

26. How have penguins evolved?
27. What adaptations have horses developed over millions of years that have strengthened their feet and allowed them to run swiftly from predators?

### Follow-up Discussion

Research indicates that students will retain their previous misconceptions about a topic, in preference to new information, until they actively recognize and correct their own errors. Therefore, it is important to have your students re-examine the facts/beliefs they put on their "Everything We Think We Know About..." list. It might also be helpful to review the list by marking each entry with a "+" or "-" to show which facts were correct and which were incorrect.

Discussions that ensue from thought-provoking questions provide a good way to assess the overall depth of student understanding. The following are some suggested discussion questions.

1. Discuss the reasons why adaptations develop slowly within a population.
2. Talk about the process of natural selection and how it drives evolution, making sure to emphasize the meaning of each term.
3. Discuss the adaptations that humans possess that have enabled them to flourish in extreme environments.

### Follow-up Activities

- In small groups, have students research a specific example of selective breeding in animals and present their findings to the class.
- Students may be familiar with science fiction movies in which characters like giant ants take over a city. Based on what they know about genetic mutation and adaptation, have them prove why these stories are definitely fiction.
- Have each student invent a unique adaptation that they would like to possess and write a story explaining how the adaptation would give them an advantage in a particular environment. Alternatively, students could choose a well-known animal and describe how it might look 50 million years from now.
- Show students photographs of specialized animal structures and have them try to guess what the structure is used for in that animal's environment.

### Internet Resources

Periodically, Internet Resources are updated on our web site at [www.LibraryVideo.com](http://www.LibraryVideo.com)

- [www.nps.gov/aplic/forkids.htm](http://www.nps.gov/aplic/forkids.htm)

This animated presentation by the National Park Service introduces students to the animals of Alaska, their adaptations and their delicate food web.

- [www.desertusa.com/animal.html](http://www.desertusa.com/animal.html)

This site has information on the many unique survival adaptations of desert animals.

(Continued)

- [www.accessexcellence.org/AE/AEPC/WWC/1995/fishtwist.html](http://www.accessexcellence.org/AE/AEPC/WWC/1995/fishtwist.html)
- [www.accessexcellence.org/AE/AEPC/WWC/1995/change.html](http://www.accessexcellence.org/AE/AEPC/WWC/1995/change.html)  
The two addresses listed above take students to specific activities from the Access Excellence lesson exchange that illustrate animal adaptations, evolution and mutation.
- [www.ecokids.ca/pub/eco\\_info/topics/climate/adaptations/index.cfm](http://www.ecokids.ca/pub/eco_info/topics/climate/adaptations/index.cfm)  
How fast can you match up animals' adaptations? This game is presented by EcoKids to increase awareness about various animals and their adaptations to successfully survive in their habitats.

### Suggested Print Resources

- Burnie, David and Don E. Wilson. *Animal: The Definitive Guide to the World's Wildlife*. DK Publishing, New York, NY; 2005.
- McNulty, Faith. *How Whales Walked Into the Sea*. Scholastic Press, New York, NY; 1999.
- Parker, Steve, Anita Ganeri & Holly Wallace. *Survival and Change*. Heinemann, Orlando, FL; 2000.
- Sís, Peter. *The Tree of Life: A Book Depicting the Life of Charles Darwin: Naturalist, Geologist, & Thinker*. Farrar, Straus, Giroux, New York, NY; 2003.

### TEACHER'S GUIDE

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### TITLES

- AMPHIBIANS
- ANIMAL ADAPTATIONS
- ANIMAL BEHAVIOR & COMMUNICATION
- ANIMAL CLASSIFICATION
- ANIMAL INTERDEPENDENCY
- ANIMAL LIFE CYCLES
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## Animal Adaptations

Grades 5–8

Students in grade 5-8 classrooms possess a wide range of background knowledge. Student response to this video program is sure to be varied, so the teachers for these grades need all the help they can get! This guide has been designed to help science teachers in grades 5-8 by providing a brief synopsis of the program, pre-viewing and follow-up questions, activities, vocabulary and additional resources.

**Before Viewing:** Extensive research tells how important it is for the teacher to discover what the students know — or think they know — about a topic, before actually starting a new unit. Therefore, after prompting discussion with the pre-viewing questions, lead your class to create a "Everything We Think We Know About..." list. You may also wish to preview key vocabulary words, and have students raise additional questions they hope will be answered.

**After Viewing:** Have your students share video excerpts that fascinated or surprised them, then challenge your students to prove or disprove the accuracy of the facts they put on their "Everything We Think We Know About..." list. Discuss what else they learned and use the followup questions and activities to inspire further discussion. Encourage students to research the topic further with the Internet and reading resources provided.



## Program Summary

We know from studying the fossil record that dinosaurs were once the most successful life form on the planet, but we do not know for sure why they disappeared. Many scientists think a sudden, catastrophic change in the environment caused their extinction. The dinosaurs could not adapt to the changes in the weather, and so they died.

The environment is always changing and organisms can react to these changes in three ways: some move to a new place, some die and the rest survive. Animals that survive have special features or behaviors called adaptations that give them an advantage for survival in the environment.

