Adapted for Survival

Survive or Perish
Animal Adaptations

All animals live in habitats. Habitats provide food, water, and shelter which animals need to survive, but there is more to survival than just the habitat. Animals also depend on their physical features to help them get food, keep safe, build homes, withstand weather, and attract mates. These physical features are called physical adaptations.

Physical adaptations do not develop during an animal's life but over many, many generations. The shape of a bird's beak, the number of fingers, color of the fur, the thickness or thinness of the fur, and the shape of the nose or ears are all examples of physical adaptations which help different animals to survive.

A structural adaptation involves some part of an animal's body, such as the size or shape of the teeth, the animal's body covering, or the way the animal moves.

- Teeth - since different animals eat different things, they don't all have the same kind of teeth
- Body coverings - Hair, scales, spines, and feathers grow from the skin. All of these parts help animals survive in their environments.
- Movement - animals find food by moving from place to place
Compare the four bird feet shown below. Each is adapted to help its owner survive in a particular physical environment. Can you decide what special functions each of these feet is adapted to perform?

Bird bills can be very revealing about what the bird eats - and that can give you clues to where the bird lives. There are several different bill types - from cracking bills to shredding bills and many, many more.
Look at these two skulls. Do you see a difference in their teeth?

Polar bears use sharp canines to rip out chunks of meat. They tend to swallow these chunks without much chewing, so their molars are reduced in size.

The walrus uses its big tusks to defend against predators, pull themselves out of the water and stab through ice.
Herbivores, or plant eaters, have incisors that they use in cutting off plant stems. Squirrels use similar incisors to force nuts open.

Carnivores, being predators, usually have large slicing canines and long roots on their teeth. They use these teeth to cut and chew off chunks of meat.

Omnivores have both sharp, long canines for puncturing and grabbing onto their animal prey and wide molars for chewing their prey and munching on plants.

What does this animal eat? The sharp, very pointy teeth should be a huge clue!
Look at the huge eyes on this monkey. The Owl Monkey feeds on fruits and insects in the dark of night. Its large eyes allow it to collect more available light, giving it sharper night vision. Here’s an interesting fact – the Owl Monkey is the only nocturnal monkey in the world!

Tasmanian devils have very strong jaws and large teeth. When they eat, they eat everything leaving nothing of the animal left. They have very dark fur that allows them to move around at night unseen by their prey as they are scavenge for food. They also have short legs help them move quickly away from their predators.
Armadillos and pangolins (also known as the scaly anteater) have developed armor-like physical features to protect themselves from predators. Armadillos are covered with bony plates except for a soft underside. To protect this area, an armadillo can pull its limbs under its shoulder and hip shields. Some then roll up into a ball. Pangolins are covered with overlapping plates and also have a softer underside that needs protection.

How would this be a protective adaptation?
**Scales, feathers, or fur** often protect animals from their environment.

Scales cover the bodies of most snakes, lizards, and bony fish. Did you know that like tree rings, the age of a fish can be determined by counting the rings on the fish’s scales?

Feathers keep birds warm, help them to fly, and even act as a raincoat.

Fur, hair, or bristles cover most mammals. They help to insulate animals from the cold, just as a winter coat keeps you warm on a cold day. These coverings, just like scales also protect the skin from wear.

Arthropods, including insects, crabs, and spiders, are covered with a hard, inflexible outer shell called an *exoskeleton*. 
Protective coloration allows an animal to blend into its environment. Another word for this might be camouflage. Their camouflage makes it hard for enemies to single out individuals.

In the spring and summer, the arctic fox has a dark coat, to match the brown dirt in its environment. In the fall and winter, it turns white, to match the surrounding snow.

This collared lizard and grasshopper use their color to blend into their surroundings.
Zebras have stripes so when they are close together in the bush their patterning makes it very difficult to spot individual animals clearly. All a predator sees is a mass of black-and-white patterns.

A polar bear lives in the cold, snowy Arctic lands. Their white fur helps them blend in with the snow and ice. A polar bear has a layer of fat under its skin which helps it stay warm. The wide, large paws help a polar bear to walk in the snow. Did you know that when a polar bear swims under water it closes its nostrils so no water can get in?
Protective resemblance fools a predator into thinking it is something else. It is also known as mimicry since one animal mimics or copies the looks of another.

This moth caterpillar resembles, or looks like, a snake.

The Clown fish’s bright colors fool predators into thinking it is poisonous.
The owl butterfly has a large spot resembling an eye towards the back of its body. It hopes that predators will attack that end, allowing it to have less fatal injuries.

This Stick Insect resembles a stick and is able to hide from predators.

Can you see the fish?

