

# *Discovery Science Library*

## *The Basics: Earth Science*

### Teacher's Guide

**Grade Level:** 6–8

**Curriculum Focus:** Earth Science

**Lesson Duration:** Three class periods

### **Program Description**

From global warming and plate tectonics to rain and amber, introduce middle school students to a wide variety of Earth science topics with these segments drawn from Discovery Channel School's award-winning series.

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### **Lesson Plan**

#### *Student Objectives*

- Discuss and define the term “scientific theory.”
- Watch segments from *Discovery Science Library: The Basics: Earth Science*.
- Work in small groups to draft an overview of one theory explored in the program, which includes details about the theory's evidence and significance.

#### *Materials*

- *Discovery Science Library: The Basics: Earth Science*
- Computer with Internet access
- Newsprint and markers

#### *Procedures*

1. Begin the lesson by asking students if they know what a “scientific theory” is. Write their ideas on a sheet of newsprint. Before continuing with the lesson, help students understand the following:
  - A scientific theory is an idea that is grounded in scientific evidence and explains a wide range of observations.
  - Over time, a scientific theory holds up. Many scientists working in different locations can corroborate the evidence for the theory.

- Scientists continue to find evidence to support a scientific theory.
  - A scientific theory adds to our growing understanding of the world and how it works.
2. Explain that students are going to watch the four segments in *Discovery Science Library: The Basics: Earth Science* that explore scientific theories— Extinction, Earth's Magnetic Field, Blue Hole, and Plate Tectonics.
  3. After students have viewed the segments, divide them into small groups of three or four. Ask each group to select a theory. (Try to make sure that all four theories are covered.) Have the groups draft an overview of their theory that includes the following information:
    - A brief summary of the theory
    - Evidence for the theory
    - The significance of the theory
  4. Give students time in class to work on their projects. Most of the information students need is in the segments, but they can visit the following Web sites for additional facts:
    - *Dinosaur Extinction Theory*  
<http://darwin.bio.uci.edu/~sustain/bio65/lec02/b65lec02.htm#Extinction>
    - *Earth's Magnetic Field*  
<http://www.crystalinks.com/corecrystal.html>
    - *Blue Hole*  
<http://www.caribbeantravelmag.com/article.jsp?ID=5106>
    - *Plate Tectonics*  
<http://www.enchantedlearning.com/subjects/astronomy/planets/earth/Continents.shtml>
  5. During the next class, give students a few minutes to meet with their groups and finish the overviews. Then ask for volunteers to present group overviews. Make sure that each theory is covered in the presentations.
  6. Conclude the lesson by asking students: What did you learn about scientific theories that you didn't know before? Why are scientific theories important? What can they teach us about the world?

## Assessment

Use the following three-point rubric to evaluate students' work during this lesson.

- **3 points:** Students were highly engaged in class and small-group discussions; produced a clear and accurate overview describing a scientific theory, with all the requested components.
- **2 points:** Students participated in class and small-group discussions; produced an adequate overview describing a scientific theory, with most of the requested components.

- **1 point:** Students participated minimally in class and small-group discussions; produced an incomplete overview describing a scientific theory, with little or none of the requested components.

## Vocabulary

### blue hole

*Definition:* A large, underwater cave in the Caribbean Sea, off Grand Bahama Island

*Context:* The presence of fossilized bat droppings and red dust, which probably blew in from the Sahara Desert when the cave was above sea level, are two pieces of evidence supporting the theory that this blue hole was once dry.

### continental drift theory

*Definition:* States that Earth was once a single giant landmass that separated and drifted apart over millions of years

*Context:* Alfred Wegener was the first scientist to propose the theory of continental drift, but it took more than 50 years before this idea was widely accepted.

### dinosaur extinction theory

*Definition:* States that a giant meteor struck Earth, changing the climate and bringing about the extinction of the dinosaurs

*Context:* Although not all scientists agree with the prevalent dinosaur extinction theory, it is clear that the extinction of the dinosaurs made it possible for mammals to dominate and diversify.

### Earth's magnetic field

*Definition:* The area between Earth's magnetic north and south poles; Earth's magnetic field is huge and extends into space.

*Context:* By studying lava flows, scientists have learned that the orientation of Earth's magnetic field changes; the last shift took place about 700,000 years ago.

### plate tectonics theory

*Definition:* States that Earth is divided into plates that are constantly moving

*Context:* The theory of plate tectonics states that earthquakes and volcanoes tend to occur in weak spots along the boundaries of plates.

