

Careers in Science

Reading Preview

Key Concepts

- What are the three main branches of science?
- Why is important for scientists in different fields to work together?
- How is science important in nonscience careers?

Target Reading Skill

Using Prior Knowledge Before you read, look at the section headings and visuals to see what this section is about. Then write what you know about scientists in a graphic organizer like the one below. As you read, continue to write in what you learn.

What You Know

1. There are different fields of science.
- 2.

What You Learned

- 1.
- 2.

Lab
zone

Discover Activity

What Do Scientists Look Like?

1. On a sheet of paper, draw a picture of a scientist at work.
2. Compare your picture to that of a classmate.
3. Use both of your pictures to list the characteristics of a "typical" scientist.

Think it Over

Inferring Where do you think your ideas about typical scientists come from?

How would you like to live and work on an island? Can you work under challenging conditions, such as extreme heat? Would you like to hike and explore new places? Would you enjoy flying in helicopters? If you answered yes to these questions, maybe you should consider becoming a scientist!

This job description probably doesn't match your idea of what a scientist does. But it accurately describes the work of a volcanologist, a scientist who studies volcanoes. Volcanologists do such things as collect and study samples of molten rock after a volcano has erupted. Other scientists can be found at work in the oceans, in laboratories, on glaciers, and in outer space. Wherever people are asking questions and searching for answers, they are using the skills of scientific inquiry.



Earth science:
Volcanologist



Branches of Science

How many different science careers can you name? Your list would probably include such careers as astronauts, doctors, and engineers. But would it also include crystallographers—scientists who study the three-dimensional structure of chemicals? How about ornithologists—scientists who study birds? As you can see, the term *scientist* spans many diverse fields and interests.

Because the areas of scientific study are so diverse, scientists organize their work into three major branches, or fields of study. **The three main branches of science are earth and space science, physical science, and life science.**

Earth and Space Science Earth and space science is the study of Earth and its place in the universe. Some earth scientists study the forces that have shaped Earth throughout its long history. Others study Earth's oceans or its weather. Space scientists study the planets and stars that exist beyond Earth.

Physical Science Physical science includes the study of energy, motion, sound, light, electricity, and magnetism. It also includes chemistry—the study of the tiny particles that make up all things, from flowers to stars.

Life Science Life science is the study of living things, including plants, animals, and microscopic life forms. Life scientists also study how living things interact with each other and with their surroundings. The study of the human body is part of life sciences, too.

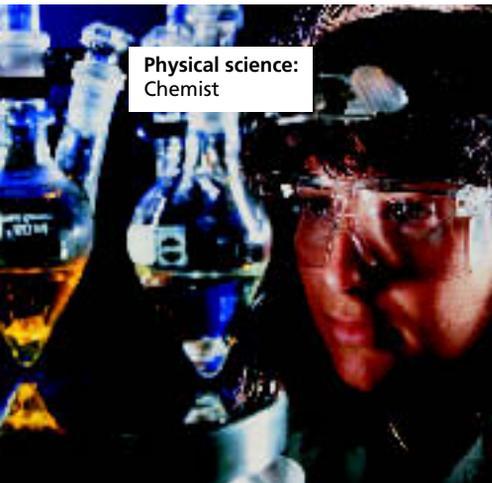


What topics of study does physical science include?

