HEREDITY

The room is a disaster. The socks are draped artistically over your lamp. Near the fish tank your untouched homework rests peacefully. Potato chip bags, soda cans and gum wrappers lend your place that "lived in" look. Oh no, it's Mom.

She quietly surveys your domain. "You're just like your father!" she scolds. But are you?

You are the offspring, or child, of your parents. You inherited some traits from them. The passing of traits from a parent organism to its offspring is called heredity, and is the topic of this part of Sci-ber text.

Look in the mirror. What do you see? What color are your eyes? Is your hair curly or straight? Do you have freckles?

Many of the things you see in the mirror are your traits. Traits are inherited characteristics you have, though sometimes what you see in the mirror are not traits.

Is the color of your clothing a trait? Why or why not?

Remember that a trait is something you just have by being born. You can't change it like you change your clothes!

How would you describe yourself?

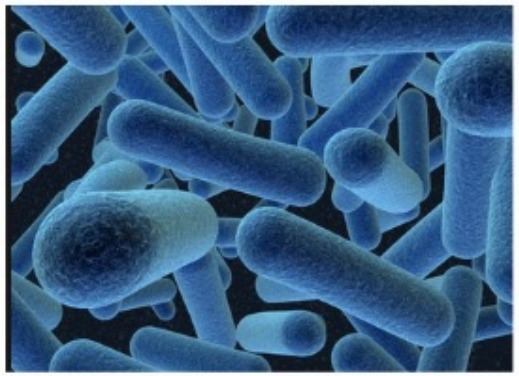
- You might say that you have brown eyes, and that you like to skateboard.
- Let's make a list of words that describe yourself!
- Now let's look at our list…how many of your descriptions could also describe someone in your family?

Now let's say that you have brown eyes and you like to skateboard…

- Consider this…does anyone else in your family have brown eyes or like to skateboard?
- Probably only a few of them like to skateboard…but one of your parents have brown eyes. Your eye color came from your parents, however you learned to skateboard.

Humans and other animals are a mix of characteristics from their parents and behaviors they learned on their own

Organism: any living thing with cells



Traits: a group of the same organisms sharing something in common.

TRAITS

Traits are personal characteristics. They are things about you, such as how you look or what you like.

Characteristics = Traits

- A characteristic of an organism may be *inherited* or *acquired*.
- You are a unique individual.
- Characteristics about you are called <u>traits.</u>
  - Examples: Eye color, basketball skills

- A physical characteristic that is passed from a parent to their baby (offspring) is an inherited trait.

Traits

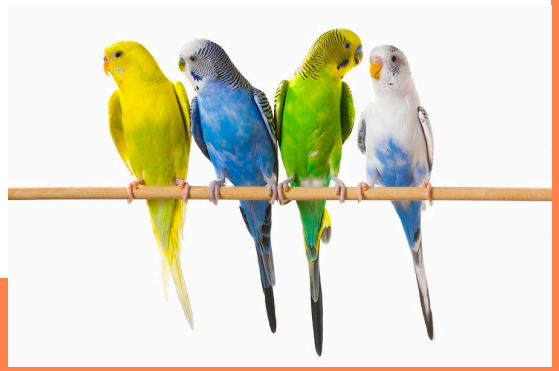
A *trait* sets one person or thing apart from another. A trait is an inherited characteristic.

The dogs below inherited many traits from their parents. Look carefully. What traits can you identify?

We have two hands. This is a trait of our species. A species is a set of organisms with common characteristics. Cats have four legs, mice have tails, lions have sharp teeth and claws, and flowers have petals. These traits identify members of a species as being the same.

Within a species however there can be variations, or slight differences. These parakeets have the same beaks, wings, and feet, but they are different colors.

In nature, some variations give individuals an advantage. They survive better in their environment or physical surroundings.



Offspring: the children from a parent

Inherited: a trait passed from parent to offspring

Inherited Traits

Some traits are given to you by mom and dad through genes.

Genes are DNA information that is in your cells.

