants use this method to survive cold and drought. How old can a seed be and still grow and blossom?

Among the oldest viable seeds known are from the lotus plan. Seeds from a 2,000-year-old peat bog near Tokyo sprouted and blossomed when planted.

Weird!

earthworms, like birds, have an interesting organ called a gizzard. These animals swallow grains of sand and pebbles and store them in their gizzards. What do the sand and pebbles do?



They help grind food. Birds and earthworms do not have teeth, and the muscular gizzard uses sand and pebbles to grind up their food.

Fact!

Plasma is a high-energy gas-like substance that conducts electricity and is affected by magnetism. Depending on the gas in it, plasma emits different colors of light. Where can you see plasma?

Neon signs and plasma TVs glow because of the plasma within them. Not all "neon" signs contain neon. Different gases are used to get different colors. (This is not the same thing as blood plasma, which is a liquid.)

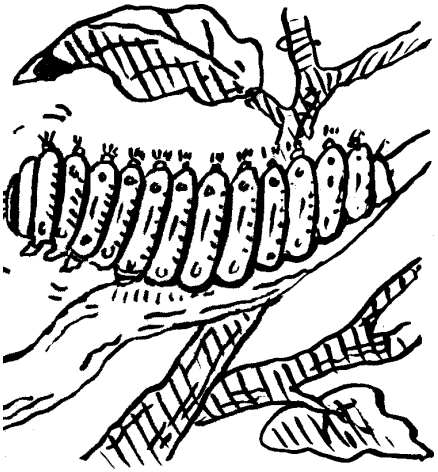
Cool!

As the ice melts in a glass of lemonade, the ice and the lemonade are 32°F. When will the lemonade start to get warmer? Why?

The lemonade will get warmer after all of the ice has melted. Until the ice has melted, any extra energy in the drink will melt the ice, and the temperature will not change. The energy required to change the phase of a material without changing temperature is called its latent heat.

Weird!

Several groups of living things go through stages in their life in which they look much different from adults. For example, insects go through four stages—egg, larva, pupa, and adult. Name any butterfly stages you have seen.



A caterpillar, for example

Who Knew?

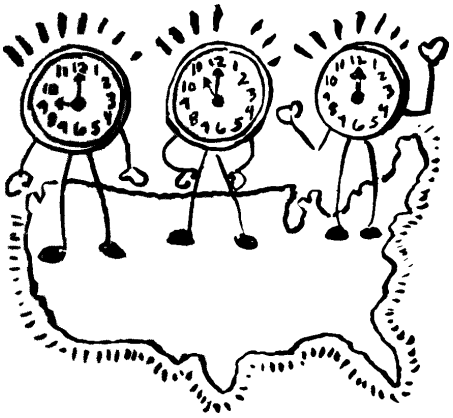
The volume of the largest planet in our solar system is larger than that of all of the other planets combined. What is the name of this giant planet?

98

Jupiter. With a diameter of more than 88,000 miles, Jupiter is bigger than all of the other planets combined.

Look!

When it is noon in New York, it is 11 A.M. in Chicago, 10 A.M. in Denver, and 9 A.M. in San Francisco. Why do we have different times in different places?

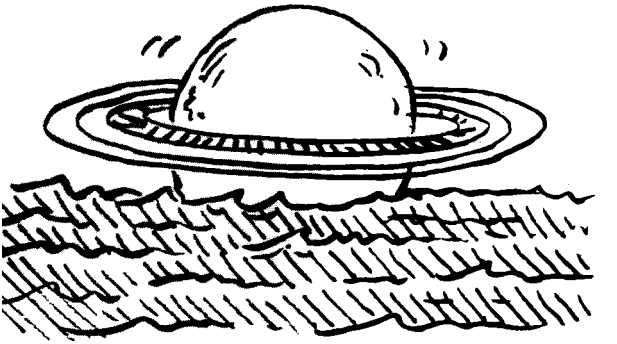


Because we base local time on the position of the sun in the sky. Noon is when the sun is directly overhead. When the sun is overhead in New York, it is low in the east in San Francisco. San Francisco is three hours "behind" New York because noon arrives in San Francisco three hours later.

Level 2 science challenge

Weird!

The larger planets in our solar system are made up of gases and other light materials. Saturn, a very large planet, is so light that it would float on water. Which planet is the densest?



100

The earth. The earth has an average density of about 5.5 times that of water.

Really?

Mammals can pull heavy weights and run fast. However, for their weight, insects are much stronger and faster. Why are insects stronger and faster?

101

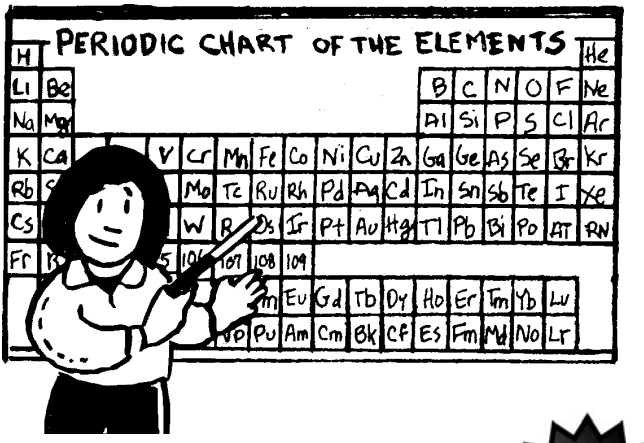
Their skeleton is on the outside and covers their bodies. This exoskeleton gives their muscles better leverage and, pound for pound, they are much stronger.

science challenge

Level 2

Listen!

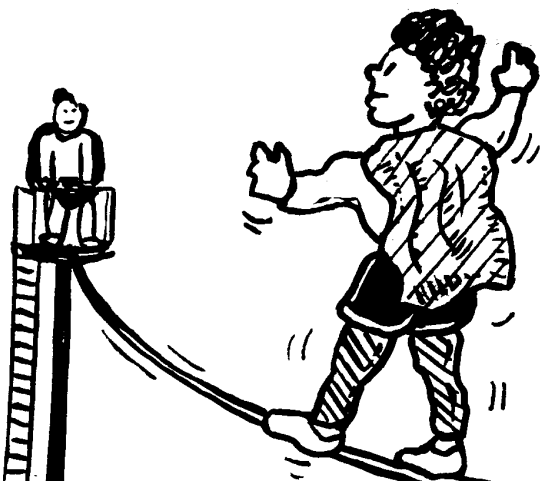
Every English word is made from the twenty-six letters in our alphabet. Likewise, every chemical compound is made from slightly more than one hundred basic materials. What are these basic materials called?



Elements. An element is a substance that cannot be broken down further by ordinary chemical means.

Neat!

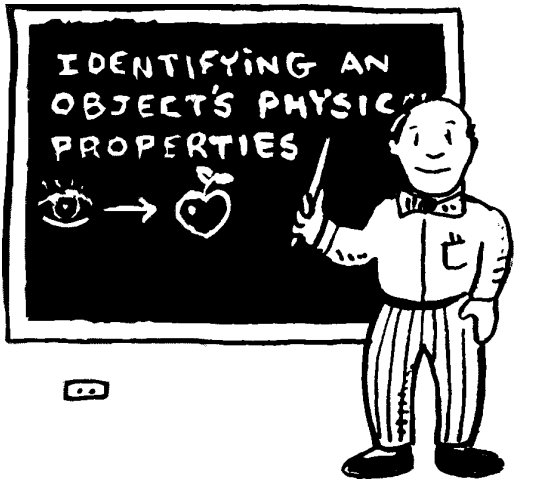
Circus performers walk on narrow wires high above the crowd. Some even perform tricks on the wire. Which organ gives us a sense of balance?



The ear. In addition to the sense of hearing, the ear contains a series of fluid-filled canals that give us a sense of balance.

Look!

