NATIONAL GEOGRAPHIC

RESOURCE LIBRARY
ACTIVITY : 25 MINS

Examining Convergent Evolution

Students examine animals that are examples of convergent evolution. They then analyze wings of bats, birds, and pterosaurs to see why these animals are not closely related.

GRADES

9 - 12+

SUBJECTS

Biology

CONTENTS

8 Images, 1 PDF

OVERVIEW

Students examine animals that are examples of convergent evolution. They then analyze wings of bats, birds, and pterosaurs to see why these animals are not closely related.

For the complete activity with media resources, visit:
http://www.nationalgeographic.org/activity/examining-convergent-evolution/

Program

DIRECTIONS

1. Define vocabulary terms *convergence* and *divergence*.
As a class, discuss the difference in meanings of converge, to move toward a common point or come together, and diverge, to move in different directions from a common point.

2. Illustrate convergent evolution.

Display the photo gallery, showing photographs of the giant anteater, aardvark, and long-beaked echidna. Ask students to list on a sheet of paper the names of each and characteristics these animals share. All of these animals specialize in feeding on ants and termites. Ask: What do you notice that is similar about them? (the shape of their snouts; their front feet, used for ripping apart termite and ant nests) These animals also have similar teeth and tongue shape. Explain that these animals look and act in similar ways, but they are not related. In other words, they did not inherit all of these traits from a common ancestor that also had these traits. Each animal evolved these traits independently in order to match a similar lifestyle, specifically catching ants and termites. This is called convergent evolution.

3. Examine gliding animals.

Tell students you will show them another set of images, and ask them to look for characteristics these animals have in common. Show the images of the Dimorphodon, a prehistoric pterosaur, the flying squirrel, and the colugo. Ask: What common characteristics do you see? (They have membranes attached from their front limbs to back limbs.) Explain that this is another example of convergent evolution, where these animals do not share a common ancestor that also shared these traits. Ask: *Why do you think these animals' traits evolved in this way?* Accept a variety of ideas, guiding students to recognize that living things develop adaptations, usually over very long periods of time, that enable them to survive in changing environments. For example, some animal species living in trees have over long periods of time developed features that helped them to glide from limb to limb, enabling them to better escape predators or reach prey. The feature that allowed them to fly enabled them to survive better than other members of the same species that did not have that feature.

4. Compare the wings of a pterosaur, bat, and bird.

Show the photographs of the pterosaur, bat, and hawk, and have students describe their similarities and differences. Students will recognize the wings as the most obvious similar features. Discuss students' ideas about whether these animals evolved from a common ancestor. Ask: *In what ways are these animals different?* (The bat is a mammal, the pterosaur is a reptile, and the hawk is a bird.) *How might their wings be different?* Accept a variety of ideas. Explain that scientists look thoroughly at an organism's characteristics, including skeletal structure, to determine how closely related species are to one another. Distribute the handout Wing Comparison: Pterosaur, Bat, and Bird, and ask students to compare the three diagrams. Have them list similarities and differences between the three. Given the different design of these wings, ask students whether or not they now think these animals evolved

from a common ancestor. Ask: *Could they have evolved independently to serve a similar function? What function?* (flight; since the bone structures are so different, their skeletal designs reveal that they evolved independently.) *What environmental conditions, or pressures, might have affected how these animals evolved?* (the need to find food; the need to escape predators)

5. Summarize new understandings.
In a written paragraph, have students explain why they think it could be difficult to use features such as wings to classify organisms, based on what they've learned about convergent evolution.

Informal Assessment

Assess students' written paragraphs to make sure they demonstrate an understanding that although species may seem to have similar characteristics, they may not be closely related. Similar characteristics, such as wings, can be a response to pressures associated with different environments, such as predators and availability of food.

Extending the Learning

Have students use library resources to do further research into animals that resemble one another but are not closely related. Possibilities include the wolf, thylacine, and brown hyena; killer whale and great white shark; mole, marsupial mole, golden mole, and naked mole rat; and the marmot and hyrax. Have students explain the role of convergent evolution, including types of environmental pressures that led to their common characteristics.

OBJECTIVES

Subjects & Disciplines

Biology

Learning Objectives

Students will:

- describe convergent evolution
- give an example of convergent evolution

Teaching Approach

- Learning-for-use

Teaching Methods

- Discussions
- Visual instruction

Skills Summary

This activity targets the following skills:

- Critical Thinking Skills
  - Analyzing
  - Applying
  - Understanding

National Standards, Principles, and Practices

NATIONAL SCIENCE EDUCATION STANDARDS

• **(9-12) Standard A-2:**
Understandings about scientific inquiry
• **(9-12) Standard C-3:**
Biological evolution

Preparation

What You'll Need

MATERIALS YOU PROVIDE

- Paper
- Pencils
- Pens

REQUIRED TECHNOLOGY

- Internet Access: Required
- Tech Setup: 1 computer per classroom, Projector
- Plug-Ins: Flash

PHYSICAL SPACE

- Classroom

GROUPING

- Large-group instruction

BACKGROUND & VOCABULARY

Background Information

Animals from different places that are unrelated evolutionarily often look remarkably alike because they have adapted to similar lifestyles in similar environments. Likewise, closely-related animals adapted to different environments and lifestyles often exhibit dramatically different appearances. Taxonomists consider the evolutionary relationships, or the common ancestry, of species in determining whether or not they are closely related.

Prior Knowledge

["classification", "evolution"]

Recommended Prior Activities

- Exploring Vertebrate Classification

Vocabulary

Term	Part of Speech	Definition
classification	*noun*	grouping based on physical and genetic characteristics.
evolution	*noun*	change in heritable traits of a population over time.
taxonomy	*noun*	study of the identification, classification, and naming of organisms.

For Further Exploration

Websites

- National Geographic Entertainment: Flying Monsters 3D