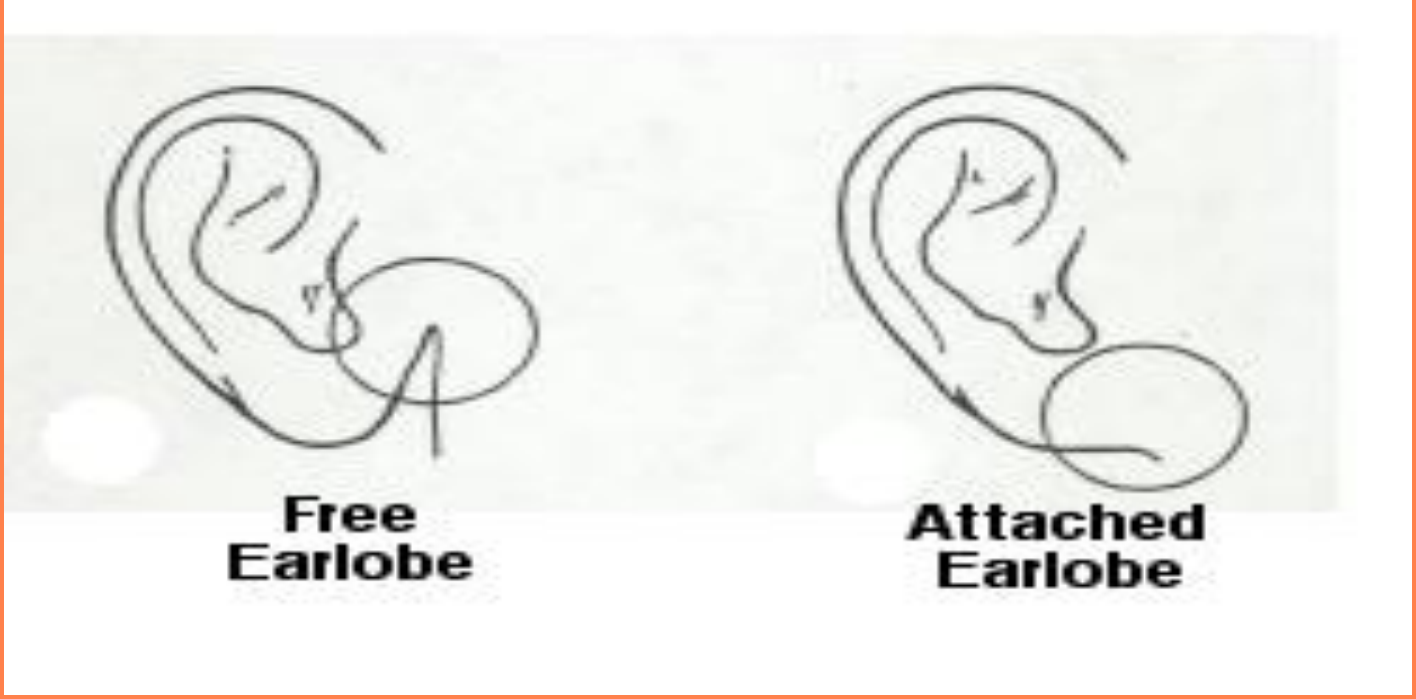
We call these traits that are passed down through genes “inherited” traits.

Examples of Inherited Traits

- Eye Color
- Hair Color
- Skin Color
- Height
- Foot size
- Moles, birthmarks, freckles
- Diseases or conditions
- Curly or straight hair
- Dimples

Are your ear lobes attached to the side of your head, or do they hang free?

- The shape of your ear lobe is an inherited trait.



Variations: small differences among individuals and species

Try it!
Measure and record the hand span from thumb to pinky in centimeters of five of your friends. Use a separate sheet of paper. Are the numbers exactly the same? Probably not. This is a variation, or slight difference, among classmates.

1.
2.
3.
4.
5.

Apples


Braeburn
Cortland
Fuji
Gala
Ginger Gold
Golden Delicious
Red Delicious
Granny Smith
Honeycrisp
Jonathan
Jonagold
McIntosh
Pacific Rose
Paula Red
Wealthy

Acquired Traits

An acquired trait is a trait that that an animal, plant or person develops through interactions in their environment.

Pierced ears

Leaves turned brown

Scars on a manatee

Acquired Traits

- Developed during life (not born with it)
- Examples
  - *Things that happened to you*
    (short hair, cut-off finger)

Some traits are both! (inherited and acquired)

- Skin color is a combination trait
  - **Inherited** part:

    Receive genes for skin color from parents.

  - **Acquired** part:

    Amount of time in the sun determines level of tan.

Acquired traits end with you!

- CANNOT pass on acquired traits to offspring
- NOT in DNA/genes!
- Example: Your kids won't be born with a missing arm if you cut off your arm first!