### scientific theory

*Definition:* An idea that is based on scientific evidence, can explain a wide range of observations, and holds up over time



*Context:* Many scientific theories, such as the theory of continental drift and the theory of plate tectonics, are important because they help explain what our planet once looked like and how it continues to change.

## **Academic Standards**

### **Mid-continent Research for Education and Learning (McREL)**

McREL's Content Knowledge: A Compendium of Standards and Benchmarks for K-12 Education addresses 14 content areas. To view the standards and benchmarks, visit <http://www.mcrel.org/compendium/browse.asp>.

This lesson plan addresses the following national standards:

- Science: Earth and Space Sciences – Understands Earth's composition and structure
- Language Arts: Viewing – Uses viewing skills and strategies to understand and interpret visual media

### **National Academy of Sciences**

The National Academy of Sciences provides guidelines for teaching science in grades K-12 to promote scientific literacy. To view the standards, visit <http://books.nap.edu/html/nses/html/overview.html#content>.

This discussion guide addresses the following Grades 5-8 science standards:

- Earth and Space Science: Structure of the earth system; Earth's history
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## **Support Materials**

Develop custom worksheets, educational puzzles, online quizzes, and more with the free teaching tools offered on the Discoveryschool.com Web site. Create and print support materials, or save them to a Custom Classroom account for future use. To learn more, visit

- <http://school.discovery.com/teachingtools/teachingtools.html>
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## DVD Content

This program is available in an interactive DVD format. The following information and activities are specific to the DVD version.

### *How To Use the DVD*

The DVD starting screen has the following options:

**Play Video**—This plays the video from start to finish. There are no programmed stops, except by using a remote control. With a computer, depending on the particular software player, a pause button is included with the other video controls.

**Video Index**—Here the video is divided into sections indicated by video thumbnail icons; brief descriptions are noted for each one. Watching all parts in sequence is similar to watching the video from start to finish. To play a particular segment, press Enter on the remote for TV playback; on a computer, click once to highlight a thumbnail and read the accompanying text description and click again to start the video.

**Standards Link**—Selecting this option displays a single screen that lists the national academic standards the video addresses.

**Teacher Resources**—This screen gives the technical support number and Web site address.

### *Video Index*

#### **Segment 1: Global Warming (7 min)**

Learn the latest thinking about global warming. Find out what causes this phenomenon and the strategies scientists are considering to slow its progression.

*Pre-viewing question*

Q: What do you know about global warming?

A: Answers will vary.

*Post-viewing question*

Q: What two strategies are under consideration to control global warming?

A: Scientists are considering planting additional trees, which add oxygen to the atmosphere, and growing plankton in the ocean to add iron to the atmosphere, which would help reduce carbon dioxide levels.

#### **Segment 2: Air Currents (8 min.)**

Travel with Ellen MacArthur as she competes in a solo sailing race around the world. Learn about the different wind systems she must overcome.

*Pre-viewing question*

Q: What do you know about the Coriolis effect?

A: Some students may know that the Coriolis effect is the apparent moving of objects that results from the Coriolis force. As a result of the Earth's rotation, this force deflects moving objects to the right in the northern hemisphere and to the left in the southern hemisphere

*Post-viewing question*

Q: Which set of winds caused problems for Ellen on her journey?

A: The polar easterlies, which bring strong winds and high waves

**Segment 3: Soil Formation in America's Prairies (6 min.)**

Explore America's prairies. Learn about the importance of soil to the growth of prairie grasses, and discover the role fire plays in prairie ecology.

*Pre-viewing question*

Q: Why do you think the American prairie is a perfect place for grasses to grow?

A: Students may know that a combination of rich soil and a dry climate is perfect for the growth of grasses.

*Post-viewing question*

Q: What factors make prairie soil fertile?

A: Bacteria and fungi work together to break down plant remains into humus, a material that makes soil fertile. Then earthworms mix the soil and ingest large quantities of it. The earthworms excrete soil – now rich in nitrogen and other key ingredients – back into the ground.

**Segment 4: Extreme Erosion (5 min.)**

Discover how the Grand Canyon formed and what it reveals about Earth's history. Find out how scientists determine the age of the canyon's rocks and fossils.

*Pre-viewing question*

Q: Why do you think the Grand Canyon is an example of extreme erosion?

A: Students may mention that it is a large trench carved in the ground over many years, which is the result of erosion.

