Chapter 1

About Science

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1.4 Facts, Laws, and Theories

When a scientific hypothesis has been tested over and over again and has not been contradicted, it may become known as a **law** or *principle*. A scientific **fact**, on the other hand, is generally something that competent observers can observe and agree to be true. For example, it is a fact that a pill bug, commonly known as a roly-poly, is able to roll into a ball when it is disturbed (Figure 1.7). Anyone can watch it happen.

Photo Credit: Katya

FIGURE 1.7

A scientific fact: healthy pill bugs are able to roll into a ball when disturbed.

Scientists use the word *theory* in a way that differs from its use in everyday speech. In everyday speech, a theory is similar to a hypothesis—a statement that hasn't been tested. But in science, a **theory** is a synthesis of facts and well-tested hypotheses. The scientific theory tends to be overarching, explaining a wide range of observations.

Physicists use quantum theory to explain the behavior of light. Chemists have theories about how atoms bond to form molecules. Astronomers speak of the Big Bang theory to explain the origin of our Universe. And, in biology, the theory of evolution explains how the Earth's diversity of living things have come to be the way they are today.

Theories are a foundation of science, but they are not fixed. Rather, theories can evolve and change over time. Often, they pass through stages of refinement. For example, in chemistry, since the theory of the atom was proposed 200 years ago, it has been refined many times in light of new evidence. Theories in biology have also changed over time. The theory of evolution, for example, underwent important changes once scientists had learned more about how DNA, genes, and heredity worked.

Those who know only a little about science may argue that scientific theories can't be taken seriously because they are always changing. Those who understand science, however, see it differently: Theories grow stronger and more precise as they evolve to include new information.

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READING CHECK

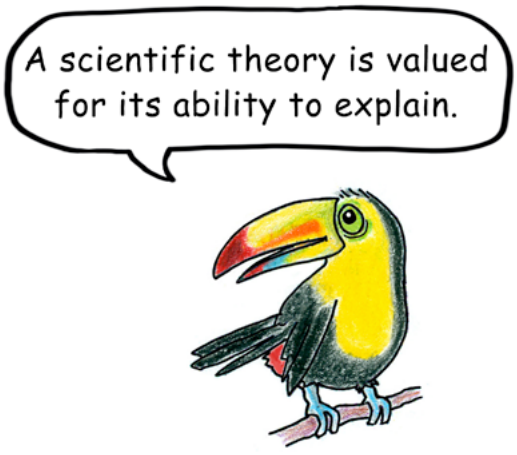
How is the word "theory" used differently in everyday speech compared to in science?

CHECK YOUR ANSWER

In everyday speech, most people use the word "theory" in a way that is similar to a hypothesis—to describe an idea that is uncertain, that has not been tested. In science, however, a theory is a synthesis of facts and well-tested hypotheses explaining a broad range of observations. Theories in science are well supported.

You can read more about scientific theories here:

https://www.livescience.com/21491-what-is-a-scientific-theory-definition-of-theory.html



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