

Section 1

Science and Scientists

Key Concept Scientists benefit society in many ways by asking questions and carefully investigating to find the answers.

What You Will Learn

- Methods of scientific investigation include research, observation, and experimentation.
- The work of scientists benefits society in a number of different ways.
- Scientists work in all kinds of jobs.

Why It Matters

Asking questions about how things work can help you find solutions to everyday problems.

What is science? You may already be more of a scientist than you think! To be a scientist, you start by observing the world around you. Then you ask questions about your observations. And that's part of what science is all about.

Starting with a Question

The knowledge gained about the natural world by investigation is called **science**. Asking a question is often the first step in the process of gathering knowledge. The world around you is full of things that can lead you to ask questions, such as those in **Figure 1**.

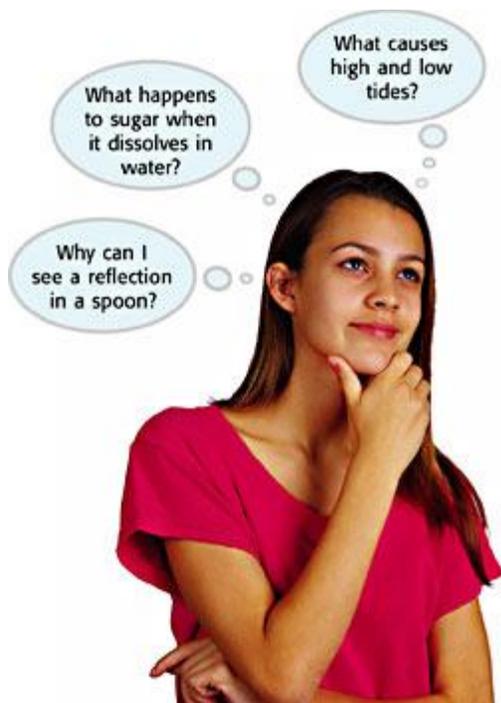


Figure 1 Part of science is asking questions about the world around you.

In Your Own Neighborhood

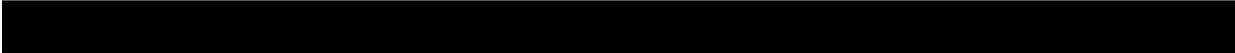
Take a look around your school and around your neighborhood. Most of the time, you take things that you use or see every day for granted. However, one day you might look at something in a new way. That's when a question hits you! The student in **Figure 1** didn't have to look very far to realize that she had some questions to ask.

The World and Beyond

Do you think you might get tired of asking questions about things in your neighborhood? Then just remember that the world is made up of many different places. You could ask questions about deserts, forests, or sandy beaches. Many different plants and animals live in each of these places. And then there are the rocks, soil, and flowing water in these environments.

But Earth is not the only place to look for questions.

You can look outward to the moon, the sun, and the planets in our solar system. And beyond that, you have the rest of the universe! There seem to be enough questions to keep scientists busy for a long time.



Investigation: The Search for Answers

Once you ask a question, it's time to find an answer. Scientific progress is made by asking meaningful questions and conducting careful investigations. There are several different methods that you can use to start your investigation.

Standards Check What are two key steps needed to make scientific progress?

□ Research

You can find answers to some of your questions by doing research. You can look up information in books, on the Internet, and in other sources. You can find information by reading about an experiment that someone did. Be sure to think about where the information you find comes from. You want to use information only from reliable sources.

Observation

You can find answers to questions by making careful observations. For example, if you want to know if cloud type and weather are associated, you could make daily observations. By recording the types of clouds that you see each day and that day's weather, you may find associations between the two.

Experimentation

You can answer some of your questions by doing an experiment, as shown in **Figure 2**. A well-planned experiment will put a *hypothesis*, which is a trial explanation, to the test.



Figure 2 This student is doing an experiment to find out how her reflection changes in different mirrors.

Research, observation, and experimentation all go together. Your research might help you plan your experiment. And you'll need to make careful observations. What do you do if you can't do the experiment yourself? For example, what do you do if you want to see how a rat runs through a maze while in space? Don't give up! Do more research, and try to find the results from someone else's experiment!

Applying the Answers

Although people cannot use science to answer every question, they do find some interesting answers. But do any of the answers really matter? Absolutely! As you study science, you will see how it affects you and everything around you.

Saving Lives

Using science, people have come up with several answers to the question, How can people be protected during an automobile accident? One answer is to require people to wear seat belts. Other answers include designing and building cars that are made of stronger materials and that have air bags. **Figure 3** shows how air bags are tested under scientific conditions. In this way, science helps make cars safer.