*Post-viewing question*

Q: What is the law of superposition?

A: The law of superposition states that in layers of rock, the oldest rock is the bottom layer and the newest rock is at the top.

**Segment 5: Rain (4 min.)**

Find out how water evaporates, condenses in clouds, and then falls as rain. Learn about rainfall in different parts of the world.

*Pre-viewing question*

Q: What causes rainfall?

A: Some students may mention the processes of evaporation, condensation, and precipitation.

*Post-viewing question*

Q: What is virga, and where does it take place?

A: Virga is precipitation that evaporates before reaching the ground. At the Grand Canyon, about six inches of precipitation experience virga.

**Segment 6: Extinction (5 min.)**

Learn why some scientists think the dinosaurs became extinct and the evidence that supports this theory. Discover what happened to other animals after the dinosaurs died out.

*Pre-viewing question*

Q: What theories do you know about the dinosaurs becoming extinct?

A: Answers will vary; some students may know that scientists believe a meteorite hit Earth that affected the climate, which led to the dinosaurs dying out and becoming extinct.

*Post-viewing question*

Q: What type of animal became dominant after the dinosaurs died out?

A: Small mammals grew, became dominant, and diversified.

**Segment 7: Amber (5 min.)**

What do scientists look for in amber? Find out what they can learn by studying plants and animals trapped in this material.

*Pre-viewing question*

Q: What is amber?

A: Some students may know that it is fossilized resin from trees.

*Post-viewing question*

Q: Why do scientists examine amber?

A: They look for plants and animals trapped and fossilized in amber over millions of years. Scientists can learn about animals living around the world during different time periods by examining the remains found in amber.

**Segment 8: Earth's Magnetic Field (7 min.)**

Find out about Earth's magnetic field and why it is constantly shifting. Travel to the town of Estel Muir in Scotland and observe how scientists study Earth's magnetic field.

*Pre-viewing question*

Q: What do you know about Earth's magnetic field?

A: Some students may know that Earth has a magnetic north and south pole that are not in the same locations as the geographic North and South Poles.

*Post-viewing question*

Q: How can scientists tell that Earth's magnetic field has shifted?

A: By studying lava flows in Steen's Mountain, Oregon, and other places, scientists can determine the orientation of Earth's magnetic field at different times, when the last shift took place, and when another one may occur.

**Segment 9: Thermal Factors (4 min.)**

Journey to Yellowstone and watch Old Faithful spew out water and steam. Learn what a caldera is, and find out how scientists determine the temperature of a geyser.

*Pre-viewing question*

Q: Where do you think Old Faithful gets its name?

A: Students may know that the name comes from the fact that it erupts regularly.

*Post-viewing question*

Q: What is a caldera?

A: It is a huge hole that remains after a volcanic mountain collapses. The hole is often filled with molten rock.

**Segment 10: Ocean Floors (6 min.)**

Travel underwater and explore the levels of the ocean floor. Begin at the continental shelf, descend to the ocean's deep zone, and observe many types of animals.

*Pre-viewing question*

Q: Why is it difficult to explore the deepest levels of the ocean floor?

A: Some students may know that the darkness, cold, and extreme pressure make it very difficult for humans to go there. The development of technology has opened up this frontier.

*Post-viewing question*

Q: Why do more animals live on the continental shelf than at other levels of the ocean?

A: The sun's rays penetrate the continental shelf so plants can grow there, and animals can eat the plants. Plants cannot grow at lower depths, so food is less plentiful.

**Segment 11: Blue Hole (3 min.)**

Enter a deep underwater cave, which scientists claim was once dry land. See what happens when freshwater and saltwater meet.

*Pre-viewing question*

Q: What do you think happens when freshwater meets saltwater?

A: Some students may know that the ocean appears to shimmer or shine. The water in that area is corrosive and can wear away limestone.

*Post-viewing question*

Q: What evidence do scientists have that the underwater cave was once dry?

A: The presence of fossilized bat droppings indicates that the cave was once dry land. Scientists have also found red dust, which may have come from the Sahara when the cave was above sea level.

**Segment 12: Plate Tectonics (5 min.)**

Learn about the theories of plate tectonics and continental drift. Find out the evidence that supports the theories.

*Pre-viewing question*

Q: What do you know about plate tectonics?

A: Answers will vary.

*Post-viewing question*

Q: What evidence supports the theory that the continents were once one landmass?

A: Scientists have found basalt in South America and Africa, which helps support the theory that these continents were once connected.