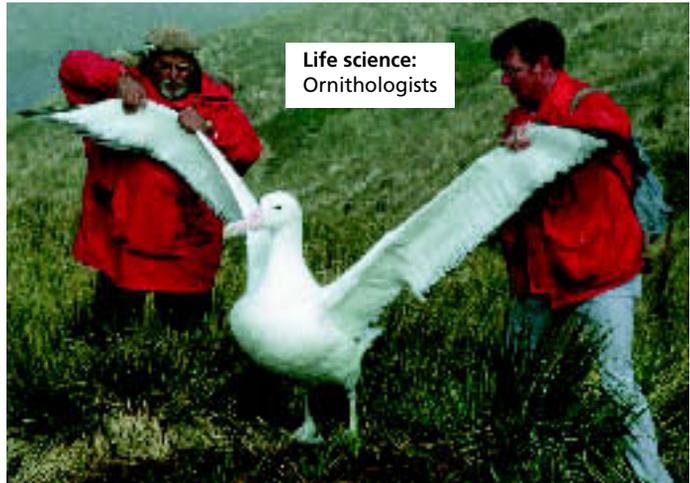
FIGURE 19

Branches of Science

The diverse topics of scientific study can be classified into three main branches: earth and space science, physical science, and life science. **Classifying** Which branch of science includes the study of clouds?



Physical science:
Chemist



Life science:
Ornithologists

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Scientists Working Together

Although it is convenient to think of science as divided into three branches, these areas are not really separate at all. Most scientific questions being investigated today span the different fields of science.

If you have ever worked on a difficult jigsaw puzzle with friends, then you can understand how scientists study questions and solve problems. One friend might work on one corner of the puzzle, while you work on another. Similarly, a physical scientist might investigate one piece of a scientific “puzzle” while an earth scientist works on another piece of the same puzzle. As you read about two scientific questions being investigated today, you can see how they involve the cooperation of a wide range of scientists.

Exploring Beyond Earth Will it someday be possible for humans to live in space? The International Space Station was designed in part to study this question. In orbit since 1998, the space station has been home to many crews, who stay for months at a time. On board, scientists explore the challenges of living in space. On the ground, hundreds of other scientists make the work of the crew possible.



Reading
Checkpoint

How is scientific inquiry similar to assembling a jigsaw puzzle?

FIGURE 20

The International Space Station
The International Space Station continually travels around Earth, about 400 km above the ground.

Posing Questions *What questions are the scientists who work on the space station trying to answer?*



FIGURE 21

Exploring Space

It takes the work of many scientists to address the challenges of living in space.

Astronauts

Some astronauts pilot the space station, while others carry out experiments. They may study how living in space affects muscle strength or whether crops can be grown in space.



Computer Scientists

On Earth, computer scientists design programs that manage many aspects of space flight, from keeping the temperature stable to controlling the space station's robotic arm.



Food Scientists

Eating in space is a challenge. Food scientists develop foods for space flights that are easy to use, nutritious, and, perhaps most importantly, tasty!



Materials Scientists

Materials scientists study the properties of materials such as ceramics to understand how they would perform in the harsh environment of space.



A soybean-powered bus ▲

Developing a New Source of Energy Imagine boarding a bus that didn't run on gasoline—but on soybeans instead! Buses like these already exist in several cities. Fuels made from soybeans or other plant matter are called biofuels. Unlike gasoline and oil, biofuels burn cleaner and are readily available.

What kinds of plants make good fuels? What conditions do they need to grow? And how can the energy in plants be converted into fuels? These are questions that botanists, soil scientists, chemists, and many other scientists are working together to answer. The goal of all these scientists is to produce high-quality, inexpensive biofuels that do not contaminate, or pollute, the environment.



What are biofuels?

FIGURE 22

Developing Biofuels

Many scientists are studying biofuels as a promising new source of energy.

Predicting What problems might arise if the scientists on this project didn't communicate with one another?



Botanists

Fuel crops must be easy to plant, grow, and process. Botanists, or plant biologists, are studying soybeans, corn, trees, and fast-growing grasses as potential fuel crops.



Soil Scientists

Soil scientists provide information about soil conditions. They help identify crops that may be used for both producing fuel and for improving the soil.



Chemists

To obtain the best fuels, chemists analyze the chemical makeup in plants and experiment with various methods of producing fuels.

Piecing Information Together

Problem

How do the skills of observing and inferring help scientists piece together information?