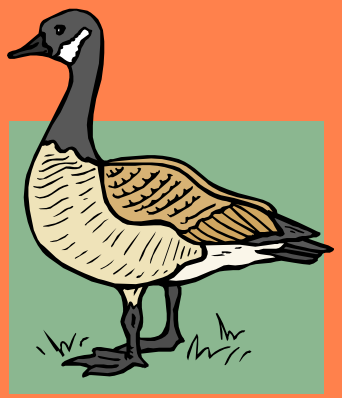
Instincts: born behaviors

Inherited Behaviors (instincts)

- A behavior is a way of acting. Behaviors can be inherited too.
- Inherited behaviors are called instincts.
- Many animals are born with instincts that help them survive.
- Can you think of any animal instincts?

Inherited Behavior examples…

- When the weather turns chilly in the fall, animals prepare for the winter by instinct.
- Some animals head for warmer climates during the winter. Other animals find a safe spot and curl up for a long sleep.
- No one taught these animals how to survive winters. They know what to do by instinct.



- Birds protect their eggs and babies by instinct.
- Frogs are not born with this instinct. They leave their eggs to hatch-or die- on their own.
- Can you think of any additional inherited behaviors (instincts).

Acquired behavior: learned (not inherited) from reactions to environment

Learned Traits/Behaviors

- Some traits are not passed down from your parents, but you learned them over time from those around you or your environment.

- Developed during life (not born with it)
- Examples
  - *Things you learned*

    (riding a bike, reading, writing)

Learned Behaviors (continued)

- Are you better at using the computer than the some of the adults in your family? If so, you learned how to do this. You did not inherit this behavior from your parents.
- We learn many behaviors that helps us every day. These behaviors include how to make a sandwich, wakeboard, and be polite to others.

Examples of Learned Traits/ Behaviors

- Mannerisms
- Language
- Religion
- Food preferences
- Music likes and dislikes
- Favorite sport

Do you think this trait is inherited or learned?

Dimples

Do you think this trait is inherited or learned?

The ability to read

Do you think this trait is inherited or learned?

Quality of eyesight

Do you think this trait is inherited or learned?

Curled Tongue

Can you learn behaviors that do not help you?

- Yes!
- They can include watching television or eating poorly.

Can animals learn behaviors?

- Yes! Can your dog sit?

Let's review…

- An inherited trait is a physical characteristic that is passed from parents to their babies (offspring).
- A behavior is a way of acting.
- Inherited behaviors are called instincts.
- Learned behaviors are not inherited but are acquired from interactions with others or an environment.

Which of these is an inherited trait?

a. Liking the color red
b. Having long fingers
c. Wearing your hair in a ponytail
d. Liking chocolate ice cream

Which of these is a learned behavior?

a. Having long eyelashes
b. Having curly hair
c. Heading south in the fall
d. Liking peanut butter sandwiches

Which of these can you change?

a. Your instincts
b. Your inherited traits
c. Your learned behaviors
d. Your inherited behaviors

A woman is an excellent cook. Why are her children likely to become good cooks?

a. They will learn to cook by instinct
b. They will learn to cook by watching
c. They will inherit her cooking skills
d. Cooking is an inherited trait

Acquired or Inherited?

An oak tree has leaves that look similar to other oak trees.

Inherited trait

Acquired or Inherited?

A person has green eyes.

Inherited trait

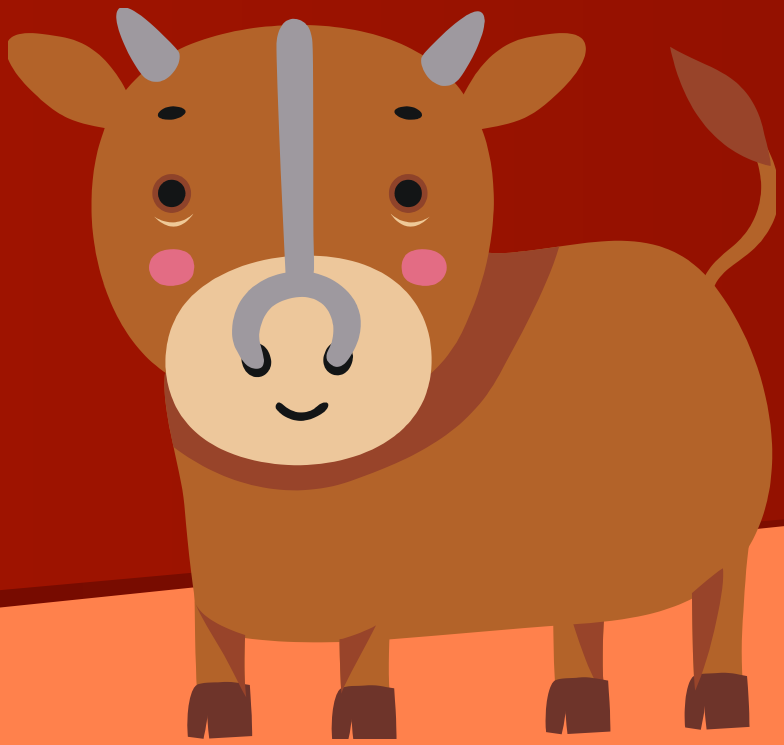
Acquired or Inherited?

