

# SCIENCE

What common substance contains sodium fluoride? ➔ page 211

## THE WORLD OF Science

The Latin root of the word “science” is *scire*, meaning “to know.” There are many kinds of knowledge, but when people use the word *science* they usually mean a kind of knowledge that can be discovered and backed up by observation or experiments.

The branches of scientific study can be loosely grouped into the four main areas shown below. Each branch of science has more specific areas of study within it than can be listed here. For example, zoology

includes entomology (study of insects), which in turn includes lepidopterology (the study of butterflies and moths)!

In answering questions about our lives, our world, and our universe, scientists must often draw from more than one discipline. Biochemists, for example, deal with the chemistry that happens inside living things. Paleontologists study fossil remains of ancient plants and animals. Astrophysicists study matter and energy in outer space. And mathematics, considered by many to be both an art and a science, is used by all scientists.

### Physical Science

**ASTRONOMY**—stars, planets, outer space

**CHEMISTRY**—properties and behavior of substances

**PHYSICS**—matter and energy

### Life Science (Biology)

**ANATOMY**—structure of the human body

**BOTANY**—plants

**ECOLOGY**—living things in relation to their environment

**GENETICS**—heredity

**PATHOLOGY**—diseases and their effects on the human body

**PHYSIOLOGY**—the body’s biological processes

**ZOOLOGY**—animals

### Earth Science

**GEOGRAPHY**—Earth’s surface and its relationship to humans

**GEOLOGY**—Earth’s structure

**HYDROLOGY**—water

**METEOROLOGY**—Earth’s atmosphere and weather

**MINERALOGY**—minerals

**OCEANOGRAPHY**—the sea, including currents and tides

**PETROLOGY**—rocks

**SEISMOLOGY**—earthquakes

**VOLCANOLOGY**—volcanoes

### Social Science

**ANTHROPOLOGY**—human cultures and physical characteristics

**ECONOMICS**—production and distribution of goods and services

**POLITICAL SCIENCE**—governments

**PSYCHOLOGY**—mental processes and behavior

**SOCIOLOGY**—human society and community life

## HOW DO SCIENTISTS MAKE DISCOVERIES? THE SCIENTIFIC METHOD

The scientific method was developed over many centuries. You can think of it as having five steps:

- 1 Ask a question.
- 2 Gather information through observation.
- 3 Based on that information, make an educated guess (hypothesis) about the answer to your question.
- 4 Design an experiment to test that hypothesis.
- 5 Evaluate the results.

If the experiment shows that your hypothesis is wrong, make up a new hypothesis. If the experiment supports your hypothesis, then your hypothesis may be correct! However, it is usually necessary to test a hypothesis with many different experiments before it can be accepted as a scientific law—something that is generally accepted as true.

You can **apply the scientific method** to problems in everyday life. For example, suppose you plant some seeds and they fail to sprout. You would probably **ask** yourself, “Why didn’t they sprout?”—and that would be step one of the scientific method. The next step would be to make **observations**; for example, you might take note of how deep the seeds were

planted, how often they were watered, and what kind of soil was used. Then, you would make an **educated guess** about what went wrong—for example, you might hypothesize that the seeds didn’t sprout because you didn’t water them enough. After that, you would **test** your hypothesis—perhaps by trying to grow the seeds again, under the exact same conditions as before, except that this time you would water them more frequently.

Finally, you would wait and **evaluate** the results of your experiment. If the seeds sprouted, then you could conclude that your hypothesis may be correct. If they don’t sprout, you’d continue to use the method to find a scientific answer to your original question.

### did you know?

More than 6,000 people die everyday because they don’t have safe drinking water. A lot of those people are kids.

In some countries, even water that looks clean can be full of bacteria. These bacteria cause serious illnesses like typhoid, dysentery, and cholera. That’s why LifeStraw, a drinking straw that filters out harmful bacteria, was invented in 2005. The LifeStraw, which is about the size of a fat pencil, uses a combination of mesh filters, iodine beads, and active carbon to make water drinkable. The best part? When the company starts mass-producing the LifeStraw, it should only cost about \$2 per person every year.