**It is important to remember that structural adaptations take place over a very long period of time and usually occur very slowly.**
Behavioral Adaptation

Some animals also need to change their behaviors in order to survive in their environment. This is **behavioral adaptation**. Behavior adaptation may occur in a very short time span or over longer periods. Generally, the more intelligent an animal is the faster it can learn to make behavioral changes in order to survive.

Behavior adaptations can be **learned** or **instinctive** (a behavior an animal is born with).

- Social behavior - Some animals live by themselves, while other live in groups.
- Behavior for protection - An animal’s behavior sometimes helps to protect it from predators.
- Moving in large groups helps protect the members of the group from predators.
- Going underground, hibernating or migrating protects an animal from harsh environmental factors.

For instance the **opossum** plays dead to fool its predators. Do you think this is learned or instinctive?
Like the armadillo and paragon mentioned earlier, the echidna also curls into a ball when frightened. No one taught him how to protect himself in this way, it is instinctive.

How old were you when you learned to reheat garbage?
Raccoons are a great example of behavioral adaptation in action! In their natural forest environment, they nest in trees and eat everything from berries to fish. They are mostly nocturnal, which means they come out at night. As night creatures, they are not seen by humans very often.

As humans destroyed the raccoon's natural habitat, these animals have learned to change their habits — to adapt. Instead of nesting in trees, suburban raccoons have made very comfortable homes in people's attics, basements, garages, and storage sheds. Since they are not picky eaters, they have traded forest food for the delicious leftovers found in our trash. Using their grasping hands, they have learned to open garbage cans and gates, creating quite a problem for their human hosts!
Migration is a behavioral adaptation that involves an animal or group of animals moving from one region to another and then back again.

Animals migrate for different reasons:
- better climate
- better food
- safe place to live
- safe place to raise young
- to go back to where they were born

Many birds and some bats migrate south during colder winter months. Because they don’t know what food sources they will find along the way, many build up reserves of body fat they will need for the journey south.

The blue whale is the Earth’s largest animal. It migrates south during the colder months to breed and find food.
Herbivores (plant eaters) of cold regions, like the moose, have summer and winter ranges and just move back and forth between them year after year.

Some herbivores of warm regions, such as the African antelopes and zebras, migrate seasonally to avoid drought.
Pacific and Atlantic salmon have very interesting migration patterns. In the fall, eggs are laid in the cold fresh streams and rivers of the northern United States, Alaska and Canada. Then in the spring, these little fingerlings migrate thousands of miles to the ocean. After spending years swimming in the ocean salmon swim back upstream to return to the streams where they were born. These salmon may swim hundreds, even thousands, of miles to get back to the stream where they hatched.

Some insects, like butterflies and moths also migrate. For example, Monarch butterflies spend the summer in Canada and the Northern U.S. They migrate as far south as Mexico for the winter. Most migrating insects go much shorter distances.
**Hibernation** is another behavioral adaptation. During hibernation:

- animals go into a deep sleep in which an animal's body temperature drops to about the temperature of the environment
- body activities, such as heartbeat and breathing are slowed causing the animal to need very little food
- some animals that hibernate actually wake up for short periods of time to find food, and then go back to hibernating
- during the hibernation the animals live off of the fat that is stored in their body

Bats hang upside down and pull their wings close to their bodies to keep warm when the temperatures drop. Bats hibernate in their caves, feeding off of their stored sugars.

Many ground squirrels hibernate during cold winters, sleeping in a nest until warm weather arrives. Some however hibernate when the weather gets too hot.
Frogs hibernate at the bottom of streams and ponds where the water does not freeze. Woodland frogs find shelter under leaves and dirt. During the winter they freeze but thaw out and wake up in the spring.

Bears go into their dens in the fall and do not come out till the spring. Their cubs are born during hibernation. But bears are not "true" hibernators. They are one of the "light sleepers." They are easily awakened from their winter slumbers. These in-between hibernators are simply taking long winter naps. Skunks, raccoons, opossums are also in this group.

Snakes travel to one spot where hundreds of them hibernate together.

It is important to remember that behavioral adaptations can take place in a very short amount of time. The more intelligent an animal is the faster it can learn to make behavioral changes, in order to survive.
Plant Adaptations

Animals aren’t the only organism that has needed to learn how to adapt. Plants have different needs too, depending on where they live. Obviously since plants do not have a brain, they cannot make behavioral adaptations. All of their changes are structural.

Some live in deserts, where water is scarce and heat is intense. Others live in warm, wet, rainforests. Still others actually grow in water or on rocks. Sometimes the soil lacks certain things plants need. In many ecosystems around the world, there are long periods of rain followed by long periods of drought.

Since plants can’t just move to a new location to find more favorable conditions, over a long period of time they have develop physical adaptations that allow them to survive.
**Desert plants** are adapted to living in intense heat and sun. While sunlight is needed for plants to make their own food, (photosynthesis) the powerful sun can damage a plant’s chlorophyll. Many plants have adapted by blocking sunlight, while a few orient their leaves away from direct sunlight.

