

# Adaptations

A Science A-Z Life Series

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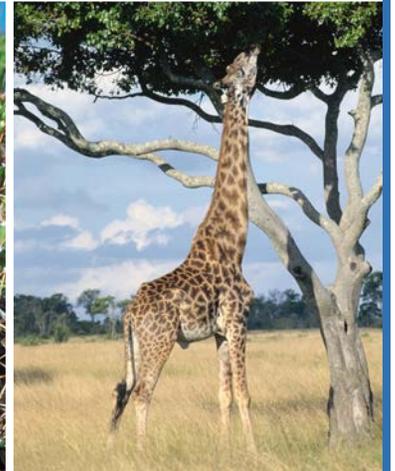
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Written by Ron Fridell

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## KEY ELEMENTS USED IN THIS BOOK

**The Big Idea:** Plants and animals, including humans, have to adapt in response to changes in the environment. These changes range from global to microscopic and may include changes in the climate, populations of other species sharing the same habitat, and the availability of essential resources for survival. Physical adaptations are natural occurrences, not deliberate choices. Behavioral adaptations are usually responses to environmental conditions, not momentary decisions made by individuals. Some adaptations turn out to be successful, and others do not. Only those organisms with successful adaptations survive and pass on their genes to future generations. Many different adaptations to a species are often successful, which has led to incredible diversity in nature.

**Key words:** adapt, adaptation, animals, behavior, birds, blowhole, cell, characteristics, climate, Darwin, drip tip, environment, evolution, extinct, gene, generation, habitat, humans, inherited, instinct, mutation, naturalist, organism, physical, plants, predator, rainforest, reflex, scientists, species, survival of the fittest, survive

**Key comprehension skill:** Main idea and details

*Other suitable comprehension skills:* Classify information; identify facts; compare and contrast; elements of a genre

**Key reading strategy:** Using a glossary and bold-faced words

*Other suitable reading strategies:* Using a table of contents and headings; ask and answer questions; connect to prior knowledge; summarize; visualize

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Cactus spines are an adaptation to keep animals from eating the plant.

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## Introduction

Afternoon sunlight shines through the trees in a park. A small bird called a warbler sings on a tree branch. Suddenly, he stops singing. He catches an insect flying by. The insect can't get away, and the warbler eats his snack. Down on the ground, a red cardinal cracks open seeds with his bill. A rat-tat-tat-tat sound rings out as a woodpecker makes a hole in a tree. Hunting grubs, she drills through the bark. On a pond nearby, some ducks float along. Their heads dip into the water. When they come up, their bills drip with water.

These birds are all looking for a meal. But because their food is different, their beaks have different shapes. The warbler's beak is pointed like tweezers. The cardinal's beak is short and hard like a nutcracker. The woodpecker's beak is hard and pointed. The ducks' bills are long and wide.

Over many thousands of years, these birds' beaks adapted to help them gather the food they need. All plant and animal **species** have **adaptations**, or changes that help them survive in their **habitat**. How do adaptations help each living thing? Let's find out.

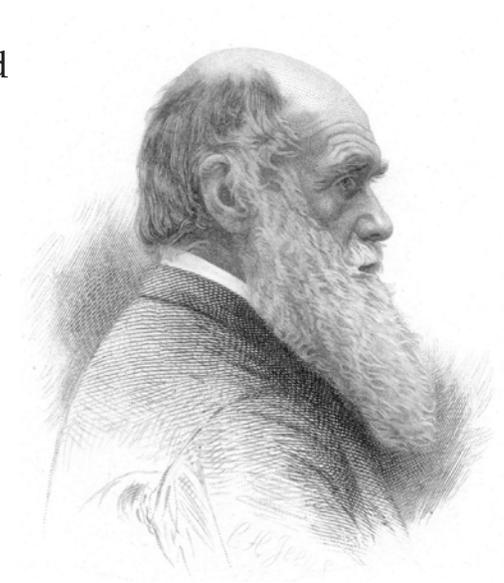


Each bird's beak is adapted to its habitat and food source.