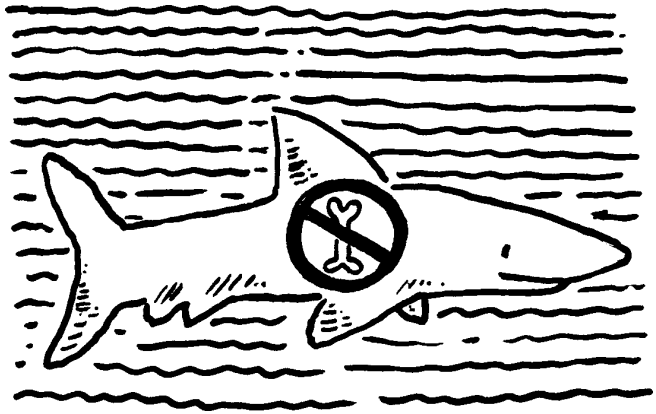
You recognize things by the way they look. A scientist calls this "identifying an object's physical properties." Name some physical properties.



Color, density, taste, odor, hardness, melting point, boiling point, whether it conducts electricity or heat, whether it is magnetic or not, and, for some compounds, the shape of the crystal

Who Knew?

Sharks are a primitive type of fish. While sharks have skeletons, they do not have bones. What material makes up the skeletons of sharks?

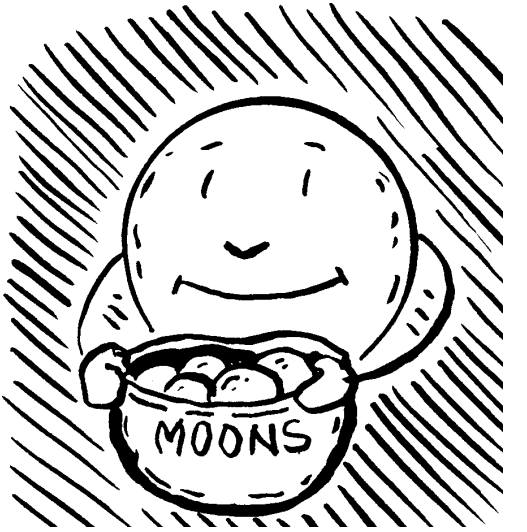


105

Cartilage. Bony fishes developed much later in history.

Look!

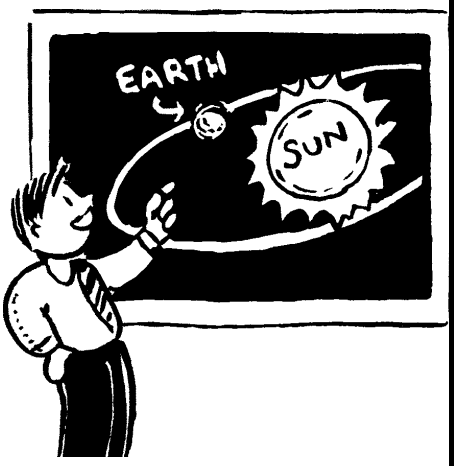
The moon circles the earth about once a month. Other planets also have moons. Which planet has the most moons?



According to NASA, as of 2005 we know of thirty-one moons of Saturn. Jupiter has sixteen confirmed moons with another eleven being investigated.

Fact!

The earth moves in an elliptical orbit around the sun. There are times when the earth is closer to the sun than at other times. Is the earth's distance from the sun the cause of the seasons?



No. The earth is tilted relative to the sun, and it is the angle at which the light hits the earth that determines how much energy is received. This is what determines the seasons. In winter the earth is tilted away, in summer the light hits it almost directly. The equator, which receives direct sunlight all year long, is the hottest region of the earth.

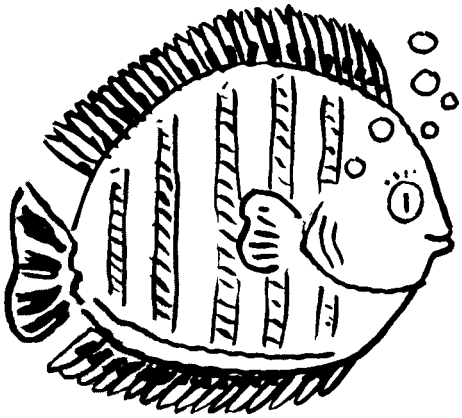
Fact!

There are areas of high and low pressure in the atmosphere. Air flows from areas of high pressure to areas of low pressure, causing wind. Where is the windiest place on earth?

With almost constant gusts, some up to 200 miles per hour, Antarctica is the windiest spot on earth. The fastest recorded winds, 231 mph, were on Mt. Washington in New Hampshire.

Weird!

Most animals have either lungs to breathe above ground or gills to breathe underwater. But a few species have gills at birth and lungs later on. What animals have gills and then lungs?

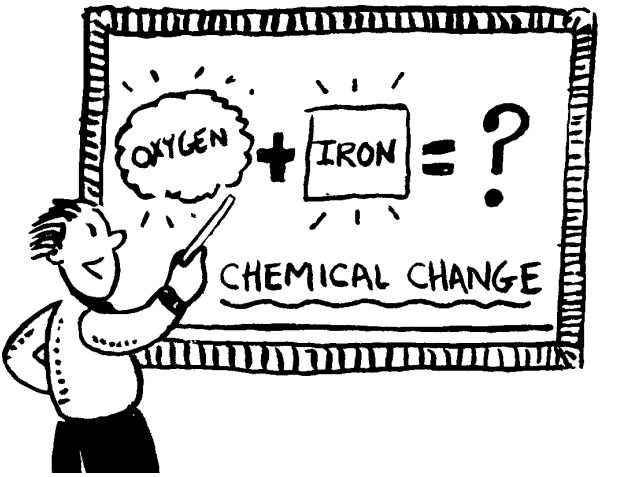


109

Amphibians. Common examples are tadpoles versus adult frogs.

Fact!

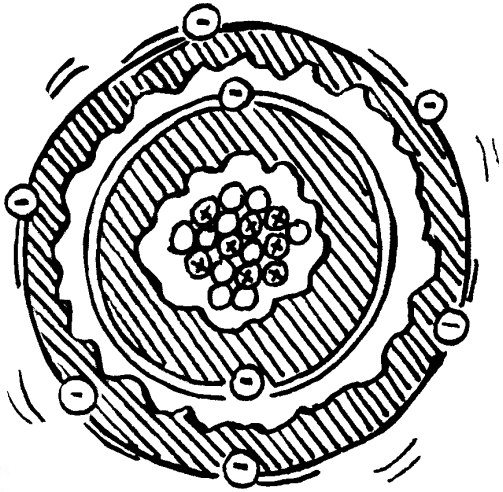
When two substances react chemically, a new substance is produced. When iron reacts with oxygen, what substance is formed?



Rust (iron oxide). Rust has properties that are very different than the iron and oxygen that combined in making it.

Fact!

Atoms are made of electrons, protons, and neutrons. Electrons surround a dense nucleus made up of protons and neutrons. What makes up the largest part of the atom?



III

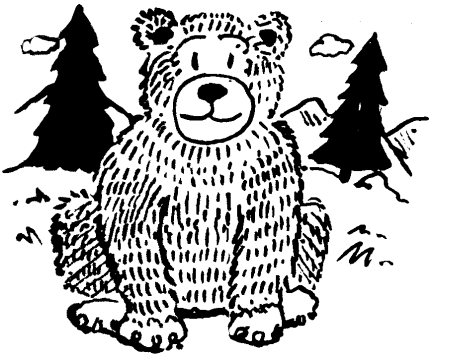
Empty space

science challenge

Level 2

Neat!

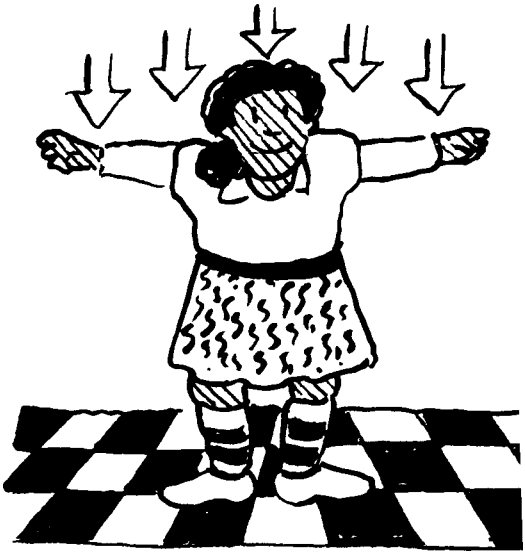
Mammals can keep warm in a wide range of temperatures. Some animals, such as fish, reptiles, and amphibians, are the same temperature as the environment. What happens to these animals when it gets too cold?



