Part 1 Evolution

Name:

Part 1 Lesson 1 Darwin, Wallace, Evolution

The earth is roughly _____ Billion years old.

Primitive life is believed to have formed _____ Billion years ago.

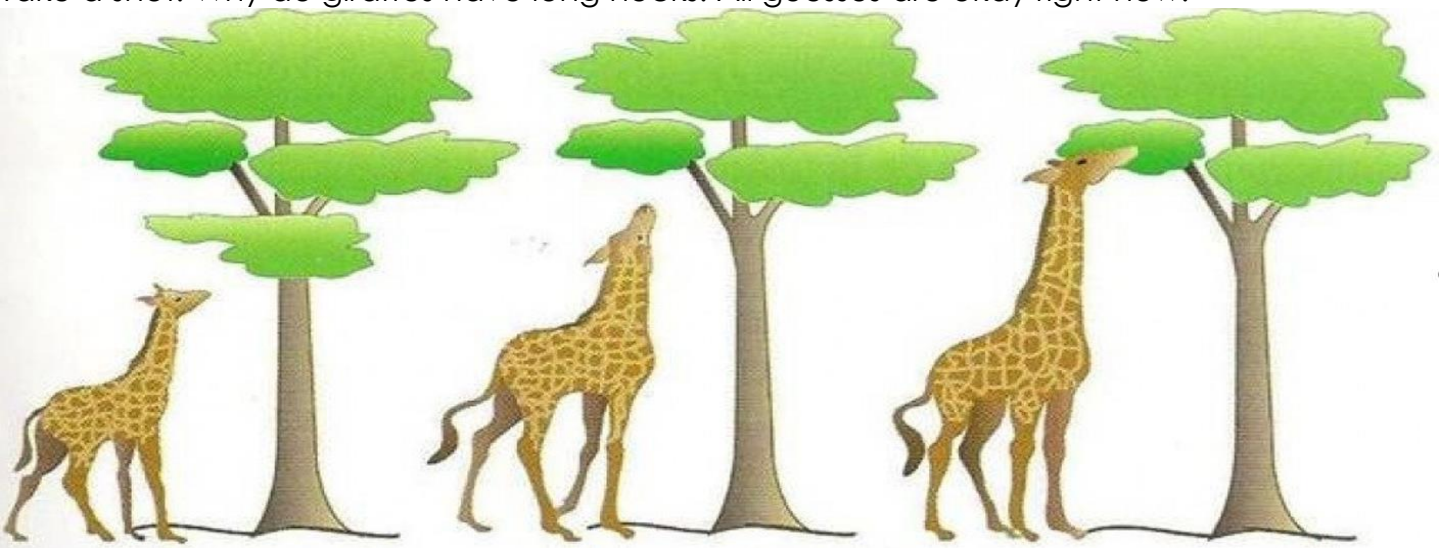
The Earth is _____, and a lot has _____ over time.

Evolution: Evolution is change in the _____of a _____of organisms from one generation to the next.

Usually an advancement.

A gene is a unit of _____ that is transferred from a parent to offspring.

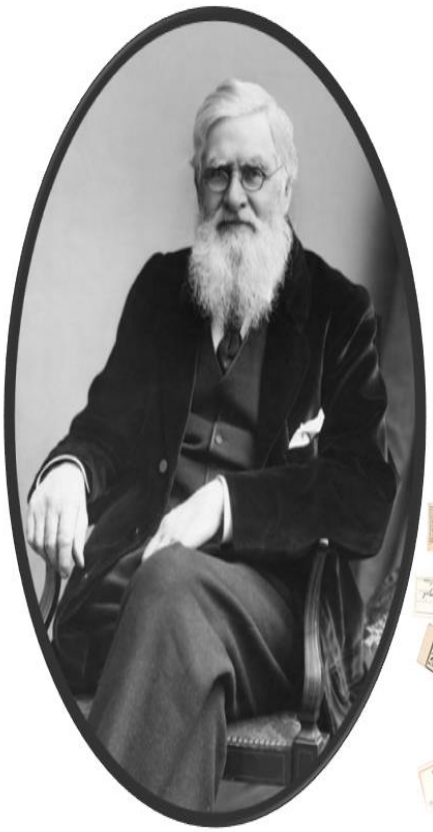
Take a shot! Why do giraffes have long necks. All guesses are okay right now.