Skills Focus

observing, inferring, predicting

Materials

- paperback book, cut into sections and stapled together
- paper
- pencil

Procedure

1. Examine the small section of the book your teacher gives you. Use your observation skills to list any facts you can state confidently about the book, including its characters, setting, or events.
2. Based on your observations, what can you infer the book is about? Write one or two sentences describing the book's storyline.
3. Get together with a partner and share your book sections, observations, inferences, and story descriptions.
4. Together, write a new one- or two-sentence story description based on your shared observations and information.
5. Get together with another pair of students. Repeat Steps 3 and 4.
6. After you have written your description of the story as a group of four, look back over all your story descriptions. Note how they have changed over time.



Analyze and Conclude

1. **Observing** Look over the list of observations you made in Step 1. Were any of the observations really inferences? If so, explain why.
2. **Inferring** How confident did you feel about the inference you made about the storyline in Step 2? How did your confidence level change when your observations included additional sections of the book?
3. **Predicting** How do you think your level of confidence would change if you observed more and more sections of the book? Explain your reasoning.
4. **Communicating** Write a paragraph explaining how this activity resembles the work of scientists. How do the observations and inferences you made relate to those that scientists make? What do your story descriptions represent?

More to Explore

Choose a scientific article from a newspaper or magazine. Read the article and identify three observations and three inferences that the scientists made.

FIGURE 23

Careers and Science

A knowledge of science is useful in many nonscience careers.



A chef uses knowledge about the chemistry of food and cooking.



A painter understands the chemistry of paints.

Science in Nonscience Careers

Are scientists the only people who need a knowledge of science on the job? The answer, of course, is no. **In many nonscience careers, a knowledge of science is essential in order to perform the job.** Just a few of the careers that involve science are presented here.

Chef Whether cooking a simple meal or creating a dessert masterpiece, chefs rely on science in the kitchen. Did you know that scrambling an egg involves chemistry or that living organisms are the key to baking delicious breads and cakes? And would you know how to prevent food from spoiling and causing sickness? A lot of science goes into what you eat!

Artist You might be surprised to learn that the work of artists involves science. Sculptors must know about the properties of the materials they use. For example, would bronze be a good material to use for an outdoor sculpture? Glass artists apply the physics of heating and cooling as they shape glass. And painters must understand the properties of the paints, paper, and other materials they work with.

Sound Technician From concert halls to radio stations, sound technicians are busy behind the scenes. Their job is to make sure that the sound quality is at its best. Sound technicians must understand how sound waves travel and how they interact with different materials. Most sound technicians use electronic equipment to adjust the sound quality in different situations.



What is one way that science is involved in an artist's career?



A sound technician uses knowledge about how sound waves travel.



A firefighter must understand the chemistry of fire.

Firefighter When a fire alarm goes off, firefighters do not know what type of fire they will encounter. Is it a grease fire, an electrical fire, or something else? Did you know that some materials actually catch on fire if you spray them with water? Understanding chemistry helps firefighters put out fires and clean up hazardous spills quickly and safely.



What is one way that science is involved in an artist's career?

Section 4 Assessment

Target Reading Skill Using Prior Knowledge
Review your graphic organizer and revise it based on what you just learned in the section.

Reviewing Key Concepts

- a. Listing** What are the three major branches of science?
b. Describing Write a one-sentence description of each of the three branches of science.
c. Classifying Into which branch of science would you classify the following scientists: a scientist studying the organisms in a river; a scientist studying how a river first formed?
- a. Identifying** Give an example of a scientific investigation that involves scientists from different branches working together.
b. Problem Solving How might an Earth scientist studying volcanoes work together with scientists in each of the other branches of science?

- a. Reviewing** Why should nonscientists study science?
b. Applying Concepts How would a knowledge of science benefit a gardener?
c. Making Judgments A friend tells you he doesn't need to study science because he doesn't even know what career he'll want to pursue. What would you tell your friend?

Lab zone At-Home Activity

Help Wanted With a family member, look through the job listings in a local newspaper. Cut out four listings—two for science careers and two for nonscience careers. For the science careers, identify the branch of science and the educational background required. For the nonscience careers, identify what science knowledge is needed to perform the job.