They move, die, or go into a deep resting stage. Some amphibians hibernate, buried in the mud, and only emerge when it warms up. These animals are called cold-blooded, or ectothermic, organisms.

Listen!

Each of us lives under a pile of air that is miles deep. This stack of air exerts pressure downward on us. What instrument is used to measure air pressure?



A barometer. A barometer is sometimes called a weather gauge because changing air pressure is a key to predicting weather.

Look!

Covered by mountains and canyons, the earth is a rugged place. Everyone knows that Mt. Everest is the highest spot. Where is the lowest spot on earth?

The Mariana Trench, which at its deepest known point is 36,201 feet under the Pacific Ocean near Guam. This is over a mile deeper than Mt. Everest is high.

Weird!

Primates have well-developed hands and feet that can grab things. In fact, some South American primates have a fifth appendage that also can grasp. What is their fifth appendage?

Their tail. New World monkeys have a prehensile tail that can strongly grip things like tree branches. This leaves their four hands and feet free.

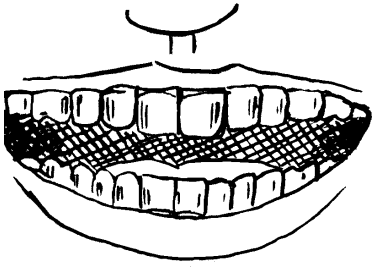
Listen!

There are two types of energy, and usually one can be changed into the other. Kinetic energy is what moving objects have; you can feel it when you catch a ball. What is the other type of energy?

Potential energy. Potential energy is what a fuel has before it is burned.

Really?

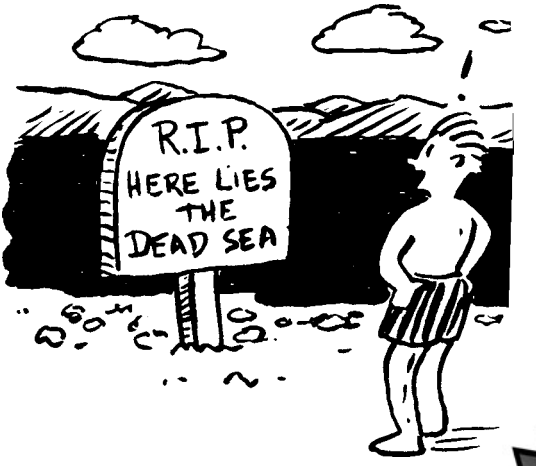
You have several different kinds of teeth. Your front teeth are sharp like chisels and can cut and tear tough food. Your back teeth are flat and broad for grinding food. What can you tell about an animal from its teeth?



What it eats and, to a certain extent, how it lives. An animal that lives by hunting will have sharp, pointed teeth. These will help it catch and eat prey. A cow, on the other hand, has mostly broad, flat teeth that help it grind up the grass and other plants it eats. Human teeth indicate that we eat a broad variety of foods.

Who Knew?

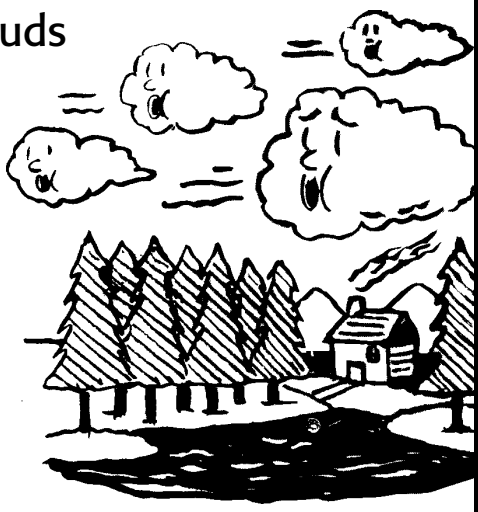
The lowest dry land on earth is the shoreline of the Dead Sea. It is just over 1,300 feet below sea level. How do you know that the Dead Sea is not connected to the ocean?



It is below sea level. If it were connected, the ocean would flood it.

Cool!

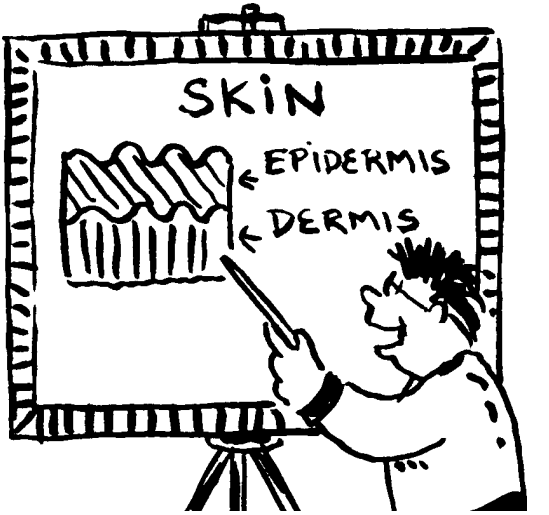
When a mass of dense, cold air moves into an area of warm air, the warm air rides up over the cold. This is called a cold front. Large, puffy clouds often mark a cold front. What often happens under a cold front?



Stormy weather—thunderstorms in warm weather and snow flurries in cold. If it is a warm front that is moving, it also rides up on the cold but produces overcast weather and long-lasting rain or snow.

Weird!

When an idea or observation is not very thorough, we say it is only "skin deep." How deep is the human skin?

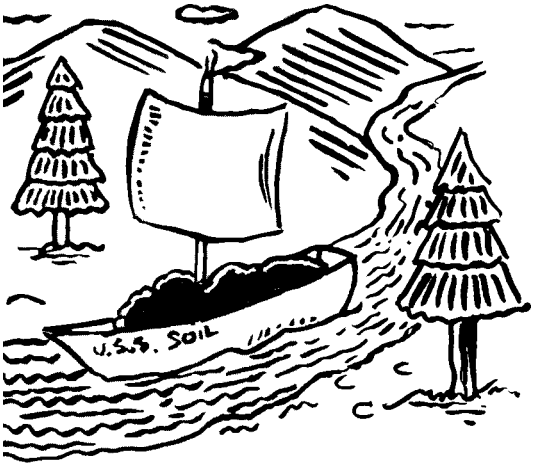


120

At its deepest point, the skin is only a few hundredths of an inch deep.

Fact!

Fast-moving water can carry soil many hundreds of miles down a river. What happens when the water slows down, such as when it enters an ocean or lake?



The soil drops out and a delta is formed. One of the best examples of this is where the Mississippi River flows into the Gulf of Mexico.

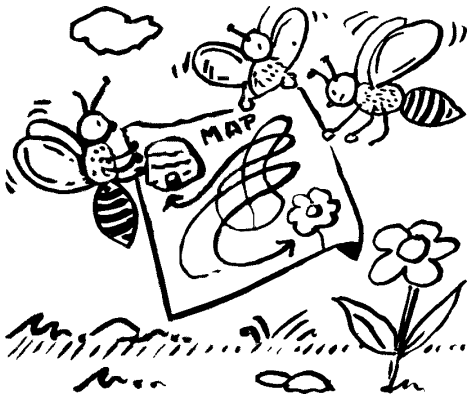
Cool!

Water can dissolve certain kinds of rocks. When this happens underground, caves and caverns are formed. What is the largest cave in the United States?

The largest known single cave is the Big Room in Carlsbad, New Mexico. It is 1,800 feet long, 225 feet high, and up to 1,100 feet wide. However, the longest known cave system, over 150 miles long, is the Flint-Mammoth cave system, in Kentucky.

Listen!

Animals communicate in many ways. Humans use speech and other messages. Some animals communicate with smell. How do bees communicate the location of food plants?