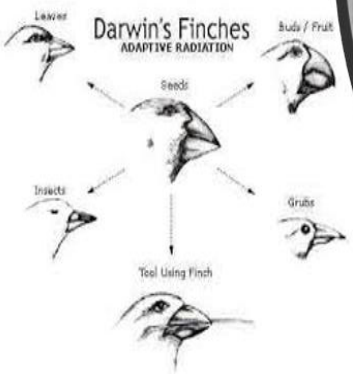


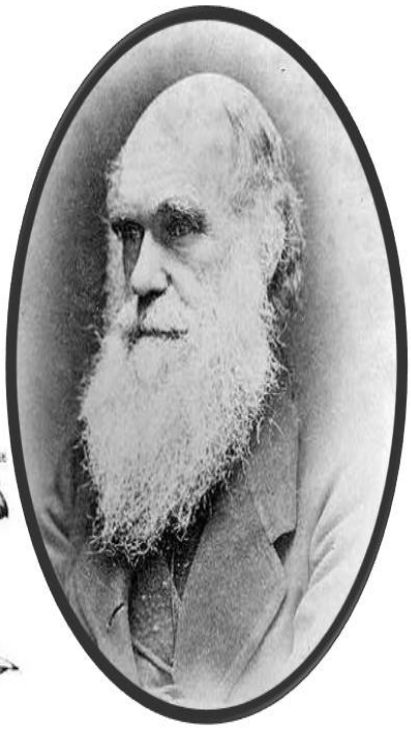
Jean-Baptiste _____ proposed the theory of transmutation of species, which turned out to have some flaws. Nonetheless, it was the first theory of evolution.

It wasn't until _____and _____published their views of evolutionary theory in 1859 that science finally had an explanation for evolution.

Describe Charles Darwin and Alfred Russel Wallace in the space below. What contributions did they make to science and how did they do it?







Part 1 Lesson 2

In 1925, The Scopes _____ Trials occurred.

"Science teacher" _____was arrested for teaching evolution which was against state law in Tennessee.

Create a newspaper front page about the monkey trials including a headline. Who were some people involved? What was it about?

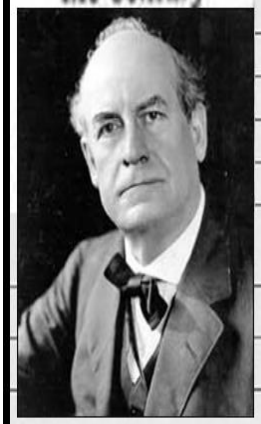
INSTRUMENT OF THE RICH

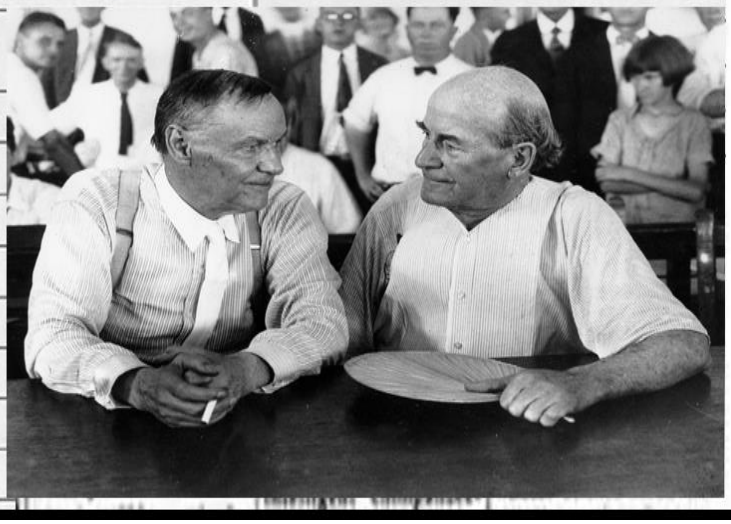
THE ONION

PACIFIER OF THE POOR

Monday, July 20, 1925 | Finest Source of News In Our Great Republic | Price Three Cents

