

Science Benchmark: 05: 05

All living things inherit a set of characteristics or traits from their parents. Members of any given species transfer traits from one generation to the next. The passing of traits from parent to offspring is called heredity and causes the offspring to resemble the parent. Some traits differ among members of a population, and these variations may help a particular species to survive better in a given environment in getting food, finding shelter, protecting itself, and reproducing. These variations give the individual a survival advantage over other individuals of the same species.

Standard 05:

Students will understand that traits are passed from the parent organisms to their offspring, and that sometimes the offspring may possess variations of these traits that may help or hinder survival in a given environment.

Shared Reading

Heredity: Life Goes On

Look around and see all the people in your life: your friends, your family, your neighbors and your classmates.



Now take another look at the people you don't know; people you see in the airport, the shopping mall or a football game. Then think of the number of people who live in different towns and cities throughout your state, the country and the world. Try to imagine all the billions of men, women, and children who make up the human population that are living on this planet right now. Each individual has characteristics that are similar to the whole group, some characteristics that are similar to a particular group, and some that are uniquely his/her own.



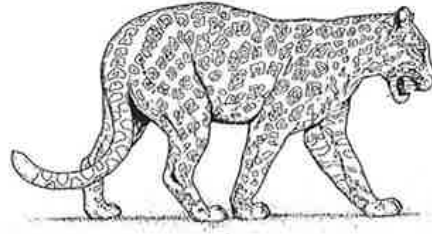
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Some trees grow very tall with thick bark while others are very short with thin bark. It all depends on an organism's heredity, the passing of traits from parents to their young. An *organism* is any living thing that can carry out its life activities on its own. Heredity applies to all organisms including humans, animals, plants, insects and even bacteria.

In a pond, every frog is unique because of various *traits* it *inherited* from its parents. A trait is a characteristic that determines how an organism looks, acts or functions. An inherited trait is a characteristic passed from parents to their young. Some examples of inherited traits are fur color, stripes or spots. The big cats picture below show inherited traits. Can you see similarities and differences between the two cats?



TIGER



LEOPARD

Dogs will always have puppies, just as cats will always have kittens and acorns will always grow into oak trees. That is why people are alike in most ways. We have noses in the middle of our faces, and not on the backs of our heads, as dolphins do. We have eyes in the front and not on the sides of our faces, as rabbits do. We have neither a tail like a dog, nor a neck like a giraffe. We look like people!

All organisms are made up of small building blocks. A person consists of about ten trillion of these building blocks, which come in over 200 varieties. These building blocks give organisms their individual traits and vary from organism to organism. These small differences are enough to keep organisms from looking identical. These differences establish our color of hair or eyes, whether we are tall or short, and whether we have freckles or not. Each of us has inherited his/her own mixture of traits. Within each building block are special instructions that tell an organism how it will grow and what traits it will develop.

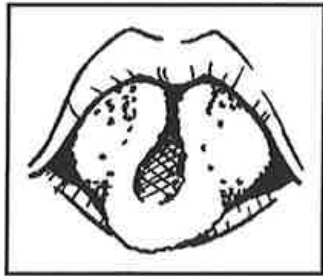
inherited: a characteristic passed from parents to their young

organism: any living thing that can carry out its life activities on its own

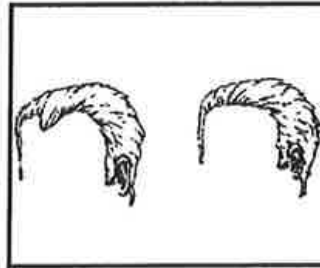
traits: characteristics that determine how an organism looks, acts, or function

Parent organisms pass these instructions to their *offspring*. For example, a puppy may inherit dark hair from its mother; a seedling may develop wide, broad leaves from its parent plant; or human beings may inherit a variety of traits. A few of these inherited traits include:

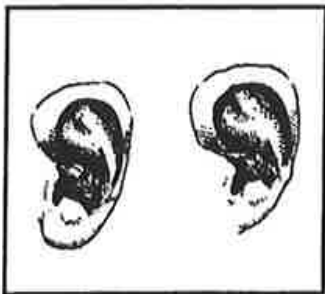
- Ability to roll your tongue



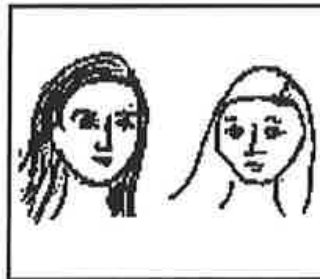
- A widow's peak or straight hairline



- Attached or unattached earlobes



- Color of skin and hair



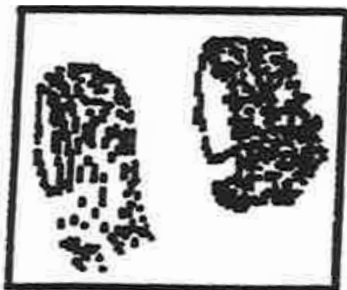
- Freckles



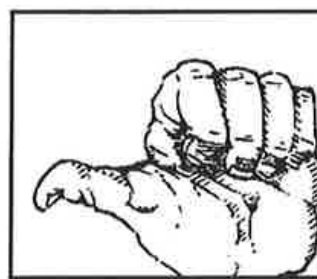
- Cleft in chin



- Naturally curly or straight hair

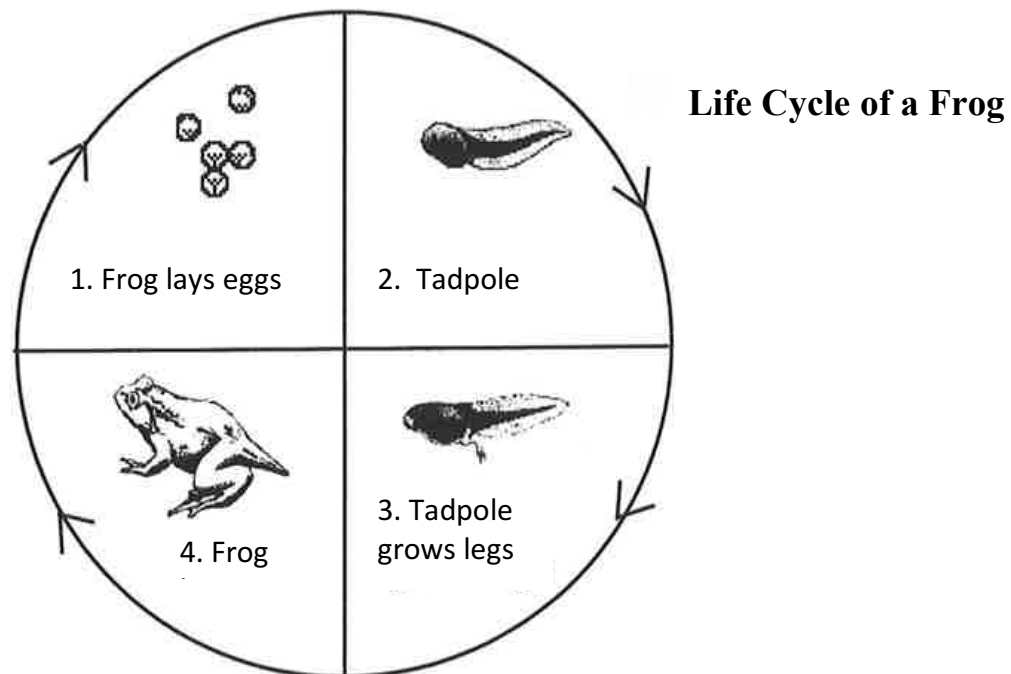


- Hitchhiker's thumb



offspring – the young of an organism
parent organism – a producer of offspring

Sometimes, offspring do not look like the parent organism. However, as they go through their *life cycles* they begin to look more like their parents. For example, the legless little tadpole with its large tail looks very different than it will as a full-grown frog.



A carrot seed looks nothing like the plump, orange vegetable it will eventually become. The pale, segmented mealworm changes dramatically as it goes through its life cycle to become a darkling beetle.

Compare puppies in a litter. Even though these puppies may have had the same two parents, there are *variations* in how they look and act. The difference in paw size, tail length or hair coloring are examples of variations. Some variations do not have much of an effect on an organism. For example, the different colors of hair on puppies may have little effect on whether or not each puppy will survive.