## Survival of the Fittest

All living things, or **organisms**, must **adapt** to changes in their **environment** to survive. If species adapt, they will survive to have babies. Living things that cannot adapt usually die out. When plants and animals adapt as a way to survive, it is known as "**survival of the fittest**." The first person to write about this idea was Charles Darwin, a British scientist. He wrote about it in 1859.

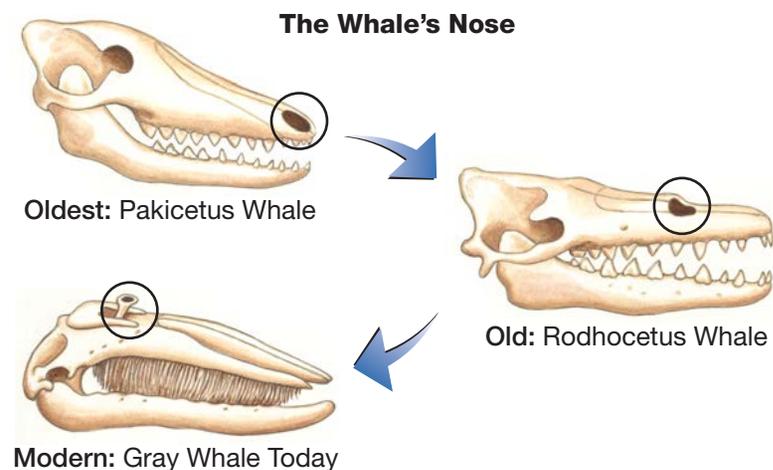
How do adaptations happen? Within a species, individuals are born with slight differences. These differences may change the way an animal or plant grows and what it can do. Sometimes one of those differences can help the living thing survive when the environment changes.



Charles Darwin

If the difference helps a living thing survive, that living thing will pass the change on to the next **generation**. The change becomes an adaptation.

For instance, millions of years ago, all whales had teeth and breathed out of holes at the end of their snouts. Over many generations, some whales developed a breathing hole farther up their head. These whales could breathe more easily in deep water. They could rise to the water's surface and take a breath without sticking their snouts above the water. As whales began to spend more time far out in the ocean, away from shore, the whales with higher breathing holes survived better. Their babies also had breathing holes high on their heads.



Today, a whale's nose is a hole on top of its head called a **blowhole**. The blowhole makes it easier for the whale to breathe. When it needs to breathe, a whale keeps the blowhole above water. It takes a breath through its blowhole. Then the whale dives back down into the ocean.



This skull is from a very ancient whale. Its breathing hole was farther forward than a modern whale's.

## Do You Know?

What happens to plants and animals that cannot adapt to changes in their environments? They become extinct, which means they die out and none are left on Earth. Thousands of living things died out before humans existed. We learn about these extinct plants and animals from fossils.



Maybe dinosaurs could not adapt to changes in their environment.

Dinosaurs became **extinct** 65 million years ago. Why? Most scientists say a giant meteor hit Earth. It sent tons of dust into the air. The dust blocked sunlight, which killed their regular food sources.



Desert plants are spaced widely apart.

## Plant Adaptations

Plants have to adapt to their environment to survive and make new plants. For example, they must find a way to get enough water and sunlight to make their own food. Let's look at how desert plants and rainforest plants adapt to get the water and sunlight they need.

There is not much water in the desert. Most deserts get less than 25 centimeters (10 in.) of rain every year. But each plant must get some water. Plants in the desert grow apart from each other so they do not have to share the small amount of water when it rains.

Rainforests get about 200 centimeters (80 in.) of rain every year. Some plants have leaf shapes that are adapted to let rain roll off easily. Their leaves have sharp points called *drip tips*, which make the water run to the tips of the leaves. Then the water drops to the ground. If the plant received too much water, it would die.



Drip tips help plants shed water quickly.

