

## *Biomes: Islands & Evolution: Teacher's Guide*

**Grade Level:** 6-8

**Curriculum Focus:** Ecology

**Lesson Duration:** Two class periods

### **Program Description**

Because they have evolved in isolation for millions of years, island life forms often show characteristics seen nowhere else on Earth. As students travel the Southern Hemisphere and encounter its wide variety of life forms, they get compelling clues to how species and traits develop over time. This program includes one feature segment and two short segments.

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### **Onscreen Questions**

- How do animals living in the Galápagos Islands help support the theory of evolution?
  - How can isolation and time lead to evolutionary changes in animal species?
  - How do certain island plants and animals form mutually beneficial relationships?
  - How can cloning help restore extinct species?
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### **Lesson Plan**

#### *Student Objectives*

- Learn that an island is any comparatively small body of land completely surrounded by water.
- Discover that islands can form in different ways and that plant and animal species travel to islands by air or water.
- Prepare a presentation that describes an island's geography and life forms.

#### *Materials*

- Globe or world map
- Internet access
- Relief maps of the Atlantic and Pacific ocean floors
- Encyclopedias, textbooks, and other library references on island

## Procedures

1. Using a globe or world map, point out that most of Earth is covered by water.
2. Using relief maps, show students that Earth's surface has peaks, valleys, and plateaus, some of which are underwater.
3. Review the three major ways islands form: A) As sea level rises, land areas may become separated by water. B) Coral reefs emerge if the sea level drops or the land underneath rises; sand and dust accumulating on the reef form an island. C) An underwater volcano can grow until it reaches above the water surface.
4. Explain that during the last ice age, more of Earth's water was frozen at the poles, which were larger than they are today. About 10,000 years ago, Earth began to warm, and the ice caps began to melt. Some land areas became islands as rising waters cut them off from a mainland. New Zealand is one such location.
5. Describe how coral polyps form islands. Polyps live in underwater colonies, where they protect their soft bodies by building limestone walls around them. The colonies grow and form reefs, which may emerge if sea level drops or the land underneath rises. Accumulations of sand and dust help form an island. The Florida Keys are a chain of coral reef islands.
6. Explain how volcanism forms islands. When underwater volcanoes erupt, lava flows build up. Over time, a volcano can reach above the surface of the sea, forming an island, such as those that make up Hawaii.
7. Explain that an island's formation affects the kinds of plant and animal species living on it. Cut off from a mainland by rising sea level, an island is likely to have mainland species from the start. Formed by a volcano or as a coral reef, an island will have no plants or animals to begin with. Animals can reach an island traveling on logs or other objects floating in the ocean. Plants and birds usually travel by air.
8. Next, have students work in pairs or groups to prepare a presentation on one island listed below – they should start by visiting the featured Web site and then supplement their research with encyclopedias, textbooks, and other library references. Presentations should include the island's location, a brief description of its geography, details about how and when the island formed, a description of at least one animal species unique to that island, and an explanation of how the species has adapted to life there.
  - Surtsey, located off the southern coast of Iceland, is referred to as the newest place on Earth because it was formed by a volcanic eruption in 1963.  
<http://www.gi.alaska.edu/ScienceForum/ASF11/1132.html>
  - The Galápagos Islands, located west of Ecuador's coast, have been isolated since they formed three or four million years ago.  
<http://www.doc.ic.ac.uk/~kpt/terraquest/galapagos/intro.html>
  - Inaccessible Island is part of the Tristan da Cunha group in the South Atlantic Ocean. It is home to just one species of bird, the Inaccessible Island flightless rail, the smallest flightless bird in the world.  
[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 about 40 species of lemur.  
[http://www.sci.mus.mn.us/greatestplaces/book\\_pages/madagascar2.htm](http://www.sci.mus.mn.us/greatestplaces/book_pages/madagascar2.htm)

## Assessment

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

- **3 points:** Students included all required elements in the presentation; gave a clear explanation with concrete facts; used logical organization; made few errors in grammar, usage, and mechanics.
- **2 points:** Students included at least two required elements in the presentation; gave an explanation with some concrete facts; used a mostly logical organization; made some errors in grammar, usage, and mechanics.
- **1 point:** Students included only one required element in the presentation; gave an explanation with few or no concrete facts; used an illogical organization; made errors in grammar, usage, and mechanics.

## Vocabulary

### continent

*Definition:* Earth's major landmasses: North America, South America, Africa, Asia, Europe, Australia, and Antarctica

*Context:* Australia is an island continent.

### coral reef

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

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

### sea level

*Definition:* The surface level of the sea used as a standard in calculating land elevations and sea depths

*Context:* A growing volcano will become an island if it rises above sea level

### species

*Definition:* A fundamental classification of living things in biology, consisting of related organisms capable of interbreeding

*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.



## Academic Standards

### National Academy of Sciences

The National Science Education Standards provide guidelines for teaching science as well as a coherent vision of what it means to be scientifically literate for students in grades K-12. To view the standards, visit <http://books.nap.edu>.

This lesson plan addresses the following science standards:

- Life Science: Populations and ecosystems

### 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/>.

This lesson plan addresses the following national standards:

- Science – Life Sciences: Understands biological evolution and the diversity of life
  - Language Arts – Reading: Uses reading skills and strategies to understand and interpret a variety of informational texts; Listening and Speaking: Uses listening and speaking strategies for different purposes
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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 four parts (see below), indicated by video thumbnail icons. Watching all parts in sequence is similar to watching the video from start to finish. Brief



descriptions and total running times are noted for each part. 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.