Scopes Trial Called 'Trial of the Century'





Charles Darwin

Most educated people in Europe and the Americas during the 19th century had their first full exposure to the concept of evolution through the writings of Charles Darwin Clearly, he did not invent the idea. That happened long before he was born. However, he carried out the necessary research to conclusively document that evolution has occurred and then made the idea acceptable for scientists and the general public. This was not easy since the idea of evolution had been strongly associated with radical scientific and political views coming out of post-revolutionary France. These ideas were widely considered to be a threat to the established social and political order.

Charles Darwin was born into a moderately wealthy family in Shrewsbury, England. His father, Robert, had the largest medical practice outside of London at the time and his mother, Susannah Wedgwood, was from a family of wealthy pottery manufacturers. She died when Charles was only 8 years old. Thereafter, he was raised mostly by his father and older sisters. Charles grew up in comparative luxury in a large house with servants. However, this was a socially very conservative time in England that set narrow limits on a young man's behavior and future possibilities. The constraints on women in Darwin's social class were even greater. Most were given only enough education to efficiently manage the homes of their future husbands and raise their children. Young men were expected to go to university in order to prepare themselves to become medical doctors, military officers, or clerics in the Church of England. Most other occupations were considered somewhat unsavory.

Charles Darwin
1809-1882

At his father's direction, Charles Darwin started university at 16 in Edinburgh, Scotland as a medical student. He showed little academic interest in medicine and was revolted by the brutality of surgery. He dropped out after two years of study in 1827. His father then sent him to Cambridge University to study theology. It was there that his life's direction took a radical change. He became very interested in the scientific ideas of the geologist Adam Sedgwick and especially the naturalist John Henslow with whom he spent considerable time collecting specimens from the countryside around the university. At this time in his life, Darwin apparently rejected the concept of biological evolution, just as his mentors Sedjwick and Henslow did. However, Darwin had been exposed to the ideas of Lamarck about evolution earlier while he was a student in Edinburgh.

Following graduation from Cambridge with a degree in theology, Darwin was clearly more interested in biology than he was in a clerical career. Fortunately, John Henslow was able to help him secure a berth on a British Navy mapping expedition that was going around the world on what would ultimately become a five year long voyage. Initially, Darwin's father refused to allow him to go but was eventually persuaded by Charles and even agreed to pay for his passage and for that of his man servant on the journey. They sailed in 1831 aboard the survey ship H.M.S. Beagle with Darwin acting as an unpaid naturalist and gentleman companion for the aristocratic captain, Robert Fitzroy. Darwin was only 22 years old at the time. The Beagle was a compact 90 foot long ship with a crew of 74. There was little space, even for the captain. Because of its small size, it was generally thought by naval men that the Beagle was ill suited for the rough seas it would encounter, especially at the southern tip of South America.

It was during the beginning of the voyage that Darwin read the early books of Charles Lyell and became convinced by his proof that uniformitarianism. provided the correct understanding of the earth's geological history. This intellectual preparation along with his research on the voyage were critical in leading Darwin to accept evolution. Especially important to the development of this understanding was his 5 weeks long visit to the Galápagos Islands in the Eastern Pacific Ocean. It was there that he began to comprehend what causes plants and animals to evolve.

