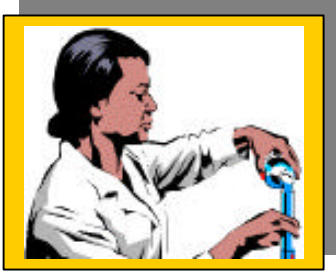


Exploring Origins

Theories in the Making

STUDENT TEXT

Science is different from other ways of understanding about the natural world in that it follows the formal processes of logic in reaching conclusions and encourages skepticism about its explanations. Scientists follow a process that has been dubbed "the scientific method" for observing and explaining natural phenomena. Observations are made, and from them multiple hypotheses may be developed. A hypothesis is a tentative description of the cause of what was observed. This preliminary explanation is used to direct further observations. Groups of hypotheses that explain relationships between related observations are called theories. For example, the hypotheses that the sun and planets revolve around the Earth and that the stars revolve around the earth on a sphere bigger than that of the sun and planets can be combined together to make the Geocentric Theory. A theory, in science, is an explanation for a class of phenomena.



When making observations or doing experiments in a new area, scientists use existing theories to aid their work and understanding. However, the scientists are aware that the theory may not explain all their results or observations.

When observations and experiments yield results that cannot be explained by existing theories, new theories are created to "replace the old ones." It is a requirement that the new theory explain everything that was explained by the old one, plus the new observation or experimental results. This replacement process does not mean that the old theory was wrong or false. It means that the old theory had limited applicability, and was replaced since it could not explain the new information.

Like literary myths, scientific theories describe and explain natural phenomena. However, a theory must be testable, and is not accepted as a belief. Scientists continually test theories to see how widely applicable they are, and how well they predict new observations or results of new experiments. To be testable, there must be some experiment that could be done or some observation that could be made that could disprove the theory.

Some people think that if theories are supported by enough observations then they become laws. Laws are different than theories in that laws are useful descriptions of natural events, such as the way gasses behave when heated or the way that objects move when subjected to a force. Laws do not try to explain why the gasses or the objects behave as they do; that is the role of the theories.

Consider what happens to rocks on Earth that are not supported. From our past experience and observations of rocks in these situations, we would predict that if we released a rock it would fall toward the earth. Isaac Newton made many observations of falling objects and formulated his Law of Gravity, which explains in detailed mathematical terms the force of attraction between objects like a rock and the Earth. The law does not try to explain why this force is present; it just describes the force. Scientists are still working on various theories of the cause of gravity and are looking for observations and evidence to support their theories.

