

## Assignment Discovery Online Curriculum

**Lesson title:**

How Islands Form

**Grade level:**

6-8, with adaptation for older students

**Subject area:**

Earth Science

**Duration:**

Two class periods

**Objectives:**

Students will understand the following:

An island is any comparatively small body of land completely surrounded by water.

Islands can form in several ways, including rising water level, growth of coral, and volcanism.

Plant and animal species can travel to islands by air or water.

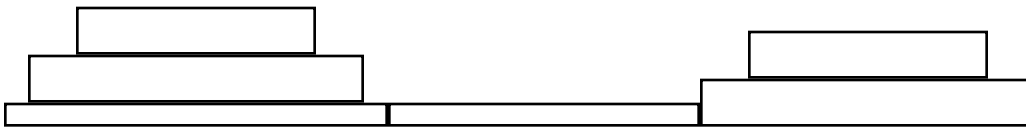
**Materials:**

- Globe or world map
- Internet access
- Relief maps showing geographic features of the Atlantic and Pacific ocean floors, available online at [www.nationalgeographic.com/resources/ngo/maps/physmaps/pacificb.html](http://www.nationalgeographic.com/resources/ngo/maps/physmaps/pacificb.html) and [www.nationalgeographic.com/resources/ngo/maps/physmaps/atlanticb.html](http://www.nationalgeographic.com/resources/ngo/maps/physmaps/atlanticb.html)
- Photographs of island types taken from space, available at “Earth from Space”: <http://earth.jsc.nasa.gov/categories.html> (optional)
- Encyclopedias, textbooks, and other library resources on islands
- Copies of Background Sheet: Three Ways to Make an Island
- Copies of Classroom Activity Sheet: Island Investigation
- Copies of Take-Home Activity Sheet: Island Hunting

**Procedures:**

1. Use a globe or a map of the world to point out to students that
  - most of Earth is covered by water;
  - Australia is the smallest island continent in the world;
  - Greenland is the world's largest island;
  - Great Britain, Japan, and Australia are island nations; and
  - Hawaii is an island state of the United States.
2. Now refer to relief maps, a globe, or a world map to show students that the surface of Earth has peaks and valleys and plateaus, some covered by water and others above water.

3. Next, distribute copies of the Background Sheet: Three Ways to Make an Island and review with students the three major ways that islands form. Refer students to the diagrams on the activity sheet.
4. Point out the polar ice caps on a map of the world or a globe. Explain that during the last ice age the ice caps were larger. More of Earth's water was frozen at the poles, and the oceans were shallower. Explain that sea levels rose dramatically at the end of the Ice Age as Earth warmed and the polar ice caps began to melt. When the ice melted, about 10,000 years ago, some bodies of land that had been connected to continents were cut off from the mainland and became islands. This is how the islands of New Zealand became isolated from the mainland of Australia.
5. Stack books on a desk to represent a mainland, a land bridge, and a body of land connected to the mainland, and have students refer to their activity sheets again. Explain that as sea levels rise, water submerges the land bridge, creating islands out of landmasses that were once connected.



6. Islands may also be formed by hardworking, coral-building sea organisms. Explain that among the creatures living in the seas are tiny animals called polyps. Polyps are related to jellyfish, but they live in colonies, and they protect their soft bodies by building limestone walls around them. As these colonies grow, they form reefs. Eventually, these reefs can cover hundreds of square miles. The polyps don't build their reefs above the surface of the water, but if the sea level drops or the land below the reef rises, the reef may emerge from the water. Then water-borne sand and wind-borne dust will accumulate on the reef and form an island. The Florida Keys are one example of coral reef islands.
7. Another way islands can form is through volcanism. Explain that volcanoes can erupt underwater as well as on land. With each eruption, lava flows build up. Over time, the volcano can grow above the surface of the sea, forming a volcanic island, such as those that make up Hawaii.
8. Explain that the way an island forms affects the range of species of plants and animals living on it. If the island is cut off from the mainland by rising sea level, then mainland species are likely to be living on it from the start. If the island forms as a volcano or as a coral reef, there may be no plants or animals living on it to begin with, and any species that does get established there has to have come from somewhere else. Animals can reach an island by traveling on floating objects in the ocean, such as trees, floating logs, or reeds. Plants and birds can reach an island by air.
9. Next, hand out copies of the Classroom Activity Sheet: Island Investigation and have students work in pairs or groups to prepare a presentation on one of the islands listed below.

Students can use printed library resources or the Internet to conduct their research. Presentations should include the following:

- A description of the island's location
- A brief description of the island's geography
- An explanation of how and when the island formed
- A description of at least one animal species that is found only on the island
- An explanation of how the species has adapted to life on the island

**Surtsey** is an island off the coast of Iceland. Referred to as “the newest place on earth,” it was formed by a volcanic eruption in 1963. See “Sandwort, Seabirds, and Surtsey,” <http://www.gi.alaska.edu/ScienceForum/ASF11/1132.html>.