Though there is not much water in the desert, there is plenty of sunlight. The desert *Haworthia* plant has adapted to protect itself from too much light and heat. It grows mostly underground where it is cooler. But the plant must get some sunlight to make food. So the tips of its leaves poke through the soil. They have clear “windows” to let in light.



“Windows” in the haworthia’s leaves let light in.

In the rainforest, trees grow tall and spread their leaves. The leaves form a thick layer at the top of the trunk where they can get sunlight. But this makes it very shady for plants underneath. Vines called *Lianas* have adapted to get the sunlight they need. Lianas climb the tallest trees to reach the sunlight above them.



This vine is climbing a tree in the rainforest to reach sunlight.

### Do You Know?

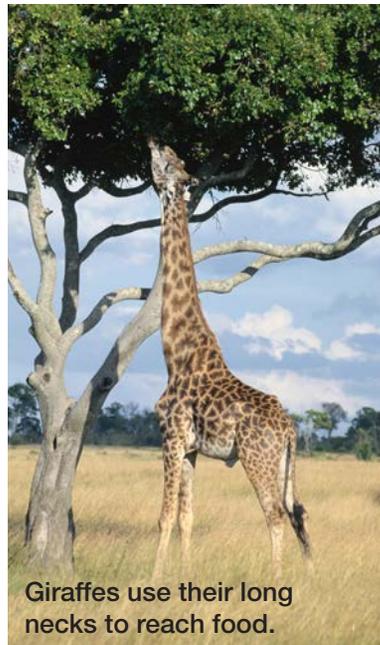
Plants cannot see or hear, but they can still sense changes in their environment. Chemicals in the plant cells react to the heat, light, moisture, and temperature around the plant. All these things can make it easy or hard for a plant to do well. A plant grows quickly or slowly because of signals from the chemicals.

## Animal Physical Adaptations

Plants make their own food, but animals have to hunt for their food. Over millions of years, animals have changed in order to find food more easily. Other changes protect these animals from other animals that hunt them.

The giraffe's neck is a good example. Giraffes born with longer necks could reach higher into trees to get more food than giraffes with shorter necks. They could also see enemies coming. The giraffes with long necks were more likely to survive and have babies than the giraffes with shorter necks. Soon more giraffes were born with long necks.

The giraffe's neck is a change to its body, or a physical adaptation. All animals have physical adaptations that help them survive.



Giraffes use their long necks to reach food.



These camels are traveling in a caravan across the desert sand.

### Do You Know?

Before we had vehicles that could travel over sand, people used camels to get around. With their transparent eyelids and long legs, they were well adapted for traveling in the desert. Camels carried goods across desert sands in long lines called caravans. This is why the camel's nickname is "ship of the desert."

Another example of an animal with a physical adaptation is the camel. Camels live in deserts that have many sandstorms. The blowing sand makes it hard to see. Camels have an extra set of eyelids that are see-through. These special eyelids protect the camels' eyes from the stinging sands so they can keep moving, find food, and avoid predators.



A camel eye has a clear eyelid.

Australia's koala bears are also well adapted to their environment. They spend a lot of time in eucalyptus trees, eating the leaves. To help them grab branches and climb, their toes have big gaps between them.

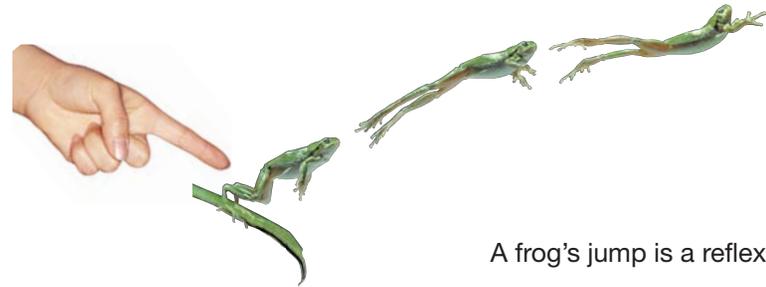
The camels' eyelids and the koala bears' toes are physical adaptations. These adaptations are **inherited** from their parents.