Look at the direction the leaves grow on the Vertical Leaf Senecio. This is an adaptation that keeps a lot of sunlight from hitting the leaf surface. The indirect light they receive is more than adequate for growth. While protected from the sun’s damaging rays, the leaves stay cooler in the hot Madagascar sun.

The Peruvian Old Man has adapted to intense sunlight by growing thick leaf hairs that block out some of the light. These waves of silvery hairs are highly modified leaves that block some of the intense sun.
This desert plant is known as the Desert Trumpet. The inflated tip of the leaf stores carbon dioxide. At night, when the plant performs cellular respiration, it exchanges oxygen for carbon dioxide. Then during the daytime when it's necessary to utilize the carbon dioxide for photosynthesis, it relies on the high concentration of CO2 that it stored up during the evening.

During times of drought, the Resurrection Plant becomes dry, turns brown, and rolls inward to survive. It can remain dormant for decades, looking dead.

After a rain, however, it absorbs water, restores chlorophyll to its leaves, and grows rapidly.
In order for the grasses in a prairie to survive the dry season, they have developed an adaptation that allows them to grow quickly when there is adequate water. Then when water becomes scarce, the grasses turn brown to limit water loss. They store necessary moisture and nutrients in their roots while they await the return of the rainy season. With food and water reserves stored below ground, the grasses are able to survive the effects of fire, caused by lightning, as well. In fact, fire actually helps the new growth and adds nutrients to the soil.

The soil underneath the prairie is a dense tangle of roots and bulbs. While the above ground part of most prairie plants die back each year, the plants are kept alive from year to year by these underground structures. The roots of prairie plants often extend deeper into the ground than the stems rise above it.
The baobab tree has adapted to the savanna biome where there are long periods of drought followed by months of rain, by only producing leaves during the wet season. When leaves do grow, they are in tiny finger-like clusters. The small size of the leaves helps limit water loss.

Another adaptation that enables the baobab tree to survive the long months of drought is its ability to store water in its large trunk.
Deciduous forests are filled with plants that lose all of their foliage for some part of the year. The leaves of these trees usually change color before dropping from the plant. The color is influenced by sunlight, moisture and temperature. In certain cases, deciduous forests lose their leaves during the dry seasons in climates that have a seasonal variation in rainfall.

Many trees of the Rainforests have broad flanges (buttresses) at the base of the trunk. It is believed that the buttresses channel stem flow and its dissolved nutrients to the roots.
Large leaves are common among trees and shrubs of the understory and forest floor layers. The large leaf surface helps intercept light in the sun-starved lower section of the forest and are made possible because the lower layers are largely protected from winds which damage large leaves in the canopy. Canopy leaves are usually smaller than found in understory plants or are divided to reduce wind damage.

In drier, temperate deciduous forests a thick bark helps to limit moisture evaporation from the tree's trunk. Since this is not a concern in the high humidity of tropical rainforests, most trees have a thin, smooth bark. The smoothness of the bark may also make it difficult for other plants to grow on their surface.
While most plants get their nutrients from the soil, plants that live in nutrient poor soil have learned to get their nutrition in other ways. Plants need protein, just as people do, but the soil some plants live in doesn’t give them what they need to make protein. So they get their protein by trapping small insects like flies, spiders and gnats. Most carnivorous plants live with their traps submerged in water. There are more than 450 species of carnivorous plants. Here are just a few.

Venus Flytrap

Bladderwort – a rootless plant

Pitcher Plant

Sundew Plant
Different plants grow on different levels of a **mountain**. At the base of a mountain are broadleaved woodlands. The foothills are usually covered with **conifer** trees that have thin, tough, needle-like leaves to survive long, cold winters.

Hardy plants such as heathers are in the next level. These have tough leaves and woody stems that are less damaged by the strong winds.

Above the scrub line are short, low-growing grasses to avoid the fierce winds. Some plants, like the edelweiss have developed adaptations like hairy leaves to keep out the worst of the frost and also to keep in moisture, since the soil is thin and rain soon drains away down the steep slopes. The showy, hair covered rosettes of this Edelweiss aren't flower petals at all, but modified leaves.
In Conclusion:

All plants and animals have behavioral and physical adaptations. The organisms that survive in our world today do so because of these adaptations. Nearly all aspects of any living organism’s appearance, body shape and behavior serves a purpose in its fight for survival.

As humans change the earth's environment, entire species of plants and animals are being eliminated because they cannot "fit in" and do not have the time needed to develop sufficient means of adapting to the changing environment.

The okapi, found only in the rainforest of the Congo is nearly extinct. Its habitat is disappearing due to slash and burn agriculture.

What can be done in order for it to survive?