A mouse with a cut tail.

Acquired trait

Acquired or Inherited?

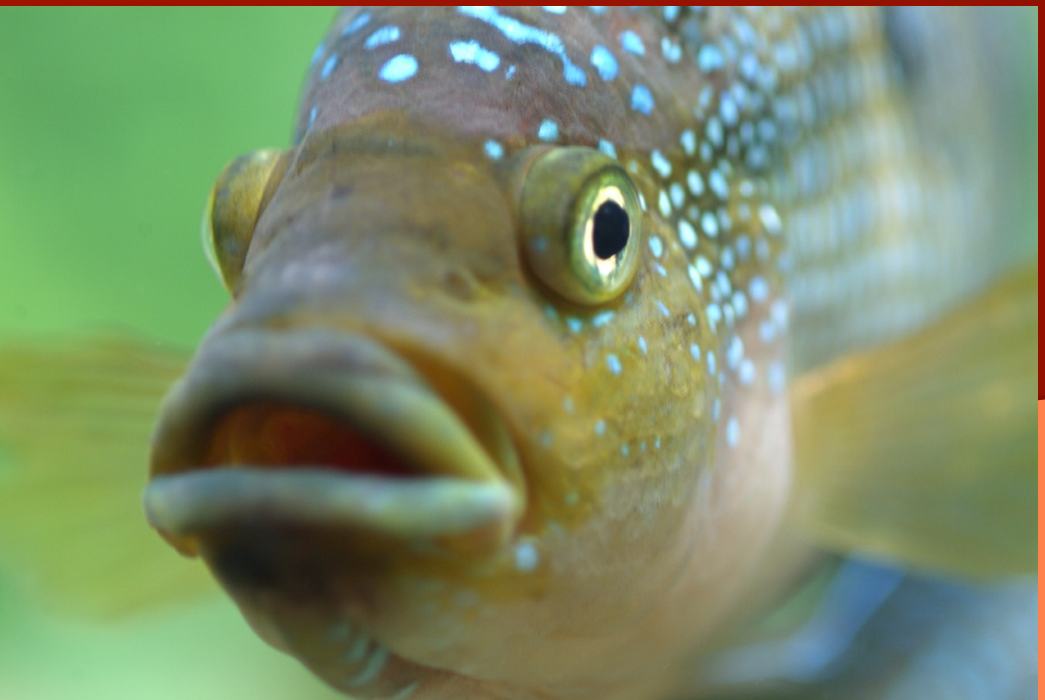
A brown calf has brown parents.



Inherited trait

Acquired or Inherited?

A fish has gills to breathe underwater.



Inherited trait

Acquired or Inherited?

A tree bent due to the harsh wind blowing.

Acquired trait

Acquired or Inherited?

A shark has scars.

Acquired trait

Acquired or Inherited?

A plant has growths from insect bites.

Acquired trait

Dimples

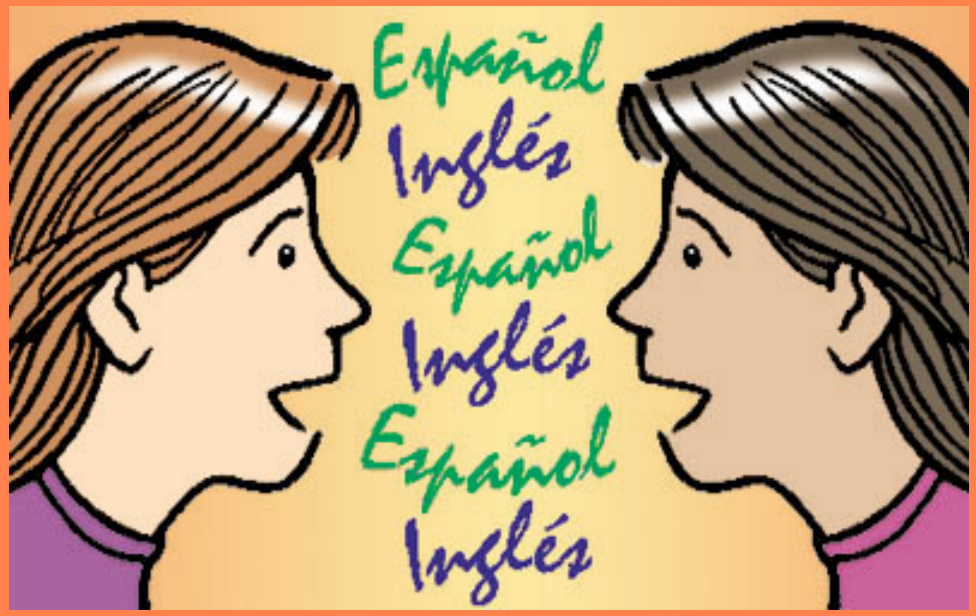
Is this an **acquired trait** or an **inherited trait?**