Koalas have big gaps between their toes so they can grab branches.

## Behavioral Adaptations

All animals have adaptations in their behavior as well as their body. **Behavior** is the way an animal acts and reacts to its environment. A basic inherited behavior is a **reflex**, such as a frog jumping when it is touched. A reflex is something an animal does without thinking about it.



A frog's jump is a reflex.

**Instinct** is another kind of inherited behavior. A sea turtle digs a hole in the sand to lay its eggs because of instinct. Birds fly south in the winter because of instinct. The animals act the same way each time the same thing happens to them.

Animals learn some behaviors by being taught. For example, you can train a dog to obey commands. Reading is a behavior you learn from practicing at home and school.



Male peacocks display their tails to attract females.

Some behaviors help animals attract a mate. For example, a male peacock spreads out its colorful tail feathers to get the attention of a female peacock. The pufferfish inflates its body to look bigger to its predators.

Some behaviors keep animals safe from other animals that hunt them. Many animals, such as flamingoes and zebras, live and move in large groups. Rabbits live in underground burrows so they can hide from their enemies.



A pufferfish inflates its body to look bigger to its predators.

Scientists are puzzled by some behavioral adaptations. They don't know if the behavior was inherited at birth or learned later from parents.

Some scientists wanted to find out if birds know songs when they are born or if they learn them later from their parents.

They studied the songs of birds that grew up in a group with parents. These birds' songs sounded just like their parents' songs.

The scientists also listened to the songs of birds that lived on their own. These birds knew how to sing, but their songs were very simple.



Birds sing simple songs by instinct, but they learn complex songs from others.

The scientists decided that birds inherit the ability and urge to sing. But young birds learn complex songs by listening to older birds.

Many behavioral adaptations are like bird songs. When animals are born, they know part of a behavior. Then they learn other parts from their parents and other animals.

## Human Adaptations

People have adaptations, too. We keep cool in hot weather by sweating. When it is hot, the sweat evaporates and cools our skin. In cold weather, we shiver, which makes enough heat to warm us up for a short time.



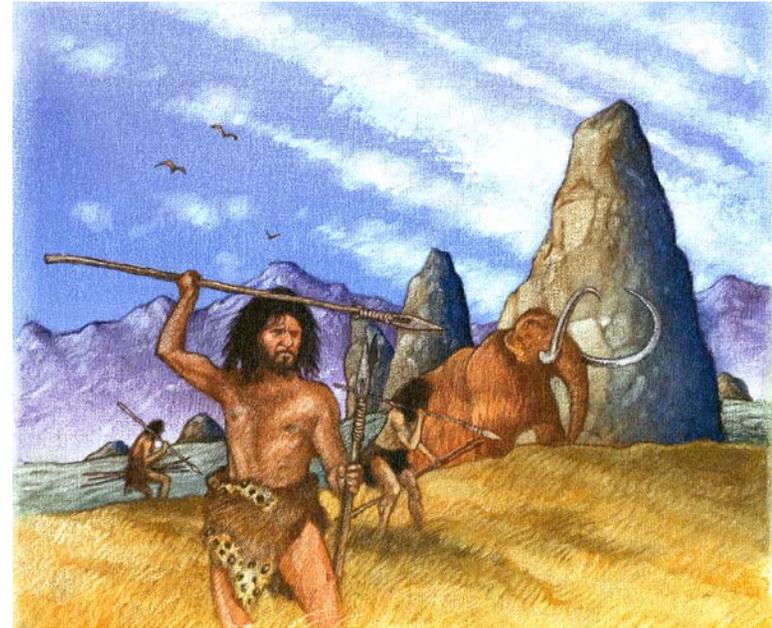
Sweating is an adaptation to help stay cool.

**Do You Know?**

Only mammals sweat. Primates sweat all over their bodies. Dogs and cats only sweat on their feet.



Shivering is an adaptation to help stay warm.



The adaptation of intelligence helped us create tools and hunt.