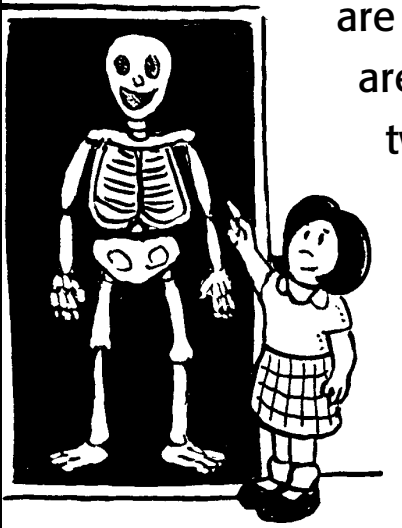


123

With a dance. The bee waggles in a figure-8 dance with a straight portion across the center. The straight portion indicates the direction, while the number of figure-8 patterns indicates the distance.

Fact!

The human skeleton is composed of more than 200 bones. Some are movable, some are not. What are the two main functions of the skeleton?



Support and protection. The skeleton is the frame upon which the body is constructed. Linked together with ligaments, the larger bones are as strong as metal girders. Some bones, such as those in the skull, are fused together and provide protection for organs such as the brain.

science challenge

Level 2

Listen!

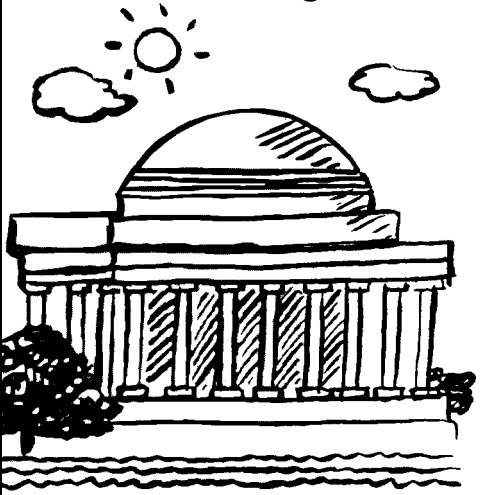
Rivers and stream flow into lakes or oceans. What force causes the movement of the water in streams and rivers?

125

Gravity. Lakes and oceans are always lower than the rivers and streams that feed them.

Fact!

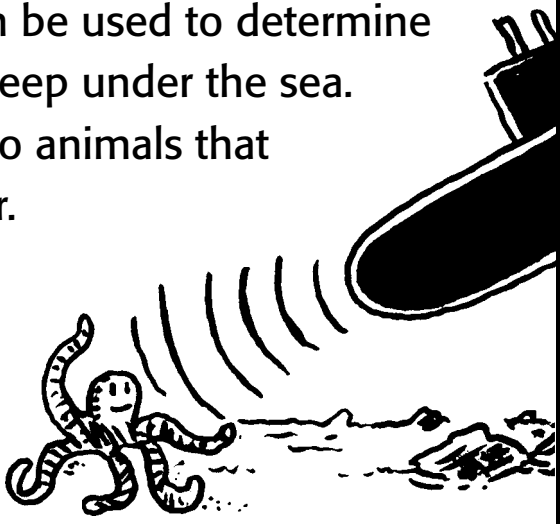
The rocks that make up the earth are both useful and beautiful. Often, rocks such as granite, which is very hard and durable, are used in buildings. What is used to cut rock into building blocks?



Harder rocks such as diamonds. Special saws with diamond teeth are used to cut granite into building blocks.

Really?

Many "new" human developments do what nature has done for thousands of years. For example, sonar can be used to determine what is deep under the sea. Name two animals that use sonar.



Bats, whales, porpoises, and dolphins all use sonar. We know the most about bats. Their sonar is much more sophisticated than the machines that humans build. Bats can not only determine shapes but also the fine details of targets.

Fact!

Work is a measure of energy used to move an object over a distance using some outside force. Juan and his backpack weigh 200 pounds. Katie and her backpack weigh 100 pounds. If Juan walks 500 feet and Katie walks 1,000 feet, who did the most work?

They both did exactly the same amount of work—100,000 foot-pounds of work.

Neat!

The oldest living plants on earth are about 4,600 years old. These are the bristlecone pines found in the Rocky Mountains. How old are the longest-living animals?

The longest-living animals are probably turtles. Box turtles have been known to live for as long as 100 years. The larger tortoises may live for 200 years.

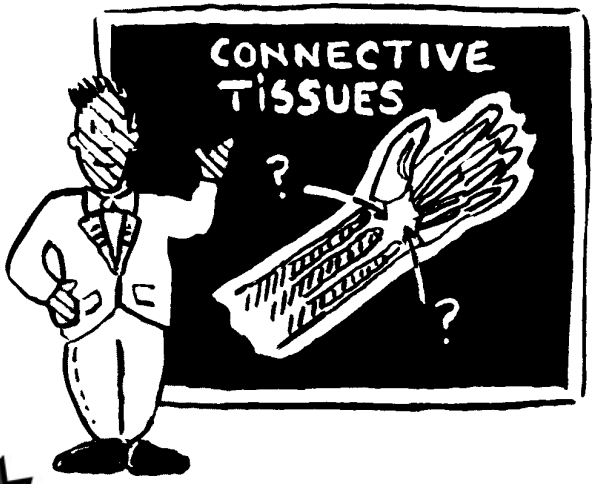
Weird!

Potential energy comes from the position or condition of an object. Kinetic energy comes from an object's motion. How could you show these two kinds of energy in a croquet ball?

A croquet ball on a sloping lawn has potential energy. If you hit it, it has kinetic energy.

Fact!

Connective tissues connect organs and other tissues together. The tissues that connect bones and muscles are called by different names. What are these tissue called?



Ligaments connect two bones together, and tendons connect muscles to bones.

Really?

For many animals, a tail is an important part of the body. How are tails useful to animals?

Monkeys and opossums use their prehensile tails as an extra "hand" and for balance. Cows and horses use tails as fly swatters. Fish use tails as rudders in swimming. A beaver uses its flat tail to swim and for slapping the water to warn of danger. Lizards can shed their tails to escape predators.

Neat!

A waterfall is a very exciting thing to see. The power of falling water is so great that it can be harnessed to do work. How is water power used by people?

Falling water was once used to turn waterwheels and run all kinds of machinery that ground flour, sawed lumber, and ran looms to weave fabrics. Today, falling water is used to power huge turbines that produce electricity.

Weird!

The largest frog in the world is named the goliath frog (*Rana goliath*). It is found in the Cameroons region of Africa. How big is this giant frog?

Rana goliath is 1 foot long. Imagine what it might sound like when it croaks!

Fact!

The joints that allow the body to move are the result of combinations of bone and muscle. How many joints does a baseball pitcher use to throw a curve ball?

Counting all the joints in his fingers, a pitcher will use seventeen different joints in his arm and hand in pitching any ball. But there are joints in his legs and feet that he uses too.

Fact!

Heat is energy. If you heat a cup of water, its particles will move faster than those in a cup of ice water. What happens to particles in melting ice?

The particles on the surface of the ice move faster than those within the ice. They collide with the slower-moving particles and give them energy. The slower-moving ice particles begin to move faster. As they move faster, they move further apart, which we can observe as melting.

Who Knew?

You have more than 600 muscles in your body. Some muscles are in use all the time, but you may not be aware of them. What do these muscles do?

Heart muscles pump blood through your body. Stomach muscles help digest foods. Diaphragm muscles help you breathe. Tiny muscles in your ears help you hear!

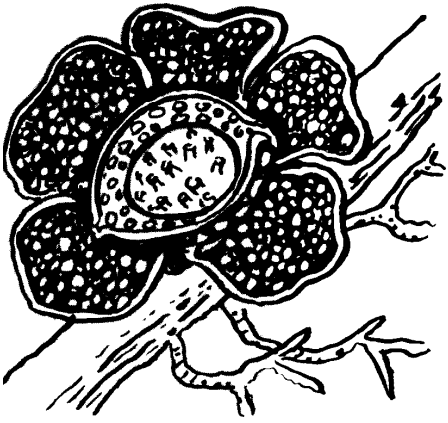
Look!

Clay soil has very tiny particles. These particles are only a little denser than water. When clay is mixed into water, it is called a colloidal state. What does this colloidal state look like?

The particles are too small to see individually, so this state will look muddy! Because the particles of clay are so tiny and only a little denser than water, it will take a long time for the clay to settle out.

