

Development of Theories

Dana Desonie, Ph.D.

Say Thanks to the Authors

Click <http://www.ck12.org/saythanks>

(No sign in required)



AUTHOR

Dana Desonie, Ph.D.

To access a customizable version of this book, as well as other interactive content, visit www.ck12.org

CK-12 Foundation is a non-profit organization with a mission to reduce the cost of textbook materials for the K-12 market both in the U.S. and worldwide. Using an open-content, web-based collaborative model termed the **FlexBook®**, CK-12 intends to pioneer the generation and distribution of high-quality educational content that will serve both as core text as well as provide an adaptive environment for learning, powered through the **FlexBook Platform®**.

Copyright © 2012 CK-12 Foundation, www.ck12.org

The names “CK-12” and “CK12” and associated logos and the terms “**FlexBook®**” and “**FlexBook Platform®**” (collectively “CK-12 Marks”) are trademarks and service marks of CK-12 Foundation and are protected by federal, state, and international laws.

Any form of reproduction of this book in any format or medium, in whole or in sections must include the referral attribution link <http://www.ck12.org/saythanks> (placed in a visible location) in addition to the following terms.

Except as otherwise noted, all CK-12 Content (including CK-12 Curriculum Material) is made available to Users in accordance with the Creative Commons Attribution/Non-Commercial/Share Alike 3.0 Unported (CC BY-NC-SA) License (<http://creativecommons.org/licenses/by-nc-sa/3.0/>), as amended and updated by Creative Commons from time to time (the “CC License”), which is incorporated herein by this reference.

Complete terms can be found at <http://www.ck12.org/terms>.

Printed: November 16, 2012

flexbook
next generation textbooks



CONCEPT

1

Development of Theories

- Define the terms theory and law as they are used in science.



Do you have a theory about this couple?

“My theory on why she doesn’t want to go out with him any more is that he won’t let her see her friends.” While that might be why she doesn’t want to go out with him, the idea is not a theory. In common speech, the word theory is often misused. It is sometimes misused when referring to scientific ideas as well. What would be a better word to use?

Theory

Scientists seek evidence that supports or refutes a hypothesis. If there is no significant evidence to refute the hypothesis and there is an enormous amount of evidence to support it, the idea is accepted. It may become a theory.

A scientific **theory** is strongly supported by many different lines of evidence. A theory has no major inconsistencies. A theory must be constantly tested and revised. A theory provides a model of reality that is simpler than the phenomenon itself. Scientists can use a theory to offer reliable explanations and make accurate predictions.

A theory can be revised or thrown out if conflicting data is discovered. However, a longstanding theory that has lots of evidence to back it up is less likely to be overthrown than a newer theory. But science does not prove anything beyond a shadow of a doubt.

Laws

Many people think that any idea that is completely accepted in science is a law. In science, a **law** is something that always applies under the same conditions. If you hold something above the ground and let go it will fall. This

phenomenon is recognized by the law of gravity. A law explains a simpler phenomenon or set of phenomena than does a theory. But a theory tells you why something happens and a law only tells you that it happens.



FIGURE 1.1

The Leaning Tower of Pisa in Italy only appears to defy gravity.

Amazingly, scientific laws may have exceptions. Even the law of gravity does not always hold! If water is in an enclosed space between a hillside and a glacier, the weight of the glacier at the bottom of the hill may force the water to flow uphill – against gravity! That doesn't mean that gravity is not a law. A law always applies under the right circumstances.

Vocabulary

- **law:** An explanation that always applies under the same circumstances.
- **theory:** A hypothesis or group of hypotheses that have been repeatedly tested that have no significant evidence against them. A theory is testable and falsifiable.

Summary

- In science, a theory is an explanation of a much more complex phenomenon than a law describes. A theory tells why something happens.
- A theory can be used to predict future events.
- A law describes something that always happens under the same set of circumstances, but not why it happens. But even laws do not always hold.

Review

1. Compare and contrast hypothesis, theory, and law.
2. Can a theory become a law or a law become a theory? Can a hypothesis become a law or a theory?
3. Which of these, if any, is more important in science: hypothesis, theory, or law?