Early humans learned to make tools because they needed to survive in a dangerous environment. The animals that lived around them used strong jaws and sharp teeth and claws to survive. Humans used their intelligence to invent tools. This helped them hunt animals and survive.

**WOWSER!**

This crow bent a wire to turn it into a hook. That's the first evidence of birds making tools!





## Many Words for the Same Thing



★ House - English

οικία - Greek

Haus - German

Casa - Spanish

Rumah - Indonesian

hus - Swedish

Bahay - Tagalog

房子 - Chinese ★★

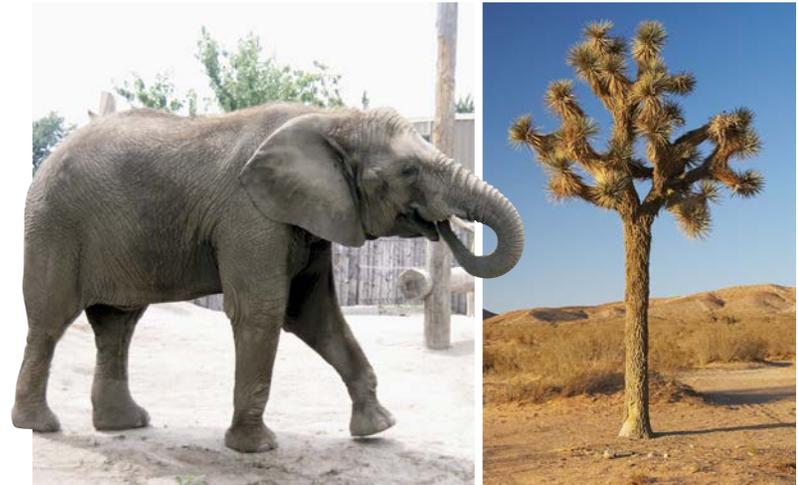
One of the most important human adaptations is our use of language to communicate. The songs of birds and the cries of monkeys are simple signals. But humans have developed complex systems of sounds and symbols to communicate with each other. Over 6,900 languages are spoken in the world today.

Like all animals, humans have adapted. But while animals inherit most of their adaptations, we mostly use learned behaviors to get what we need. To keep warm, we wear clothing, build fires, make electricity, and live in homes. To get food, we grow fruits and vegetables, and raise animals. We learn to speak, read, and write languages. We use bikes, cars, and airplanes to get around.

## Adaptations Everywhere

Think about adaptation. Consider physical and behavioral adaptations. What do you know about inherited and learned adaptations?

Look around your own environment. What adaptations do you see? How do the adaptations help living things get everything they need?



How have these organisms adapted to their environments?

## Glossary

<b>adapt</b>	to change physical features or behaviors of a species in response to changes in the environment (p. 6)
<b>adaptations</b>	specific changes to physical features or behaviors of a species that help the species survive (p. 5)
<b>behavior</b>	a way of reacting to a certain set of circumstances (p. 16)
<b>blowhole</b>	a hole at the top of a whale or dolphin's head, through which it breathes (p. 8)
<b>environment</b>	all of the conditions affecting an organism in one area, including the plants, animals, water, soil, weather, landforms, and air (p. 6)
<b>extinct</b>	no longer in existence (p. 9)

<b>generation</b>	all the organisms of a species born around the same time; the time between when a group of organisms and their offspring are born (p. 7)
<b>habitat</b>	the natural conditions and environment in which a plant or animal lives (p. 5)
<b>inherited</b>	passed on from parent to child (p. 15)
<b>instinct</b>	inherited behavior that leads an animal to act certain ways in certain situations (p. 16)
<b>organisms</b>	living things (p. 6)
<b>reflex</b>	an automatic response (p. 16)
<b>species</b>	a group of related organisms with characteristics that distinguish them from other groups of organisms (p. 5)
<b>survival of the fittest</b>	a theory explaining that the organisms best suited to live in a particular environment are those most likely to survive (p. 6)