H.M.S. Beagle

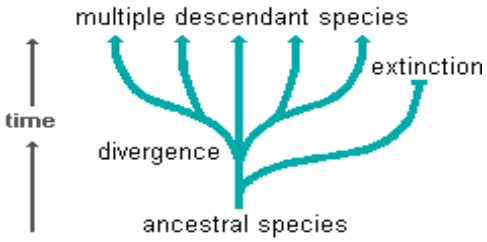
Five year voyage of H.M.S. Beagle (1831-1836)

The Galápagos Islands have species found in no other part of the world, though similar ones exist on the west coast of South America. Darwin was struck by the fact that the birds were slightly different from one island to another. He realized that the key to why this difference existed was connected with the fact that the various species live in different kinds of environments.

Darwin identified 13 species of finches in the Galápagos Islands. This was puzzling since he knew of only one species of this bird on the mainland of South America, nearly 600 miles to the east, where they had all presumably originated. He observed that the Galápagos species differed from each other in beak size and shape. He also noted that the beak varieties were associated with diets based on different foods. He concluded that when the original South American finches reached the islands, they dispersed to different environments where they had to adapt to different conditions. Over many generations, they changed anatomically in ways that allowed them to get enough food and survive to reproduce.

Finches from the Galápagos Islands

Today we use the term adaptive radiation to refer to this sort of branching evolution in which different populations of a species become reproductively isolated from each other by adapting to different ecological niches and eventually become separate species.



Darwin came to understand that any population consists of individuals that are all slightly different from one another. Those individuals having a variation that gives them an advantage in staying alive long enough to successfully reproduce are the ones that pass on their traits more frequently to the next generation. Subsequently, their traits become more common and the population evolves. Darwin called this "descent with modification."

The Galápagos finches provide an excellent example of this process. Among the birds that ended up in arid environments, the ones with beaks better suited for eating cactus got more food. As a result, they were in better condition to mate. Similarly, those with beak shapes that were better suited to getting nectar from

flowers or eating hard seeds in other environments were at an advantage there. In a very real sense, nature selected the best adapted varieties to survive and to reproduce. This process has come to be known as **natural selection**.

Darwin did not believe that the environment was producing the variation within the finch populations. He correctly thought that the variation already existed and that nature just selected for the most suitable beak shape and against less useful ones. Some of Darwin's supporters ultimately described this process as the "survival of the fittest." This is very different from Lamarck's incorrect idea that the environment altered the shape of individuals and that these acquired changes were then inherited.

Nineteenth century critics of Darwin thought that he had misinterpreted the Galápagos finch data. They said that God had created the 13 different species as they are and that no evolution in beak shape has ever occurred. It was difficult to conclusively refute such counter arguments at that time. However, 20th century field research has proven Darwin to be correct.

#1.) Describe Darwin's Journey? (Question meant to be vague)

#2.) Name a few words that you did not understand from the reading and look up their definitions?

#3.) How did Darwin's ideas differ from the other scientist who studied natural selection?

#4.) What observations did Darwin make to lead him to his conclusions about the theory of natural selection?

#5.) Discuss the finches that Darwin looked at. What made them so special?

#6.) What is the theory of the natural selection? Give a strong example of an animal mentioned in the text or one that you are aware of.

What is the modern importance of evolution?