However, for some organisms living in the wild, color can make a big difference. For example, a moth with brightly colored orange and yellow wings will not survive very long if its environment is the dark bark of pine trees. The brightly-colored moth can easily be seen and eaten by birds. A moth with similar color patterns to its surroundings may survive longer. These variations give a *species* a better chance to live or survive.

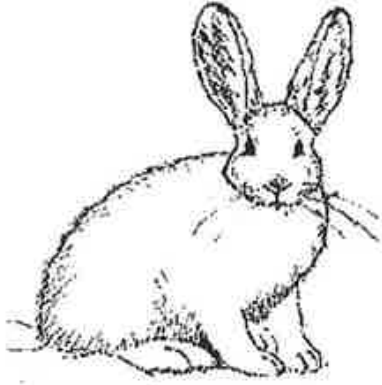
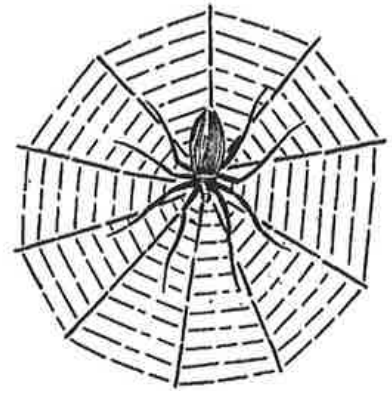
life cycles – the stages of a living organism will go through during its lifetime

species – a certain group of plants or animals that can only reproduce among themselves

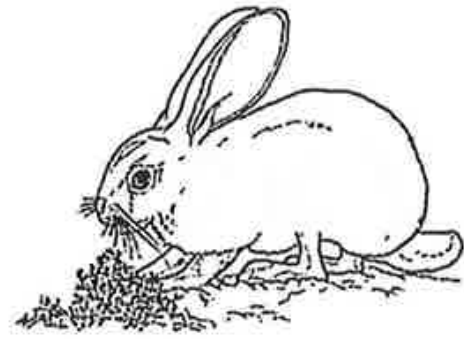
variations – differences in the appearance of an inherited trait among the members of a group (species)

Instincts are also behaviors that are inherited from the parent organism. These instincts help organisms to survive. This explains why salmon migrate upstream to spawn, a cat purrs, a duck swims, a spider spins a web, or a termite rots wood.

Other variations may include *specialized structures* for organisms to survive in their *environments*. A snowshoe rabbit has small ears and broad feet. Its smaller ears prevent it from losing body heat, enabling it to stay warmer in its cold northern habitat. Its broad-sized feet are well suited to help it travel over snowy terrain.

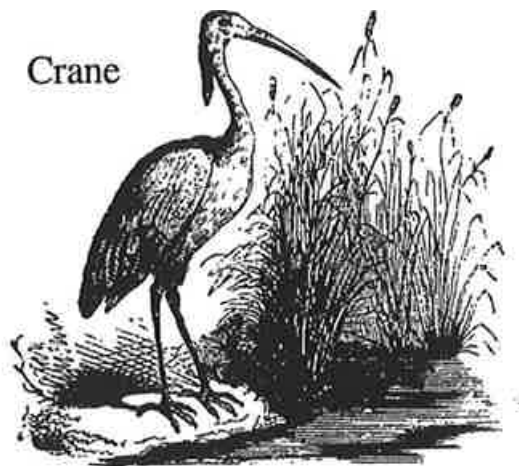


Snowshoe Rabbit



Jackrabbit

A jackrabbit lives in the hot, dry areas of the southwest. It has long, large ears and powerful hind feet. These ears provide a large surface area that allows excess heat to escape. The powerful hind legs enable it to outrun predators. These specialized features of a snowshoe rabbit and jackrabbit enable them to live and reproduce in different environments. A crane has large feet enabling it to walk and stand in muddy, shallow ponds. Its long legs raise its body well above the water, giving it a good view of animals swimming below. The crane can quickly stretch out its long neck to grab the prey with a quick snap of its sharp beak.