Dimples – Inherited Trait!

This child has genes from her parents that gives her dimples.

Inherited or Acquired Trait or Behavior

- Someone is bilingual.



Inherited or Acquired Trait or Behavior

- You know how to swim.

Inherited or Acquired Trait or Behavior

- You have a hitchhiker's thumb.

Inherited or Acquired Trait or Behavior

- A man is blind from a firework accident.

Inherited or Acquired Trait or Behavior

- Sarah can roll her tongue.

Inherited or Acquired Trait or Behavior

- You have calluses on your feet.

Inherited or Acquired Trait or Behavior

- A pea plant has purple flowers.

Inherited or Acquired Trait or Behavior

- Captain Kirk can make the vulcan hand sign.

Inherited or Acquired Trait or Behavior

- Harry has a scar on his head.

Inherited or Acquired Trait or Behavior

- Sam has a birthmark on his back.

Inherited or Acquired Trait or Behavior

- A bush has trimmed limbs.

Inherited or Acquired Trait or Behavior

- Kilam is very good at basketball.

What are Some of the Inherited Traits Seen Here and What are They Used for?

Animal Behaviors: Learned vs. Instinct:

- How would you explain the last three pictures on this page? Instinctive or Learned behaviors?

- Why?

Other Instinctual Behaviors:

- **Fight or Flight response:**
  - When startled by an outside stimulus the animals instinctive behavior will be triggered.
  - Those behaviors can be to run, hide, or stand your ground and fight

Survival: a species lives well in their environment; finding food, avoiding predators, and raising young. They stay alive!

Did you know?

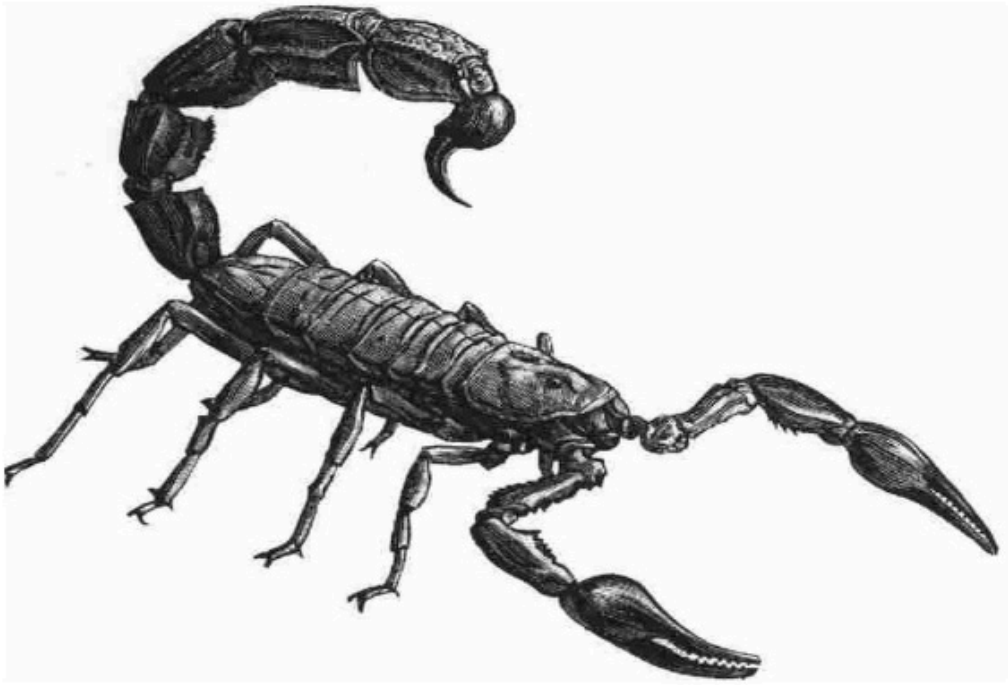
The traits of an animal or plant often help it survive in its environment.