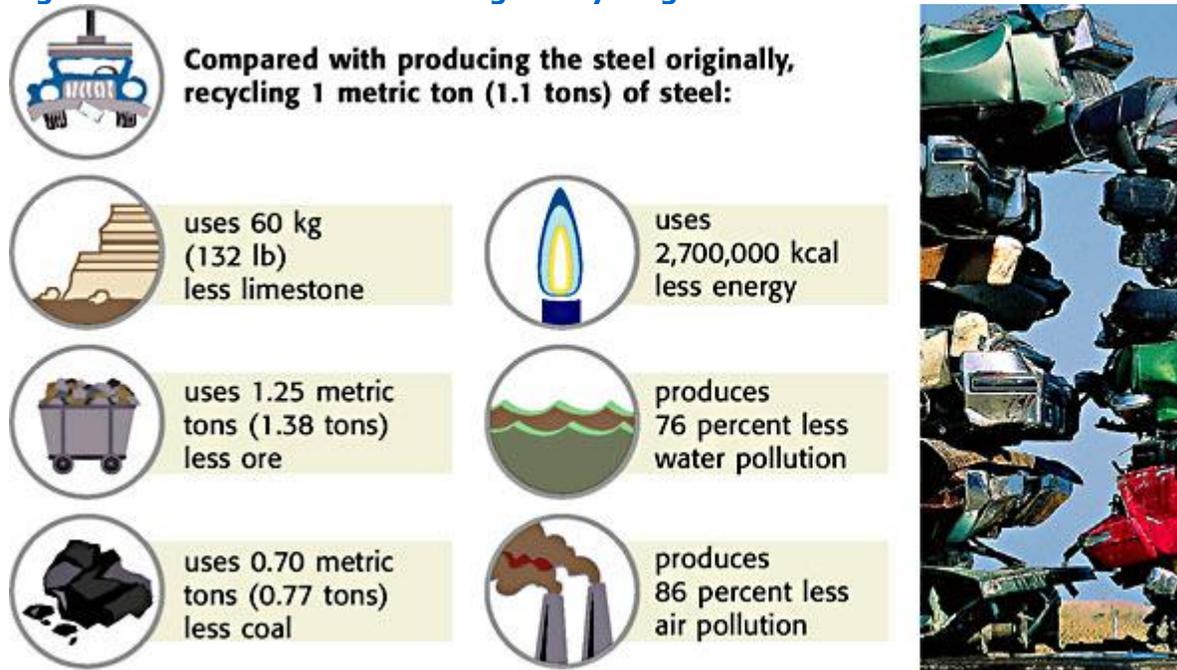


Figure 3 The results of this test are used to improve air bags.

Saving Resources

Science has also helped answer the question, How can resources be made to last longer? Recycling is one answer. Science has helped people invent ways to recycle a variety of materials. For example, when a car becomes worn out or is wrecked, its steel can be recycled and used to make new products. And recycling steel saves more than just the steel, as shown in **Figure 4**. Using science, people develop more-efficient methods and better equipment for recycling steel, aluminum, paper, glass, and even some plastics. In this way, science helps make resources last longer.

Figure 4 Resources Saved Through Recycling



Protecting the Environment

Science has helped answer the question, How can the ozone layer be protected? Scientists have found that substances called chlorofluorocarbons (KLAWR oh FLUR uh KAHR buhnz) (CFCs), which can be found in aerosols (spray-can products), have had a role in damaging the ozone layer. Also using science, people have made other substances that can take the place of CFCs. These substances do not harm the ozone layer.

Why does the loss of this layer matter? The ozone that makes up this layer protects everything on the planet from a harmful type of light called ultraviolet (UV) light. Without the protection of the ozone layer, higher levels of UV light would reach the ground. Higher rates of skin cancer could result. By finding ways to reduce the use of these chemicals, we can help protect the environment and make the world a healthier place.

Standards Check Give three examples of important questions that scientists have asked.



Scientists Everywhere

Believe it or not, scientists work in many different places. Any person who asks questions and investigates how things work could be called a scientist. Keep reading to learn about a few jobs that use science.

Meteorologist

A *meteorologist* (MEE tee uhr AHL uh jist) is a person who studies the atmosphere. One of the most common careers that meteorologists have is that of weather forecaster. But some meteorologists specialize in—and even chase—tornadoes! These meteorologists predict where a tornado is likely to form. Then, they drive very near the site to gather data, as shown in **Figure 5**. These data help meteorologists and other scientists understand tornadoes better. A better understanding of tornadoes helps scientists more accurately predict the behavior of these violent storms. The ability to make more-accurate predictions allows scientists to give earlier warnings of storms, which helps reduce injuries and deaths caused by storms.



Figure 5 These meteorologists are risking their lives to gather data about tornadoes.

Geochemist

Look at **Figure 6**. A *geochemist* (JEE oh KEM ist) is a person who specializes in the chemistry of rocks, minerals, and soil. Geo chemists determine the economic value of these materials. Many geochemists work for oil companies. They also try to find out what the environment was like when these materials formed and what has happened to the materials since they first formed.



Figure 6 This geochemist takes rock samples from the field. Then, she studies them in her laboratory.

Ecologist

To understand the behavior of living things, you need to know about their surroundings. An *ecologist* (ee KAHL uh jist) is a person who studies a community of living things and their nonliving environment. Ecologists work in many fields, such as wildlife management, agriculture, forestry, and conservation.

Volcanologist

Imagine working right at the edge of a 1,000°C pool of lava, as seen in **Figure 7**. That's where you might work if you were a volcanologist! A *volcanologist* (VAHL kuh NAHL uh jist) is a scientist who studies volcanoes. Volcanologists must know the structure and the chemistry of Earth and its rocks. They must also understand how volcanic materials such as lava interact with air and water. This knowledge helps volcanologists learn how and why volcanoes erupt. If volcanologists can predict when a volcano will erupt, they can help save lives.



Figure 7 Volcanologists study volcanoes. Many volcanologists study volcanic patterns in order to predict when a volcano will erupt.

Science Illustrator

You may be surprised to learn that there is a career that uses both art and science skills. *Science illustrators* draw scientific diagrams, such as the one in **Figure 8**. Good science illustrators are needed in areas like biology and medicine, where accurate and clear diagrams are important.

Science illustrators often have a background in art and a variety of sciences. However, some science illustrators focus on one area of science. For example, some science illustrators draw only

medical diagrams. These diagrams are used in medical textbooks or in brochures that patients receive from their doctors.



Figure 8 A science illustrator drew this diagram so that students can learn about the digestive system in birds.

Section Summary

- Scientific progress is made by asking meaningful questions and conducting careful investigations.
- Three methods of investigation are research, observation, and experimentation.
- Science affects people's daily lives. Science can help save lives and resources and can help improve the environment.
- There are several types of scientists and many jobs that use science.

