

- **Science** is the systematic study (observation & experiments) of the natural world.
- A **hypothesis** is an educated guess, based on observation.

### Hypothesis Example:

- 1) If you see no difference in the cleaning ability of various laundry detergents, you might **hypothesize** that cleaning effectiveness is not affected by which detergent you use. You can see this hypothesis **can be disproven** if a stain is removed by one detergent and not another. On the other hand, you cannot prove the hypothesis.
- 2) If I brush my teeth every day, then I will not develop cavities.

### ▪ Scientific Model

Scientists often construct models to help explain complex concepts. These can be physical models, like **a model volcano** or **atom** or conceptual models, like predictive weather algorithms. A model doesn't contain all the details of the real deal, but should include observations known to be valid.

**Model Example:** The **Bohr model** shows electrons orbiting the atomic nucleus, much like the way planets revolve around the sun. In reality, the movement of electrons is complicated, but the model makes it clear protons and neutrons form a nucleus and electrons tend to move around outside the nucleus.

### ▪ Scientific Theory

A scientific **theory** summarizes a hypothesis or group of hypotheses that have been **supported with repeated testing**. A theory is valid as long as there is no evidence to dispute it. Therefore, theories can be disproven. Basically, if evidence accumulates to support a hypothesis, then the hypothesis can become accepted as

a good explanation of a phenomenon. One definition of a theory is to say it's an [accepted hypothesis](#).

### Theory Example:

- It is known that on June 30, **1908 in Tunguska, Siberia**, there was an explosion equivalent to the detonation of about 15 million tons of TNT.
- Many hypotheses have been proposed for what caused the explosion. It is theorized that the explosion was caused by a **natural extraterrestrial phenomenon**, and was not caused by man.
- Is this theory a fact? **No**. The event is a recorded fact. Is this this theory generally accepted to be true, based on evidence to-date? **Yes**. Can this theory be shown to be false and be discarded? **Yes**.

### ▪ Scientific Law

A scientific law generalizes a body of observations. At the time it is made, **no exceptions** have been found to a law. [Scientific laws](#) explain things, but they do not describe them. **One way to tell a law and a theory apart is to ask** if the description gives you a means to explain 'why'. The word "law" is used less and less in science, as many laws are only true under limited circumstances.

### Scientific Law Example:

Consider Newton's Law of Gravity. Newton could use this law to predict the behavior of a dropped object, but **he couldn't explain why it happened**.

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

## Summary:

- 1) **Law** is an observation; a **theory** is the explanation of that observation.
- 2) **Theory** requires experimentation under various conditions. A **law** has no such requirements.
- 3) **Theory** may become obsolete with time. This is not the case with a **law**.
- 4) **Theory** can be replaced by another better theory; however, this never happens with a **law**.
- 5) **Theory** may be strong or weak according to the amount of evidence available. A **law** is a universally observable fact.