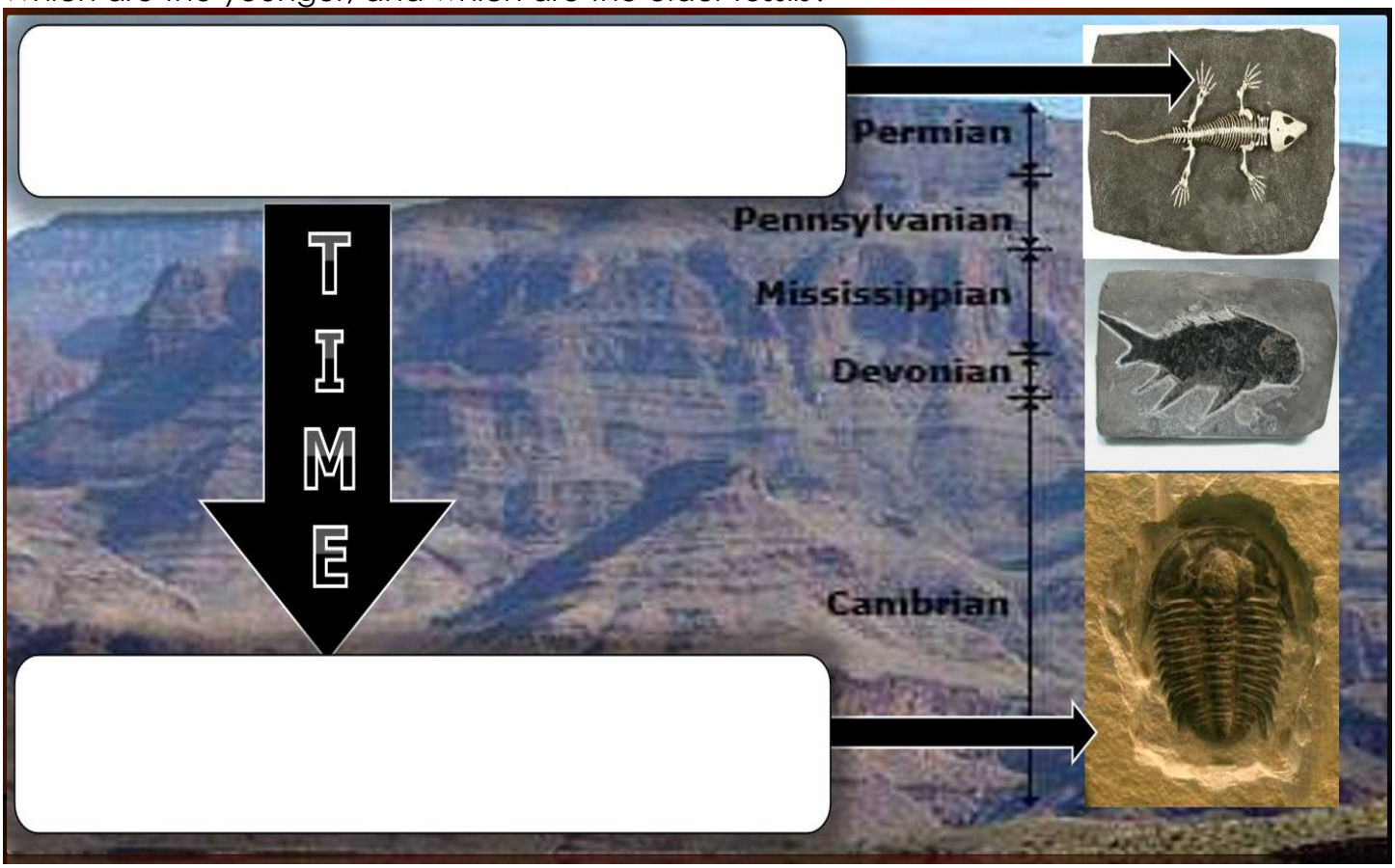
Part 1 Lesson 3 Evidence of Evolution

Evidence of Evolution

-The _____ record of changes in plants and animals over _____ of years.
From simple to more _____.
-Chemical and anatomical _____ of related life forms.
-The geographic distribution of _____ species.
-Genetics (DNA) A more recent branch of science that shows how organisms have _____ and are related on a genetic level.

Principle of superposition. The rock layers on the bottom are _____ and will contain older _____.
More primitive species on the bottom.