THINK ABOUT IT!!!
A frog's skin color is inherited. How does it help the frog survive?

How can being like a parent, help offspring survive?

Describe ways that they young tiger cub and its parent are alike and different.

Specialized structure: unique body parts that help an organism to survive (like leaves on a plant, or a stinger on a scorpion)



Having What it Takes- to Survive!

Changes Over Time!

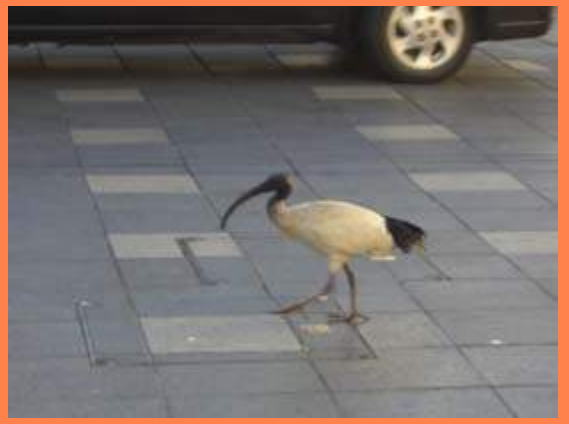
Evolutionary Adaptations

- What can cause changes in animal behaviors or genetic traits?

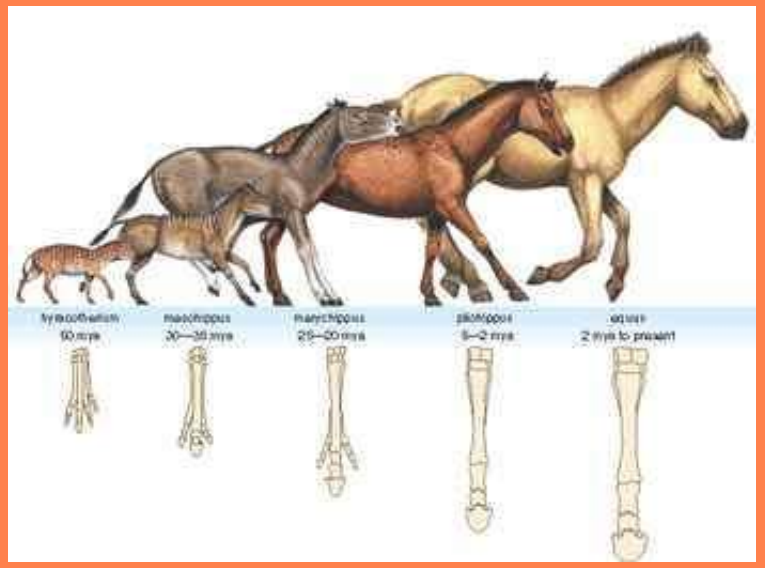
Changes Over Time!!

Evolutionary Adaptations

- What can cause changes in animal behaviors or genetic traits?



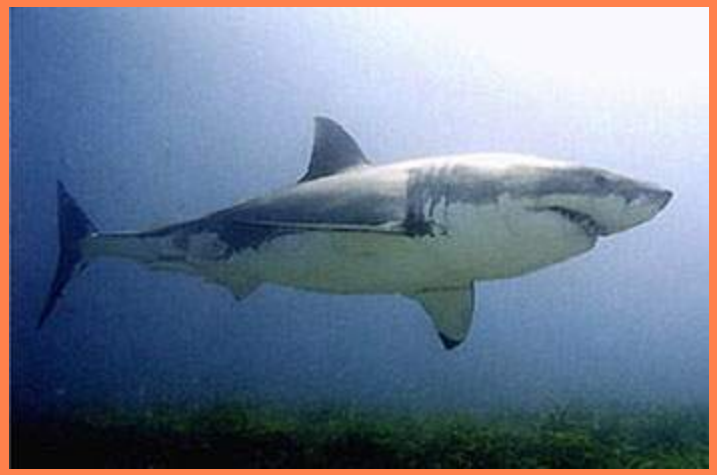
Changes Over Time Continued:



- **Evolutionary Adaptations** are the changes that occur over long periods of time.
  - Adaptations are changes made by organisms in response to the environment. (external stimuli)
  - If an organism can survive without needing to change/ adapt anything about itself then it will. Example, armadillos, many insects, fish…
  - However, some organisms must adapt to environmental changes or risk the chance of extinction.