Weird!

If you like things to be big, you might enjoy growing a monster flower! Rafflesia is a flower that grows and blooms in Malaya and Borneo. How big is Rafflesia?



Rafflesia measures up to 3 feet across. It is brown and purple and parasitic on other plants. If you wanted to grow it, your neighbors would probably object because it has a scent like rotting meat!

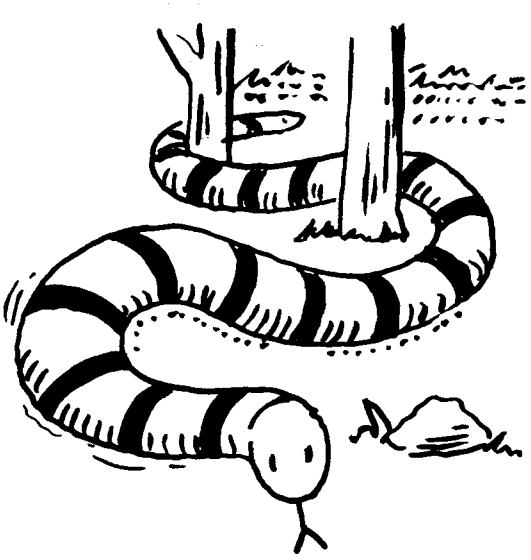
Neat!

Your bones are extremely strong and at the same time, very light. Because they are light, you can move easily and quickly when you need to be speedy. How much do an adult's bones weigh?

In a 160-pound man, the bones will weigh only 29 pounds.

Really?

The forked tongue of a snake looks like a stinger as it flickers in and out of its mouth. Is the tongue of a snake actually a stinger?



No. A snake's tongue is more like a nose. They use their tongues to help them smell. Snakes also use their tongues like feelers to touch things.

science challenge

Level 2

Really?

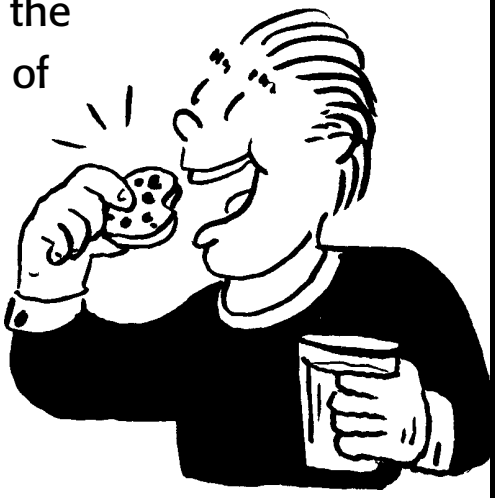
One of the most important organs of your body is your skin! It is also the largest organ. How does your skin protect you?

It protects against harmful sunlight and bacteria, controls your body temperature, and keeps the body from drying out. The skin also picks up messages from your environment. Nerves in the skin relay messages to the brain.

142

Cool!

The temperature of an object is a measure of its kinetic energy. You nibble a warm cookie. What can you tell about the kinetic energy of the cookie versus your cold milk?



The temperature of the cookie is higher than that of the milk because the kinetic energy of the cookie particles is higher than the kinetic energy of the milk particles. A useful analogy is to think of a thermometer as a molecular speedometer.

Look!

Floods take place every year somewhere in the world. They do great damage because of two characteristics of flooding. What two characteristics cause most flood damage?

increases in the volume and velocity of water. The standing water damages homes and crops. The fast-flowing stream carries away structures, soil, rocks, and boulders, and erodes riverbanks.

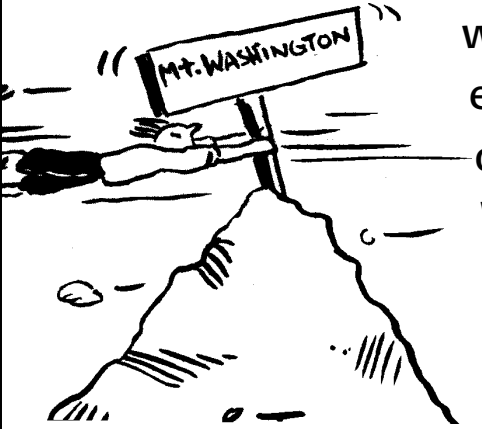
Really?

Anthropologists can tell the sex of a person, their age to within a few years, and their health by their bones. How can bones tell so much about a person?

Bones grow and change as we grow older. Certain structures are shaped differently in men and women. Broken bones and bones that have been stressed by disease are distinguishable from healthy bones.

Who Knew?

Chicago is known as the "Windy City." But there are much windier places. One of these is Mount Washington, New Hampshire.

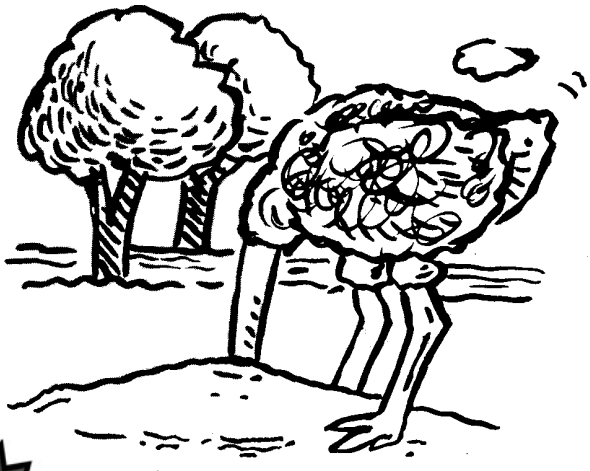


What is the highest wind speed ever recorded on Mount Washington?

On April 12, 1934, the weather station on top of Mount Washington recorded a blast that measured 231 miles per hour!

Weird!

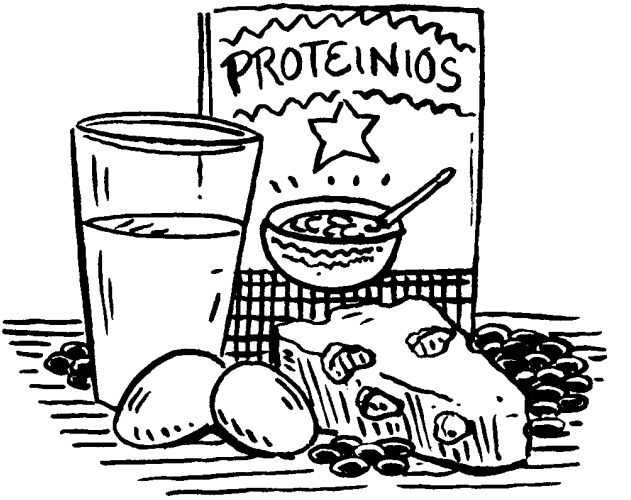
Some people believe that ostriches bury their heads in the sand to escape danger. But this is not the way that these birds protect themselves. How do ostriches really escape danger?



Ostriches cannot fly, but they can run at speeds of about 40 miles an hour. They can also deliver ferocious kicks!

Fact!

Protein is an important part of a good diet. It is called one of the building blocks of life. How is protein important in your diet?



Protein is used to make parts of every cell in your body. Even your bones, which are mostly compounds of calcium and phosphorus, have small amounts of protein.

Neat!

Heat energy can be transferred between objects. When you iron, heat is transferred from the iron to the cloth. Where does the heat energy in a hot sidewalk come from?

The heat from the sidewalk comes from the sun. The sidewalk can actually store some heat, and on a very hot day will feel quite warm hours after sundown.

science challenge

Level 2

Look!

Thousands of years ago, great sheets of ice called glaciers covered parts of northern Europe and North America.

How can we tell where the glaciers were?

150

Some glaciers still exist in all parts of the world. Geologists have studied their effect on the land around them. Glaciers leave scratches and gouges on rocks as they move. They also pile up debris in hills called moraines. Moraines are found in places where there are no glaciers today. Rocks that bear the marks of glaciers are also found near moraines.

Really?

When a football player kicks a field goal or a pitcher delivers a curve ball over the plate, one special type of joint enables them to do this. What kind of a joint is it?

