Hypothesis, Theories, and Laws

Words have precise meanings in science. For example, 'theory', 'law', and 'hypothesis' don't all mean the same thing. Outside of science, you might say something is 'just a theory', meaning it is a guess that may or may not be true. In science, a theory is an explanation that generally is accepted to be true. Here's a closer look at these important, commonly misused terms.

Hypothesis

A hypothesis is an educated guess, based on observation. Usually, a hypothesis can be supported or refuted through experimentation or more observation. A hypothesis can be disproven, but not proven to be true.

Example: Civil war soldiers often died not because of their injuries, but because of infection. The doctors did not understand why. One doctor thought that if they kept things clean, this would prevent some deaths. They started cleaning instruments and the death rate dramatically decreased. This supported the doctor's hypothesis that if instruments were cleaned, more soldiers would survive; however, it did not "prove" that all of the deaths from infection were caused by dirty instruments.

Law

A *law* is a hypothesis that has been tested over and over and has not been contradicted. Basically, if evidence accumulates to support a hypothesis, then the hypothesis can become accepted as a good explanation of an incident. One definition of a law is to say it's an accepted hypothesis. At the time it is made, no exceptions have been found to a law. Scientific laws explain things, but they do not describe why they are that way.

Example: Once multiple doctors saw that cleaning instruments reduced deadly infections, this idea was accepted as a scientific law. This law did not attempt to explain why this is so; it only stated the results of their tests based on their observations. Many scientific laws are considered to be "common knowledge" because they have been tested so often and not disproven.

Theory

A scientific *theory* summarizes a hypothesis or a group of hypotheses that have been supported with repeated testing. A scientific theory is a *general* statement intending to explain nature and is supported by all available evidence. It can be used to predict new, as yet unobserved incidents. A theory is valid as long as there is no evidence to dispute it. Therefore, theories can be disproven. One way to tell a law and a theory apart is to ask if the description attempts to explain "why." If so, it is a theory.

Example: Germ Theory is now used to explain why dirty instruments cause infection. It is the result of many scientists' work. It states that microscopic organisms found on dirty instruments cause disease, which can lead to the deadly infections experienced by soldiers. Cleaning these instruments remove many of these organisms, which reduces the occurrence of infection.

As you can see, there is no 'proof' or absolute 'truth' in science. The closest we get are **facts,** which are indisputable observations.

We work under the definition that to prove something implies it can never be wrong, and this is not appropriate in science.

If you're asked to define hypothesis, theory, and law, it is important is to realize they don't all mean the same thing and cannot be used interchangeably.

Taken from: http://chemistry.about.com/od/chemistry101/a/lawtheory.htm