- What are some specific adaptations seen in these pictures, and what are their purposes for that organism?????

Animal adaptations allow animals to live effectively within their environments. Do all of these pictures represent that statement? Why or Why Not?



Within an Ecosystem:

Organisms that live together within an ecosystem are all competing for the same resources.

However, their specific adaptations allow them to be specialized in their niche and therefore reduce the competition for resources in some way.

Example:

Giraffes eat from tall trees instead of the shorter ones where all other animals eat.

Zebras eat from the top part of the grass

Wildebeest eats the leaves,

Gazelles eat the rest of what's left.

Adaptation vs. Mutation:
What is a Mutation?

- When a new/different genetic trait first appears in an organism it is often looked at as a “mutation”.

- Note: Not all “Mutations” are bad. When they are caused by “Gene Shuffling” it just means something different than what is normally expected, was passed on to the offspring due to the large amount of DNA combination possibilities.

Which fox is best suited for the environment it is in? Why? Are these adaptations or mutations? Why?

Adaptations/Mutations:

- If the "mutation" allows for the organism to survive and reproduce it may become a new trait and in fact it may create a new species with those traits being important/necessary for their survival.
- Competition for resources and the ever changing environment calls for organisms to change if they are going to survive and continue in the future.

The tapir is a member of the same family as the horse and the elephant. Tapirs are mammals. They produce one, and in rare cases two, live babies after a thirteen-month gestation period. Tapirs are herbivores, and play an important part in their habitat as seed dispersers, making them a keystone species for many plant species

Adaptation/Mutation Continued:

- If a mutation is caused by some sort of outside interference like air pollution, then severe mutations can occur and they may in fact be harmful to the organism.
- These types of mutations are different than a gene shuffling mutation caused by the different DNA possibilities of the parents without such outside interference.

A piglet was born with three eyes and two mouths. The piglet was among eight newborn piglets at Liu Dingsheng's farm in Chongren County, Zhejiang province. A local vet said the abnormality may have been caused by genetic mutation or feed pollution. China suffers heavily from environmental pollution.

Creature Features

What if animals had different specialized structures?

Could they survive in their environment?


HUMAN
DESCENT


HUMAN
DESCENT


HUMAN
DESCENT


HUMAN
DESCENT


HUMAN
DESCENT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HUMAN
DESCENT


HUMAN
DESCENT

Some Other Behaviors:

- Living in herds and packs vs. living solitary lives
- Three reasons to live in herds or packs:
  1. Protection from predators
  2. Hunting packs- more efficient at capturing prey
  3. Reproductive Efficiency – mates found within pack or herd

Solitary Lives:

- Why do some animals live solitary lives?
  - Some animals live alone because there are not enough resources to support more than one animal in the territory (i.e. food, shelter, etc)

Predator vs. Prey:

- Most prey animals live in social groups, packs, schools (fish), herds, for protection, finding of resources and reproducing;
- Some do live solitary lives. Where these animals live determines how they live…can you look at the pictures below and conclude why?
- Some prey animals react to a predator very differently from other prey animals.

Horses:
Run away from predators.

Rabbits:
Freeze in the presence of a predator, and will try to hide as soon as possible.

Behavioral Differences Between Male And Female Animals?

- **Female animals:** tend to take care of the young, can lead the herd/pack and be the hunters/gatherers of the pack/herd and watch/listen for danger.

- **Male animals:** In some cases lead, watch for danger but in most cases they must fight off other males who may want the females of the pack/herd for reproducing and thus the passing on of his traits. The stronger male wins, which means the stronger traits get passed on.

There are Alpha males and females in all packs/ herds. What is the difference between them and non-alpha animals?

Just Some Cool Animals You May Not Know About:

What do you think their adaptations are for?

Bask Shark!

Mongolian Mickey Mouse!

Purple Frog!

Look them up and check them out!

Natural Selection: These pictures show variation in species in big cats and owls.