Both the football player and the pitcher depend on ball-and-socket joints in the shoulder and hip. Ball-and-socket joints are the most movable type and allow movement in several directions.

Weird!

Animals such as squid, snails, and clams are mollusks. Most of these animals are not very large. But some giant clams are enormous! How big do some clams get?

The class called Tridacna gigas can be up to 54 inches long, and it can weigh as much as 579 pounds.

Really?

Everyone has heard of the "wise old owl" but is an owl truly wise? Probably not. Crows and geese may be wiser than the owl. What is the most intelligent bird?

Probably the gray parrot. Gray parrots have been taught to count, to learn colors, and to say many words. Unlike other parrots, they seem to know the meaning of some words—and use them properly.

Cool!

Your skin helps regulate your body's temperature. How does it do this?

When you get too warm, you perspire. As the moisture on your skin evaporates, you feel cooler. This is because heat that evaporates the sweat is drawn from the skin. When you are cold, you get goose bumps—your skin's effort to minimize heat loss.

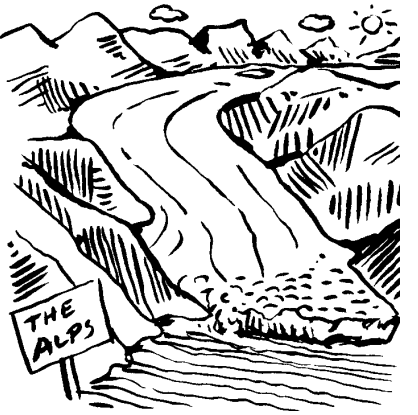
Fact!

The weather near large lakes is changed by what meteorologists call the "lake effect." How do large lakes affect weather?

Large lakes provide a source of moisture and stabilize temperatures. Prevailing winds passing over the water pick up moisture and release it over the shoreline, causing heavy snows in winter. Because water cools less quickly than air, lakes also tend to prevent sharp temperature changes on land nearby.

Who Knew?

In the Alps, most of the mountains over 13,000 feet have at least one glacier. In the Rocky Mountains of Colorado, there are mountains over 13,000 feet. But they have fewer, smaller glaciers. Why?



The Colorado Rockies may not receive as much snow as the Swiss Alps do and most of it melts. Much of the moisture that comes from the Pacific Ocean is lost to the mountains of the West Coast.

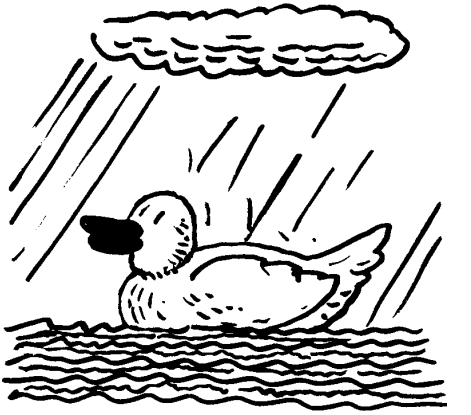
Fact!

The grasses are the most common plants in the world. The oldest cultivated plant, wheat, is a member of the grass family. How long have people been growing wheat?

People have grown wheat for about 10,000 years. It is still one of the most common grains throughout the world.

Weird!

Ducks spend much of their time in the water, but their feathers never seem to get wet. Why are ducks able to stay dry?



Ducks' feathers are waterproof because of the oil that covers them. An oil gland near the duck's tail supplies oil. Ducks pick up some of the oil on their bills and spread it over their feathers. If you have ever seen a duck preening its feathers, this is what it was doing.

Really?

Mistletoe, which is used for holiday decorations, is actually a parasite that grows and feeds on trees. It is different from most parasitic plants in one way. What is that difference?

Mistletoe is green. This indicates that some form of photosynthesis occurs in the plant's leaves. However, mistletoe requires a host plant to supply minerals and water.

Listen!

Stacey is preparing for an important track-and-field competition. Her coach told her to eat a high-carbohydrate diet. What are carbohydrates?

160

Carbohydrates are foods that supply energy that can be released quickly. There are three kinds of carbohydrates—sugar, starches, and fiber. Fruits such as apples and pears contain high amounts of sugar. Bread and pastas contain starch. Peas and beans have large amounts of fiber.

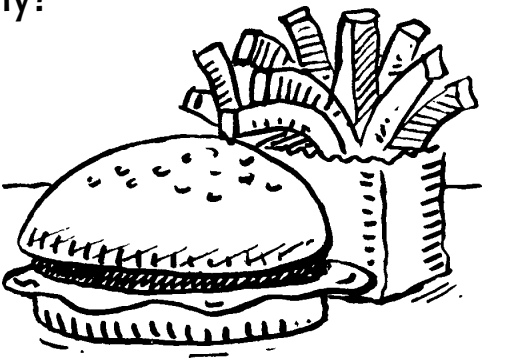
Really?

Long ago, Native Americans discovered that fire could be produced by rubbing two pieces of dry wood together. You can get a similar effect by rubbing your hands together. What produces this heat?

It is friction, produced by mechanical energy. The same kind of energy can produce enough heat to start a fire when two pieces of wood are rubbed together.

Listen!

Many people like to eat at fast-food restaurants. But a hamburger and French fries every day may not be the best kind of diet. Why is this not healthy?



Both the hamburger and the French fries are high in fat. Hamburgers have a lot of saturated fat (fat that comes from animal products). French fries are cooked in oil, an unsaturated fat (which comes from plants), which they tend to absorb. Fats should make up less than 30 % of your diet for good health.

Fact!

Rocks require a lot of force to break. Road builders use jackhammers and dynamite to break up rocks. But in nature, rocks are broken up by another method. What breaks up rocks naturally?

Water and temperature changes cause the forces that break up rocks.

Look!

Most meteors burn up when they enter earth's atmosphere. You may have seen them on a summer night as falling stars. Large meteors have fallen on earth, however. How do we know that?

Meteors leave craters on the earth's surface. The largest identified meteor crater is the Vredefort Ring in South Africa. It measures 188 miles across and may be two billion years old. Meteorites, meteors that reach the ground without completely burning up, have also been found. The largest is the 60-ton Hoba meteorite.

Weird!

Has anyone ever called you a "bonehead"? You should not be upset. Bones in the skull serve a very important function. They protect your brain. How many bones are in your skull?

It's hard to believe, but there are eight bones in your skull proper! There are another fourteen in the face and six in your ears. Anthropologists can tell a person's age by examining the bones of the skull. In adults, these bones are fused.

Neat!

Have you ever heard the expression, "blind as a bat"? Bats are not actually blind, but they do not see well. How are bats able to fly at night without bumping into things?

Bats use echolocation (sonar) to find their way. They make high-pitched squeaks that create sound waves. The sound waves bounce off any nearby object. Bats hear the sound waves as echoes and can steer clear of objects and each other!

Who Knew?

Red is a color that you often see in fruits such as apples and tomatoes. It is produced by a special pigment. Even red flowers contain this pigment. What is the pigment called?

The pigment is anthocyanin. Its colors can range all the way from pale pink to deep purple.

Fact!

Rondell sprained his ankle. The doctor told him to soak his ankle in warm water and afterward to apply hot towels. How is the heat traveling throughout Rondell's ankle?

The heat is penetrating Rondell's ankle by direct contact. When heat energy moves directly from a source to an object, the process is called conduction.

Listen!

Did you know that water is a nutrient? You could go without food for several weeks, but you cannot go without water for more than a few days. What makes water so important?

The human body is 60% water on average. Your cells are mostly water. Your blood is mostly water and it carries other nutrients to all parts of your body. Water helps get rid of waste materials. Water, given off through sweat, helps to cool your body. You also lose water in your breath.

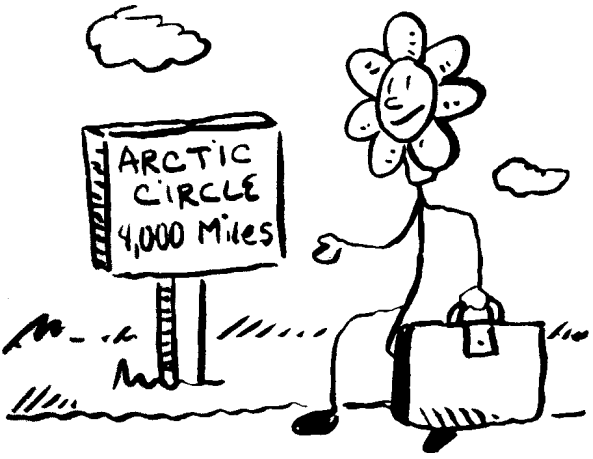
Cool!