Adaptations in an animal species occur gradually over long periods of time and begin as small genetic variations in individual animals. Since the animals best suited for life in a particular environment are the ones most likely to reproduce, an animal with a variation that increases its chance for survival will probably have the most reproductive success. The characteristics that make these animals a little bit different from their fellow animals are then inherited by their offspring. These animals will eventually outnumber the animals without the variation, and a new adaptation will emerge throughout the species. This process is called natural selection. Charles Darwin observed this process during a scientific expedition to the remote Galapagos Islands in the 1800's, and from these observations, he developed the theory of evolution. This theory provides an explanation for the ability of animals to change from simple to more complex creatures over millions of years.

How do genetic variations occur? All animals have genes made up of DNA (deoxyribonucleic acid). This DNA contains the instructions for all characteristics that are inherited. A slight change, or mutation, in the DNA can happen by chance in an animal's reproductive cells, causing it to give birth to an animal with a random variation. If the variation works well in the environment, then animals with this change have a good chance of passing on this gene. The huge amount of diversity in animals can be explained by these chance mutations.

There are many types of adaptations in the animal kingdom; some for gathering and eating food, some for reproduction and caring for offspring, and some for protection and defense. An investigation illustrates the special adaptation that crayfish and lobsters have for getting oxygen from their environment. Also discussed is the tremendous impact that humans have had on animals through selective breeding.

## Vocabulary

The following words are included for teacher reference or for use with students. They are listed in the order in which they appear in the video.

**adaptations** — Inherited physical features or behaviors that enable an animal to survive in its environment.

**generation** — A group of animals of a particular species that are of the same age.

**evolution** — A theory that all types of living organisms have their origin in other preexisting types and that the differences among them are due to small changes in individual animals over many generations. *(Continued)*

**gene** — A specific sequence of DNA that contains information which determines an animal's characteristics.

**DNA** — (deoxyribonucleic acid) A specialized molecule that contains genetic information, allowing characteristics to be passed from parents to offspring.

**variation** — Small differences in characteristics among animals of the same species, brought about by genetic mutations.

**species** — A group of animals that share characteristics and are capable of reproducing.

**offspring** — Baby animals.

**mutation** — Random change in the DNA of an organism's reproductive cells, which can change a characteristic from parents to offspring.

**natural selection** — The theory that small changes, or variations, in an animal's characteristics give an animal an advantage in surviving and reproducing, and these changes are passed to offspring, eventually leading to new adaptations.

**Charles Darwin** — (1809-1882 CE) The naturalist famous for developing the concept known as natural selection and the theory of evolution.

**survival of the fittest** — The idea that animals with the best adaptations for a given environment will survive and reproduce. As the environment changes, the adaptations that are considered most "fit" change as well.

**environment** — All the conditions that surround an animal living in a particular place. These conditions include landscape, food sources, climate and other organisms.

**carapace** — The protective upper shell of a turtle.

**quill** — The sharp modified hairs of animals like the porcupine.

**camouflage** — The ability of some animals to blend in with their environment.

**sexual reproduction** — The production of offspring by two animals of the opposite sex of the same species. Sexual reproduction involves the fertilization of an egg cell with a sperm cell. Some animals have adaptations that allow for internal fertilization, while others are adapted to reproduce without ever touching.

**crustaceans** — Animals such as lobsters and crayfish that have protective exoskeletons.

**migration** — The movement of an animal or group of animals in search of better environmental conditions. Migration is an inherited genetic behavior in many animals.

**instinctive behavior** — An action that is genetically inherited and not learned, such as migration.

**selective breeding** — The human process of cultivating animals and plants with desired characteristics.

**pollination** — The fertilization of a flower by the transfer of pollen from the male part of a flower to the female part of a flower. Many animals like insects have adaptations that make them excellent pollinators.

## Pre-viewing Discussion

Before students generate their list of "Everything We Think We Know About..." for this topic, stimulate and focus their thinking by raising these questions so that their list will better reflect the key ideas in this show:

1. What are some widely held beliefs about the extinction of dinosaurs?
2. How do animals react to changes in their environment?

After the class has completed their "Everything We Think We Know About..." list, ask them what other questions they have that they hope will be answered during this program. Have students listen closely to learn if everything on their class list is accurate and to hear if any of their own questions are answered.

## Focus Questions

1. Why do many scientists think dinosaurs no longer roam the Earth?
2. What are the three things that animals can do when their environment changes?
3. What is an adaptation?
4. Why did giraffes develop long necks over millions of years?
5. What is evolution?
6. According to the theory of evolution, where did all animals alive today come from?
7. How do adaptations occur?
8. What is a genetic mutation?
9. How do mutations cause variations within a species?
10. Are all variations beneficial? Explain.
11. What is natural selection?
12. Who was Charles Darwin?
13. What did Darwin observe about the adaptations of finches on the Galapagos Islands?
14. What are some examples of adaptations for eating?
15. What are some interesting defensive adaptations among animals?
16. How does the ability to blend in with the environment help an animal survive?
17. What unique adaptation for reproduction is evident in sea horses?
18. How do crayfish take in oxygen?
19. What are some examples of how the environment is constantly changing?
20. Why is migration considered a beneficial adaptation?
21. What is instinctive behavior?
22. What is so unique about the discovery of the coelacanth?
23. Why is the coelacanth called a "living fossil?"
24. How can humans control the genetic makeup of animals?
25. What is pollination? Why is it important that insects have adaptations for pollination? *(Continued)*