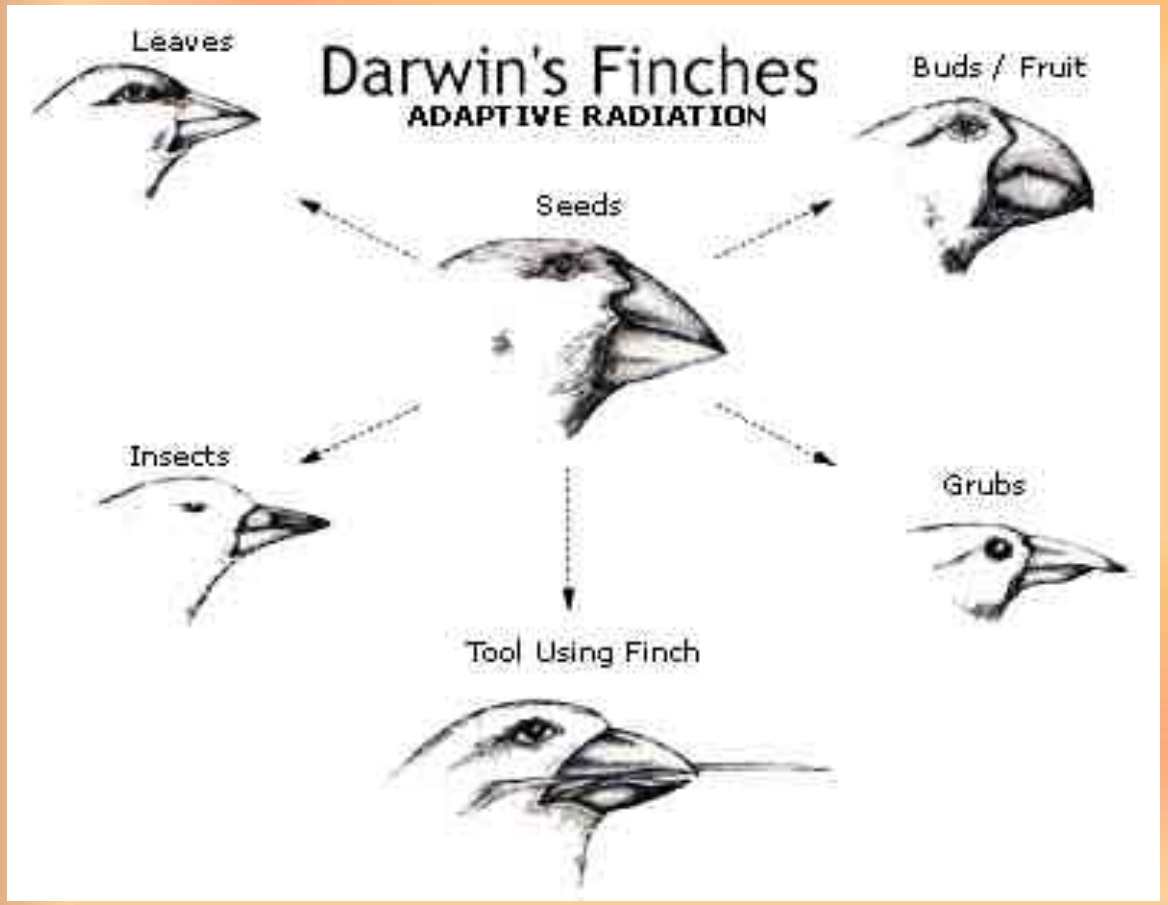
Natural selection is considered to be the biggest factor resulting in the diversity of species (speciation).

Natural Selection:

All organisms need to reproduce to survive. The successful organisms pass on the genetic information of the surviving species from *generation* to generation.

This 'weeding out' of the less suited organisms and the reward of survival to those better suited led Darwin to conclude that species evolve at different times and places and his survival of the fittest theory.

The Galapagos Finches:
An Example of Natural Selection



DNA data indicate the origin of Darwin's finches from a single ancestral species.

The most important differences between species are in the size and shape of their beaks, and the beaks are highly adapted to different food sources.

The adaptive evolution and specialization of Galápagos Finches

What is Selective Breeding?

Angora Rabbits - bred for soft fluffy fur. Used in clothing.

Thoroughbred Horses - bred for speed

- Breeders of animals and plants in today's world want to produce organisms that will possess the most desirable characteristics. What are desirable characteristics?

- So how do you think they make plants and animals with all the best characteristics?????

Corn – new hybrids created to be high producing, drought resistant, and disease resistant.

Selective Breeding:

Cattle like this are used to increase beef production.

- This process of selecting the "best" parents is called artificial selection or selective breeding.
- Specific plants or animals with specific traits are crossed to get offspring with the same desirable traits.

Some selective breeding can change things about a species. Like this cauliflower that has had color bred in to it.

In Conclusion:

- Adaptations can be both how an organism looks and how it acts.
- Adaptations are how a population becomes better suited to live in its environment. They can be random at times and thus called mutations at first.
- Natural Selection – Organisms with the most favorable traits survive in the natural environment and reproduce most successfully.
- Selective Breeding – People picking only the traits they like to be passed on.