The Grand Canyon is one of the scenic wonders of the United States. It has been forming for millions of years. Was the Grand Canyon formed by glaciers?

No, the Grand Canyon was formed by water cutting through rock. Some of this water may have come from Ice Age glaciers but most did not. It has taken millions of years to form the canyon.

Look!

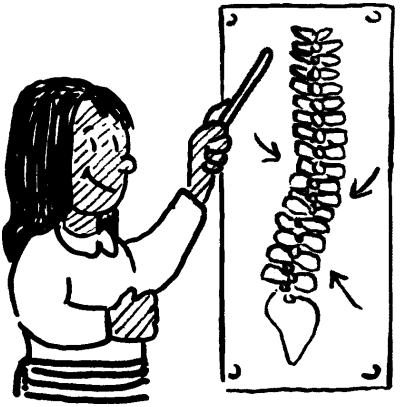
We are used to seeing many kinds of trees and flowering plants. This is because we live in a climate where plants grow quickly. Do plants grow above the Arctic Circle?



It's surprising to know that even though winter temperatures reach -60°F or lower, several flowers will grow and bloom in the Arctic summers. Trees do not grow in the Arctic, however.

Listen!

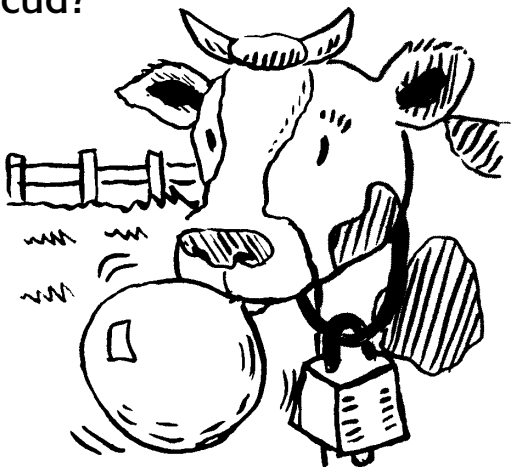
The spine is one of the most important body systems. It is made up of twenty-six separate bones and supported by muscles and ligaments. What makes the spine such an important part of the skeletal system?



The spine enables humans to stand upright. It supports the ribs and the skull and acts as a conduit for the nervous system.

Weird!

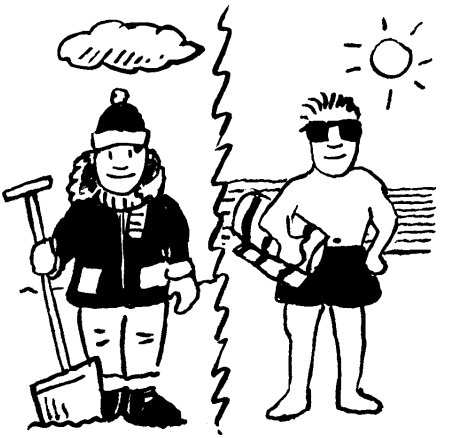
Have you ever watched cows standing in a pasture? They seem to be chewing gum! But they really are chewing cud, a wad of tough grass fibers. Do other animals chew their cud?



Yes, cows, goats, sheep, deer, and camels all chew cuds. These animals belong to a group called ruminants. Ruminants have special stomachs that break down plant foods that are hard to digest.

Who Knew?

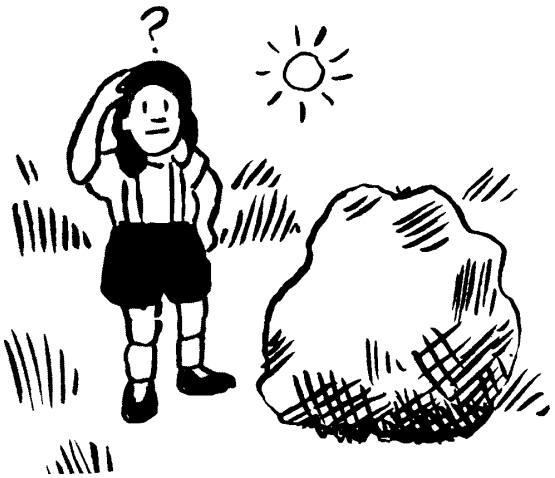
Because you cannot see air, it is hard to believe that it has density. But it does. Which is denser, warm air or cold air?



Cold air is denser than warm air. This is the reason why warm air rises. But as warm air rises, it gives off some of its heat, becomes cooler, and starts to sink. This process causes convection currents. If you have ever seen hawks or sailplanes (gliders) climbing, it is these convection currents (called thermals) that are carrying them higher.

Look!

You are walking across a flat field and find a large boulder. This rock is made from material that is not present in other rocks less than 50 miles away. How did the boulder get to the field?



It was probably carried there by a glacier during the Ice Age. These boulders are called erratics and are quite common in areas that show other signs of glaciation, such as moraines.

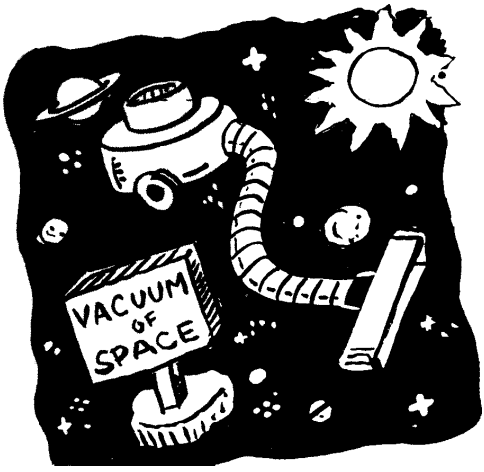
Look!

When you breathe in, your diaphragm muscle contracts and makes your chest cavity bigger. Why does air flow in when your diaphragm contracts?

When your chest cavity gets bigger, the air pressure inside it drops. Outside air, which is under higher pressure, flows into your lungs. When your diaphragm relaxes, the opposite happens.

Fact!

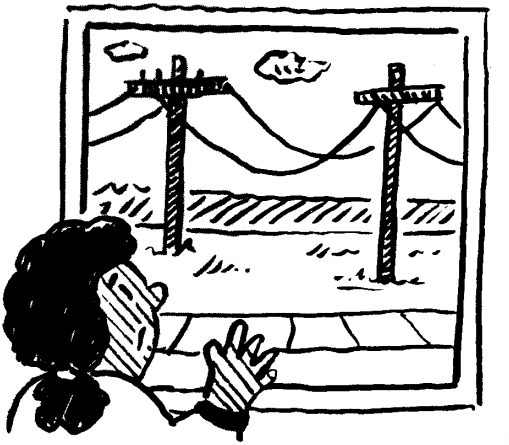
When you touch something hot, it is easy to see how heat is conducted to your hand. However, most of the heat on earth comes from the sun. How does the sun's heat get here?



The same way that light gets here—as radiation. Electromagnetic waves carrying energy in many different forms travel through space at the speed of light.

Listen!

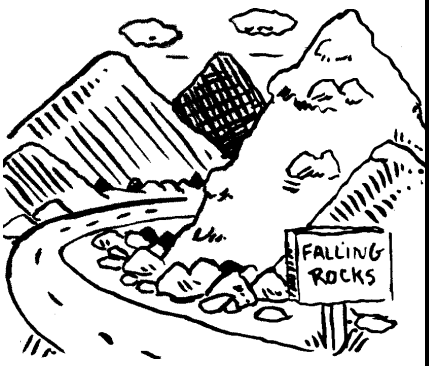
Last winter Nicole moved into a brand-new house. The telephone and power wires in front ran straight from pole to pole. One day in July she noticed that the wires had drooped down. Is this a problem?



No. What she is seeing is the property of most substances to expand when they are warm and contract when cold.

Who Knew?

