



EARTH SCIENCES: HISTORY

FOCUS: Man reached the moon in 1969. How has this accomplishment impacted your life?

PURPOSE: When you have completed this lesson, you should be able to do the following items.

1. Understand that the scientific community often rejects new ideas.
2. Give examples of ideas that came from unexpected findings.
3. Explain that the development of new ideas is often slow and a result of many different findings.
4. Identify and describe advances in life science that have had important long lasting effects.
5. Analyze emerging scientific issues such as resource depletion, exponential population growth, and global warming.

WHAT YOU NEED TO KNOW

TOPICS AND SCIENTISTS:

It is your responsibility to know these topics. This list is by no means a complete list. You must keep yourself current. Make time to read the newspaper daily. Make a file of newspaper clippings and copies of information from other sources about current "hot" topics. Use the Internet as a resource if you have access to it.

Plate Tectonics

1. Alfred Wegener proposed continental drift in 1912.
2. Harry Hess proposed sea-floor spreading in the 1960's.
3. The *Glomar Challenger* research ship gathered evidence of sea-floor spreading.
4. The Theory of Plate Tectonics was proposed in the 1960's.

Rock Cycle

1. James Hutton proposed uniformitarianism. He published views proposing the rock cycle in the 1700's.
2. The Principle of superposition identifies the age of rock by the layers.
3. Radiometric dating is used to determine absolute ages of rocks and fossils and to develop geologic time scales.

Universe

1. Ptolemy developed a geocentric model of the solar system in A.D. 140.
2. Copernicus developed a heliocentric model of the solar system in 1543.



3. Tycho Brahe measured the position of stars and planets over a period of twenty years. This was before the invention of the telescope.
4. Johannes Kepler inherited Tycho Brahe's notebooks and, after years of study, proposed three laws of planetary motion.
5. Galileo first used the telescope to study the skies and found evidence to support the heliocentric model.
6. Isaac Newton proposed the Universal Law of Gravitation that gave support to Kepler's laws of planetary motion.
7. Jan Oort proposed the idea that a cloud of comets surrounds the solar system.
8. The Protoplanet Hypothesis suggests how the solar system developed.
9. In 1995, amateur astronomers discovered a new comet, Hale-Bopp.
10. The leading theory of the creation of the universe is the big-bang theory.

Climate and Weather

1. Benjamin Franklin proposed that weather could be predicted.
2. In 1850, Joseph Henry began drawing weather maps from weather data.
3. The United States Weather Bureau was functioning by the late 1800's.
4. Wladimer Köppen developed a system of classifying climates in 1918.
5. Over the years, many scientists have debated the idea of global warming.

Modern Space Exploration

1. The launching of the *Sputnik I* satellite in 1957 is often considered the beginning of space exploration.
2. Satellites have a wide range of uses such as communication, data gathering, global positioning, and photography.
3. Probes are used to gather data from other planets, from far reaches of the solar system, and from beyond the solar system.
4. Man reached the moon in 1969 as part of the Apollo project.
5. The space shuttle was developed to be a reusable form of transportation for transporting people and supplies into space.
6. Many different types of telescopes are used to gather data from space.
7. The *Hubble Space Telescope* was launched in 1990.
8. *Mir* was the first space station developed for prolonged stays in space.
9. The *International Space Station* is in the process of being built by the joint effort of sixteen countries.

Resource Depletion

1. There are concerns that people are using the natural resources faster than they can be replaced.
2. The exponential growth of the human population means a greater need for more resources.
3. Rachel Carson's book, *Silent Spring*, caused a great deal of concern over human use and treatment of our resources.

ISSUES:

1. The general public and scientific community have rejected many ideas. Over time many ideas gained support or proved to be true.
 - a. Copernicus's idea of a heliocentric solar system



- b. Alfred Wegener's proposal of continental drift
- c. Tycho Brahe's study of planetary motion
2. Some ideas were limited by the context in which they were conceived.
 - a. Tycho Brahe's study of planetary motion without the use of telescopes
 - b. Copernicus's proposal of a geocentric solar system
3. There are many emerging issues today with strong supporters and opponents.
 - a. the big-bang theory
 - b. the global warming debate
 - c. the use of natural resources
 - d. the control of population growth
4. Some findings have been unexpected.
 - a. the discovery of Hale-Bopp
 - b. similarities of fossils, plants, rock development, and climate to support the idea of continental drift
5. Many ideas develop over a long period of time from input of many scientists' research.
 - a. the development of the Theory of Plate Tectonics
 - b. Benjamin Franklin's idea of predicting weather
 - c. the Laws of Planetary Motion by Kepler
6. Many advances have had long lasting effects for our lives.
 - a. space exploration
 - b. predicting the weather

GUIDED PRACTICE

1. Identify two reasons people might not support the big-bang theory.

2. Students face many issues. You must become well-informed to be a responsible adult. Identify two pros and two cons for the control of population growth.

3. Why was the evidence for continental drift unexpected?



4. The development of the Laws of Planetary Motion occurred over many years. Why did it take so long?
5. What could be some possible long-term effects of weather prediction?

INDEPENDENT PRACTICE

1. The importance of Wegener's proposal of continental drift was not recognized until several years after he died. How did the rock structures in Africa and South America bring about this recognition?
2. You must be an informed voter. Would you support limitations on the use of natural resources? Support your answer with a minimum of two reasons.
3. Why might the discovery of Hale-Bopp have been unexpected?
4. The belief in a geocentric solar system existed for hundreds of years. It took approximately 1600 years to disprove it. Why was this so difficult?



5. Identify some long lasting effects of studying earthquakes.

TEST PRACTICE

1. The building of the *International Space Station* will continue for a few more years. What are the possible benefits once it is completed?

2. Identify a discovery that was unexpected.

3. If the first satellite was launched in 1957, why did it take so long to get to the moon?

4. How could the unlimited use of natural resources have a lasting effect in your lifetime?



5. Identify the possible positives and negatives from the use of satellites.

CLOSURE

Let's return to the Focus section at the beginning of this lesson.

Reaching the moon was the first step in moving beyond the scope of our solar system. The immediate impact of this accomplishment has been the development of technology, especially in computerization. The everyday impact has been felt in the development of many by-products, such as satellite dishes and cellular phones.