**Curriculum Units** – These are specially edited video segments pulled from different sections of the video (see below). These nonlinear segments align with key ideas in the unit of instruction. They include onscreen pre- and post-viewing questions, reproduced below in this Teacher's Guide. Total running times for these segments are noted. To play a particular segment, press Enter on the TV remote or click once on the Curriculum Unit title on a computer.

**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

### I. Islands of Theory (7 min.)

The Galápagos Islands are home to animals not found anywhere else. Discover the unique animals that inspired Charles Darwin's theories on evolution.

### II. Animals of Java (19 min.)

Stranded on Java after the last ice age, the monitor lizard and other animals have adapted well to island life.

### III. Life Without Fear (16 min.)

There are no large predators on Sulawesi, an island isolated for thousands of years. See what life is like for its fearless animals.

### IV. Extinct No More (4 min.)

The tiger-like thylacine once roamed the mountainous island of Tasmania. Can scientists bring this species back from extinction?

## Curriculum Units

### 1. Darwin's Discovery

*Pre-viewing question*

Q: What is an adaptation?

A: A change of structure or habits to fit new conditions; an adaptation increases a species' reproduction or survival rates.

*Post-viewing question*

Q: Why did Darwin find differences within species from one island to the next?

A: Answers will vary.



## 2. Natural Selection

*Pre-viewing question*

Q: Do you agree with Darwin's idea of survival of the fittest?

A: Answers will vary.

*Post-viewing question*

Q: What is natural selection?

A: The process by which organisms with beneficial adaptations are affectively "selected" by nature to have a better chance of either surviving in their current habitat or occupying a new habitat

## 3. Island Castaways

*Pre-viewing question*

Q: What adaptations might be useful to island-dwelling animals?

A: Answers will vary.

*Post-viewing question*

Q: How were Java's animals separated from their mainland ancestors?

A: Java became an island at the end of the last ice age. As ice caps melted and sea levels rose, land bridges to the mainland disappeared and many animals were marooned.

## 4. Island Plants and Animals

*Pre-viewing question*

Q: What plants and trees would you find on Java?

A: Answers will vary.

*Post-viewing question*

Q: Why do fig trees flourish on Java?

A: Throughout the year, the different fig trees on Java each burst into fruit for seven or eight days. During each tree's annual fruiting period, birds and other animals come from all over to feast on the fruit. The seeds of the fruit pass through the animals' digestive systems and dispersed throughout the forest.

## 5. The Predators of Java

*Pre-viewing question*

Q: How does an animal's size affect its behavior and lifestyle?

A: Answers will vary.

*Post-viewing question*

Q: Why is the leopard a more threatening predator than the monitor lizard?

A: Leopards hunt more often – they need to eat fresh meat at least twice a week, the monitor lizards only about once a month. Leopards are also larger and more ferocious; they can tackle larger game and prey. Monitor lizards typically eat smaller animals and birds.



## 6. Inhabiting a New Island

*Pre-viewing question*

Q: What would be the benefits of living on a previously unsettled island?

A: Answers will vary.

*Post-viewing question*

Q: Why is the monitor lizard Anak Krakatau's top predator?

A: The monitor lizard is a fantastic swimmer. Unlike the leopard, it was able to swim to Anak Krakatau, where it is the fiercest creature on the island.

## 7. Island Lizards

*Pre-viewing question*

Q: What type of lizard is the most interesting?

A: Answers will vary.

*Post-viewing question*

Q: What distinguishes the Komodo dragon from other lizards?

A: It can bring down large, live prey. The Komodo dragon, the biggest lizard in the world, can eat up to 80 percent of its body weight in a single meal and then wait months before eating again.

## 8. Safety in Numbers

*Pre-viewing question*

Q: What is life like for an animal with no predators?

A: Answers will vary.

*Post-viewing question*

Q: Why do Sulawesi's black macaques travel in large troops?

A: The only threat the macaques face is coming across another, larger group of their same kind. Traveling in conspicuous groups of 50 or more provides safety – something that would not be true in there were large predators on the island.

## 9. Spreading Fig Seeds

*Pre-viewing question*

Q: How do plants and trees govern animals' lives?

A: Answers will vary.

*Post-viewing question*

Q: What reproductive advantage does the strangler fig tree have?

A: The fig's seeds are encased in a fatty package that is attractive to ants. Ants carry them from the forest floor up to their nest in the sunlit canopy, where they can germinate free of the competition they'd find on the forest floor.



## 10. Dining in the Trees

*Pre-viewing question*

Q: What types of differences are found in related species?

A: Answers will vary.

*Post-viewing question*

Q: How does a bear cuscus differ from a dwarf cuscus?

A: The bear cuscus is awake during the day and feeds on leaves. The nocturnal dwarf cuscus feeds on fruit. The bear is the largest cuscus; the dwarf the smallest.

## 11. Ancient Primates

*Pre-viewing question*

Q: What traits are unique to animals found in your area?

A: Answers will vary.

*Post-viewing question*

Q: Is it problematic that Sulawesi has no predators?

A: Answers will vary.

## 12. Cloning Animals

*Pre-viewing question*

Q: If we brought back extinct species, what problems could result?

A: Answers will vary.

*Post-viewing question*

Q: How does nuclear transfer work?

A: In this form of cloning, scientists remove a cell's nucleus, the place where the DNA is stored. An electrical charge is used to insert the nucleus into an egg cell from a host animal, in which the nucleus has already been removed. If the cells begin to divide properly, the embryo is then planted in a host animal's womb.