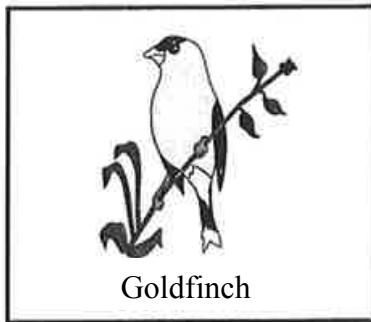
Crane

environment - the surroundings in which an organism lives

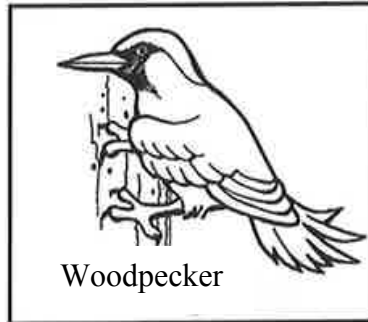
instincts – behaviors that are inherited from the parent organism

specialized structure – a body part unique to a species for survival in its environment

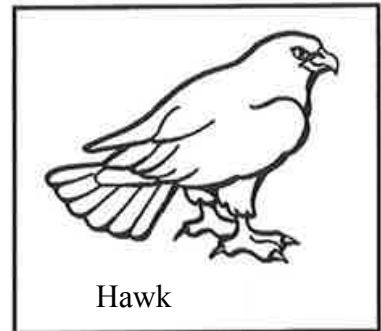
All birds have a beak but all beaks do not look the same. A goldfinch has a short beak for eating seeds. A woodpecker has a slender beak to get insects from under tree bark. A hawk has a hooked beak for ripping and tearing prey, such as rabbits.



Goldfinch



Woodpecker



Hawk

Variations among plants can also provide them with a survival advantage. Pine seedlings compete for sunlight, water, and soil nutrients. Fast-growing seedlings are more likely to crowd out their slow-growing neighbors. Most organisms compete for resources such as food, air, water, and space. Variations that make it easier for organisms to find or use a resource are better able to survive.

The environment is constantly changing. Sometimes the changes are gradual, as in climate changes. Other changes may be sudden, such as volcanoes, earthquakes, floods, landslides, or violent storms. When an environment changes, some organisms die. Some organisms move to a new environment. Some have variations for better *survival*. The helpful variations will be inherited by some of the offspring. After many generations, most organisms in that species will have the helpful variations. Years ago, when DDT (a poison that kills insects) was used on the environment, a few mosquitoes were resistant to DDT. These mosquitoes with this variation were better suited to survive in an environment that contained DDT. They lived and produced offspring that DDT could not kill. As a result, the *population* of DDT-resistant mosquitoes has grown larger in recent years.

population – the number and kind of organisms in the area

survival – the continuation of life

The traits inherited from parents are only part of who they are. Some actions of organisms are *learned behaviors* from parent organisms and from their environment. These are behaviors learned during an organism's lifetime. Learned behaviors vary from organism to organism. Calves, following their mothers to the water troughs, will soon learn to go there by themselves when they are thirsty. Dogs learn different ways to let their owners know when they want to come inside or go outside the house. Some dogs may scratch at the door while others may sit by the door and whine. Many animals such as bears develop different ways of hunting food. Some grizzly bears hunt salmon by grabbing at the fish from the shoreline with their powerful paws. Other grizzly bears dive into the river and use their strong jaws to catch salmon. Trees and plants will bend toward the sun to get the sunlight they need for survival. Trees, such as those on high mountains or near sea shores, may also bend away from constant blowing winds.

Learning is important for all organisms because it allows them to change when the environment around them changes. This ability to change or learn a new behavior will help them to survive for many years.

This introduction to heredity is just a beginning. You may want to read more about this fascinating topic.



learned behavior – an action that is learned through trial and error or is brought about by the environment.

Science Language Students Need to Understand and Use

1. **environment:** the surroundings in which an organism lives
2. **inherited:** a characteristic passed from parents to their young
3. **instincts:** behaviors that are inherited from the parent organism
4. **learned behavior:** an action that is learned through trial and error or is brought about by the environment
5. **life cycle:** the stages a living organism will go through during its lifetime
6. **offspring:** the young of an organism
7. **organism:** any living thing that can carry out its life activities on its own
8. **parent organism:** a producer of offspring
9. **population:** the number and kind of organisms in an area
10. **specialized structure:** a body part unique to a species for survival in its environment
11. **species:** a certain group of plants or animals that can only reproduce among themselves
12. **survival:** the continuation of life
13. **traits:** characteristics that determine how an organism looks, acts, or functions
14. **variation:** differences in the appearance of an inherited trait among the members of a group (species)