**The Galapagos Islands** are located off the coast of Ecuador and have remained geographically isolated since they were formed three or four million years ago. Information can be found online at TerraQuest's “Virtual Galapagos,” <http://www.terraquest.com/galapagos>.

**Inaccessible Island** is located in the Tristan da Cunha group of islands in the South Atlantic. It is home to just one species of bird—the Inaccessible Island flightless rail, the smallest flightless bird in the world. See “Inaccessible Island,” [http://www.btinternet.com/~sa\\_sa/inaccessible\\_island/inaccessible\\_island\\_history.html](http://www.btinternet.com/~sa_sa/inaccessible_island/inaccessible_island_history.html).

**Madagascar**, the world's fourth-largest island, is home to some 40 species of lemur, an animal that evolved from what may have been a single pair of mammals that floated to the island 70 million years ago. Information can be found online at “Madagascar,” [http://www.sci.mus.mn.us/greatestplaces/book\\_pages/madagascar2.htm](http://www.sci.mus.mn.us/greatestplaces/book_pages/madagascar2.htm).

10. After students have completed their presentations, summarize what they have learned about how islands form, how plants and animals come to live on islands, and how species adapt to their environment to survive. Then pass out copies of the Take-Home Activity Sheet: Island Hunting. Students should be able to answer the questions based on the classroom discussion and the student presentations.

#### **Adaptation for older students:**

Long Island, in the state of New York, formed from the silt deposited by a melting glacier in North America at the end of the last ice age. Challenge students to investigate islands that have formed in less familiar ways, such as Long Island and barrier islands throughout the world. Have students prepare a class demonstration about these formation methods.

#### **Questions:**

1. Many scientists believe that burning fossil fuels causes global warming, an overall increase in the average temperature worldwide. If global warming continues, what effect do you think

it will have on the world's islands? On the plants and animals living on those islands?

2. Hypothesize about the effect a future ice age would have on the world's islands and their plants and animals.
3. How do animals and plants travel to islands?
4. Small islands have far less diversity of species than large continents. How can you explain this difference in diversity?
5. What is the greatest danger to the delicate ecosystems of the world's islands? What steps do you think should be taken to reduce this danger?
6. Imagine that a new volcanic island has formed. Choose its location and hypothesize about what types of plant and animal species you would expect to colonize the island.

### **Evaluation:**

You can evaluate your students' presentations using the following three-point rubric:

Three points: inclusion of all required elements in the presentation; clear explanation that includes concrete facts; logical organization; few errors in grammar, usage, and mechanics

Two points: inclusion of at least two of the required elements in the presentation; clear explanation that includes concrete facts; organization that is good enough to follow; some errors in grammar, usage, and mechanics

One point: inclusion of one of the required elements in the presentation; explanation that includes concrete facts; errors in grammar, usage, and mechanics

### **Extension ideas:**

#### **Island Travelogues**

Have individuals or groups of students choose an island and prepare a travelogue about it, including information about its formation and the plant and animal species that live on the island. The travelogue can be presented with PowerPoint, as a poster, on a Web site, on videotape, or through another medium.

#### **Many Monitors**

On the islands of Indonesia live many species of monitor lizard. Each species has adapted to the conditions of its specific island. On one, the monitor has evolved into a gentle vegetarian, while on another it has become the Komodo dragon, the main predator on the island. Challenge students to research three species of monitor lizard and the conditions on each type of island. Have the students develop hypotheses to explain why each species adapted as it did. The

following Web site from the American Museum of Natural History will get them started:  
<http://www.amnh.org/exhibitions/endangered/ora/ora.html>>.

### **Suggested Reading:**

#### ***Galapagos: Islands Born of Fire***

Tui De Roy. Warwick Publishing, 1998.

The author of this stunning volume was raised on the Galapagos Islands and has spent her life photographing its variety. Her extraordinary color photographs enhance the story of these unique islands, their volcanic origins, their diverse and distinctive wildlife, and their delicate ecosystems. The final chapter covers the challenges facing the Galapagos in the coming century.

#### ***Islands: Portraits of Miniature Worlds***

Louise B. Young. W.H. Freeman, 1999.

Here is an opportunity to explore islands around the world, from the lush beauty of the Hawaiian islands, to the fire and ice islands of Iceland, to the mysterious Easter Island. There is even a chapter about the mythic island of Atlantis! Occasional pencil drawings help illustrate the information.