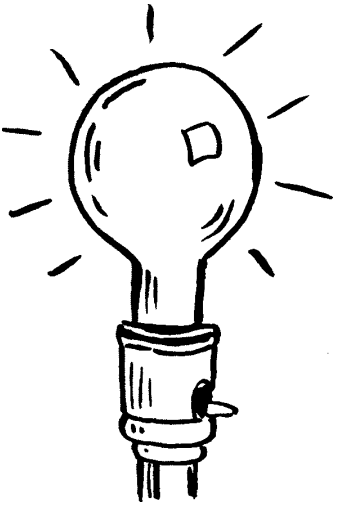
Mountains wear down at a rate of about one foot every 900 years, producing small particles that are carried away by water or wind. Often these particles pile up and turn back into rock. What kind of rock is made this way?



Sedimentary rock. Sandstone is a good example of the end product of this process. Limestone is also a sedimentary rock, but it is usually produced in the ocean by chemical action.

Fact!

You use energy every day for light, transportation, and warmth. Energy can be changed but not created or destroyed by ordinary mans. Where does the energy go after you've used it?



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Almost all of it is given off as waste heat. For example, most of the energy given off by a light bulb is heat, the energy of a car is converted to heat by its brakes as it slows down, and the heat from your furnace eventually leaks into the outside environment.

Neat!

Cameras are an important part of our lives. Without cameras, we couldn't take pictures. The first camera was invented in 1839. It did not use film. What did the first camera use to make pictures?

The first cameras used strips of copper called plates. These plates were covered with silver iodide, a chemical that changed when light touched it. Developing the chemical with mercury made the picture appear. This image is called a daguerreotype after its inventor, Louis-Jacques-Mandé Daguerre.

Cool!

Want to see a rainbow? Fill a jar with water and place it in a sunbeam on a windowsill. Put a piece of white paper on the floor where the sunbeam hits. What makes the rainbow?

When sunlight passes through the glass jar and the water, it is bent (refracted). Each color in the light bends a little differently. Violet bends most and red bends least.

Who Knew?

Cloning has been in the news a lot. What is a clone? Where do clones occur naturally?

A clone is a plant or animal that is genetically identical to one parent. It is produced asexually. Plants such as ferns and fungi that reproduce by spores are clones.

Fact!

When you get sick, the cause could be either bacteria or a virus. What is the basic difference between a bacterium and a virus?

A bacterium (plural, bacteria) is a single-celled organism. They can live in all natural environments. A virus is a parasite. It cannot reproduce, or usually even live very long, outside of a host cell. Bacterial infections can be treated with antibiotics, but antibiotics have no effect on viruses.

Cool!

How is swimming in the Dead Sea different from swimming in a lake? What happens if you try to dive underwater?

The surface water of the Dead Sea is about eight times saltier than seawater, and it gets saltier the deeper you go. Saltwater is denser than freshwater, so swimmers are much more buoyant. If you tried to dive, you'd float back up to the surface.

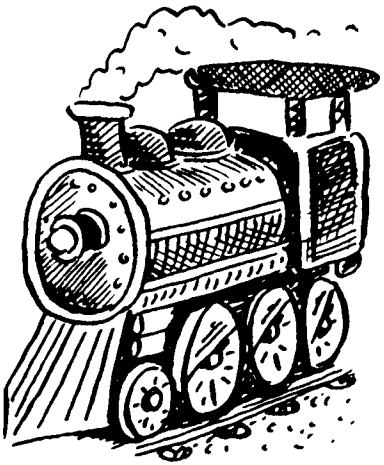
Weird!

You probably have some pairs of jeans hanging in your closet. But did you know you also have pairs of genes in your body? What are genes? Where do your genes come from?

Genes are the basic pieces of hereditary information. Genes, or combinations of them, are what determine your height, hair color, eye color, and many other traits. You get one gene from your mother and a matching gene from your father.

Listen!

Have you ever listened to a train whistle as a train goes by? What happens as the train gets closer? As it passes and moves farther away?



As the train moves closer, the whistle's pitch gets higher. As it moves away, the pitch drops. This is called the Doppler effect.

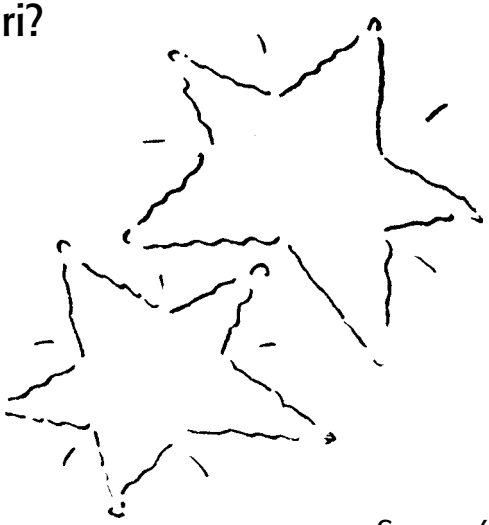
Look!

What is the star closest to earth (not counting the sun)? How far away is it?

The closest star is actually a cluster of three stars, called Alpha Centauri. The closest, Proxima Centauri, is 4.3 light-years away.

Really?

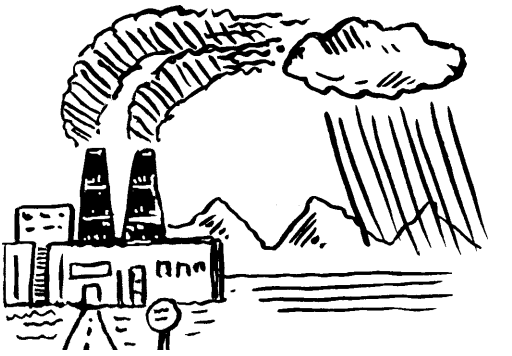
The starlight you see when you look at Alpha Centauri in the heavens isn't the same light that's leaving the star system today. How long ago did the light you see leave Alpha Centauri?



A light-year is the distance light can travel in space in one year. If Alpha Centauri is 4.3 light-years away, the light you see left the star 4-1/3 years ago!

Fact!

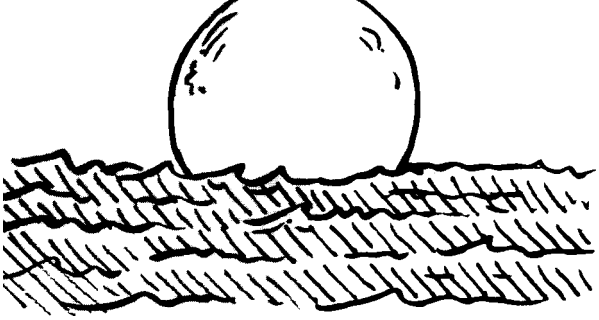
You may have heard stories about the greenhouse effect on the news. What is the greenhouse effect? Why are scientists concerned about it?



Water and carbon dioxide in earth's atmosphere trap heat from the sun and reflect it back to the surface. Without greenhouse gases, earth would be so cold that even the oceans would freeze. Burning gasoline and coal releases more carbon dioxide into the atmosphere. If we add too much, the earth could warm up, causing global climate change.

Who Knew?

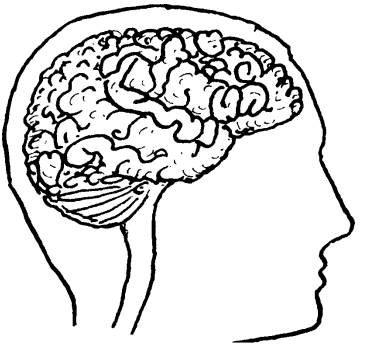
The level of the ocean rises and falls on the beach, usually twice a day. These changes are called tides. What causes high and low tides?



The gravitational pull of the moon on ocean water causes tides. Tides are high in the areas of the earth directly facing and directly opposite the moon. Other areas experience low tides. As the earth rotates, the areas of high and low tides change.

Weird!

Has anyone ever told you that your wires are crossed? When it comes to your body, they're right. The nerves from each side of your body cross at the base of your brain. What effect does this have?



With a few exceptions, the right side of the brain controls the left side of the body, and vice versa. If the right side of a person's brain is damaged, the effects will show up on the left side of the body.