### **Vocabulary**

#### **continent**

Definition: One of Earth's major landmasses, which include North America, Africa, South America, Asia, Europe, Australia, and Antarctica.

Context: An island is a body of land smaller than a **continent** and is completely surrounded by water.

#### **coral reef**

Definition: A mound or ridge of coral skeletons and calcium deposits that forms in warm shallow seas.

Context: A **coral reef** is a complex ecosystem that shelters many kinds of marine life.

**ice age**

Definition: Any part of geological time during which glaciers covered large parts of Earth's surface.

Context: Huge sheets of ice covered Earth's surface during the last **ice age**, called the Pleistocene glacial epoch, which ended 11,500 years ago.

**sea level**

Definition: The surface level of the sea, especially the mean between high and low tide, which is used as a standard in calculating land elevations and sea depths.

Context: As a volcano grows, it may rise above **sea level** and become an island.

**species**

Definition: The most fundamental classification of living things in biology, comprising individuals that can breed with one another but not with those of other species; a subdivision of a genus.

Context: An island's isolation limits the number and variety of its animal and plant **species**.

**volcanism**

Definition: The force, activity, or phenomena associated with volcanoes.

Context: **Volcanism** created the Hawaiian Islands.

**volcano**

Definition: A mountain or hill created around a vent in Earth's crust through which molten rock, ash, and gases are expelled.

Context: Surtsey, the world's youngest island, is the top of an undersea **volcano**.

**Academic standards:****Grade level:**

6-8

**Subject area:**

Earth and Space Sciences

**Standard:**

Understands Earth's composition and structure.

**Benchmark:**

Knows how landforms are created through a combination of constructive and destructive forces (e.g., constructive forces such as crustal deformation, volcanic eruptions, and deposition of sediment; destructive forces such as weathering and erosion).

**Grade Level:**

6-8

**Subject Area:**

Life Sciences

**Standard:**

Understands biological evolution and the diversity of life.

**Benchmark:**

Knows basic ideas related to biological evolution (e.g., the diversity of species is developed through gradual processes over many generations; biological adaptations, such as changes in structure, behavior, and physiology, allow some species to enhance their reproductive success and survival in particular environments).

**Credit:**

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## Three Ways to Make an Island

### 1. Rising Sea Level



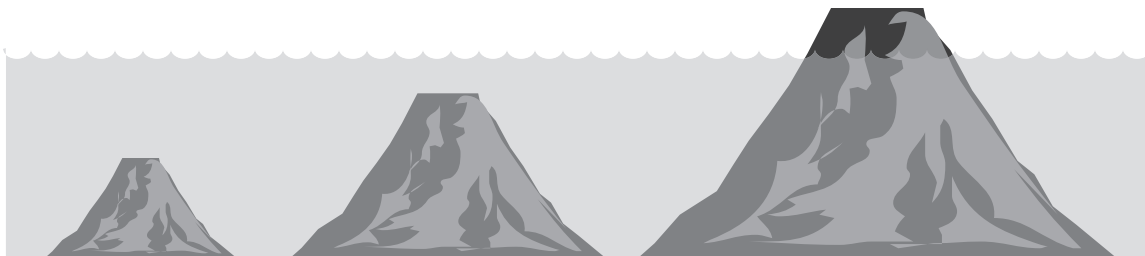
If the sea level rises, as it did after the last ice age, a portion of the mainland may become separated from the rest of the mainland by water, forming an island.

### 2. Coral



Polyps are related to jellyfish, but they live in colonies, and they protect their soft bodies by building limestone walls around them. As these colonies grow, they form reefs. Eventually, these reefs can cover hundreds of square miles. The polyps don't build their reefs above the surface of the water, but if the sea level drops or the land below the reef rises, the reef may emerge from the water. Then water-borne sand and wind-borne dust will accumulate on the reef and form an island.

### 3. Volcanism



An underwater volcano can grow until it reaches above the surface of the water.

## Island Investigation

**Directions:** *Work with a partner to research your assigned island and answer the questions below.*

What is the name of your island?

Where is your island located?

Describe the geography of your island.

How and when did the island form?

Briefly describe the physical characteristics and diet of at least one animal species found on the island.

How has this species adapted to life on the island?

## Island Hunting

*Fill in each blank below with an island that fits the description:*

1. An island formed by rising sea level

\_\_\_\_\_

2. An island formed by a volcano

\_\_\_\_\_

3. An island formed by coral

\_\_\_\_\_

4. The world's largest island

\_\_\_\_\_

5. The world's youngest island

\_\_\_\_\_

6. The largest of the Hawaiian Islands

\_\_\_\_\_

7. The island where the Statue of Liberty stands

\_\_\_\_\_

8. The islands where Darwin studied adaptation

\_\_\_\_\_