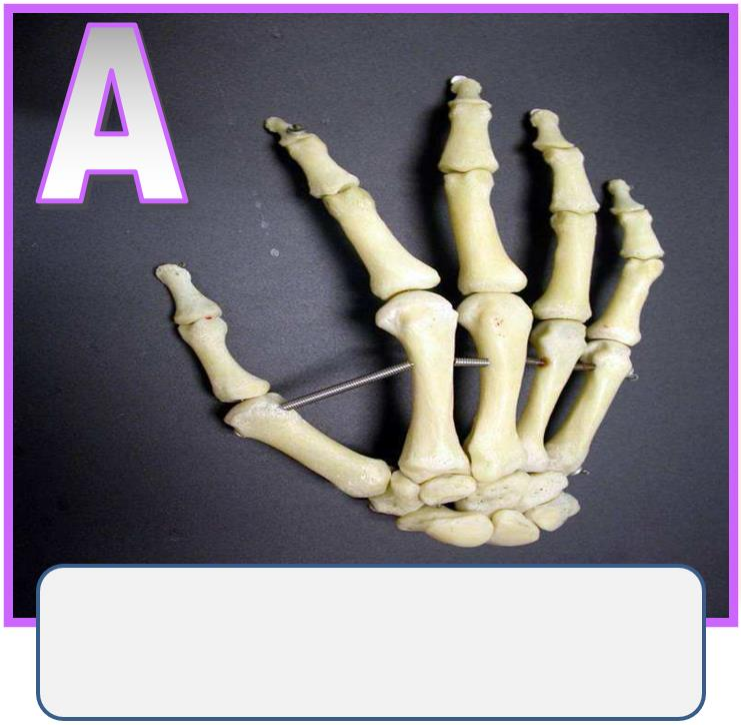
Which are the younger, and which are the older fossils?

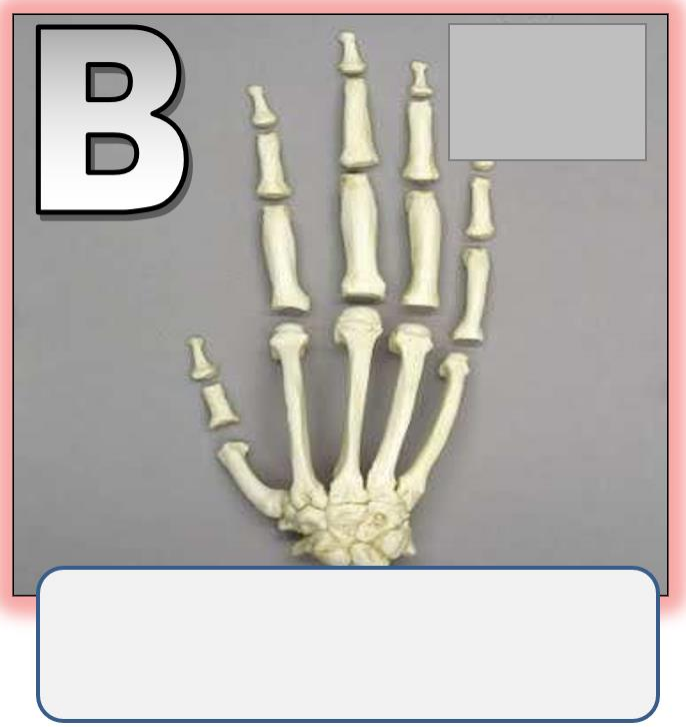


From _____ to more _____

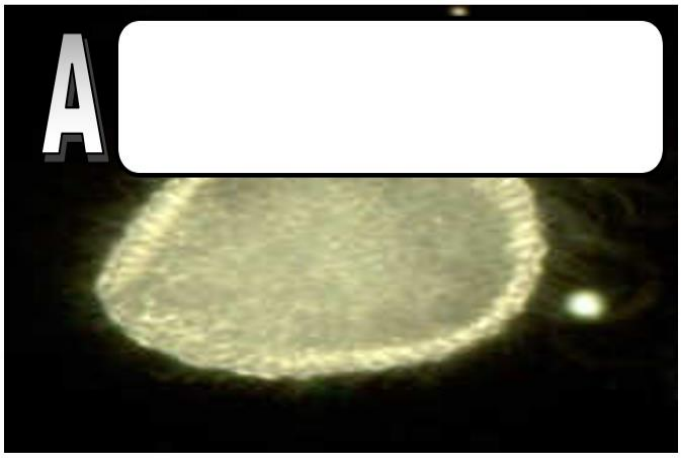
They all have…	Some have…

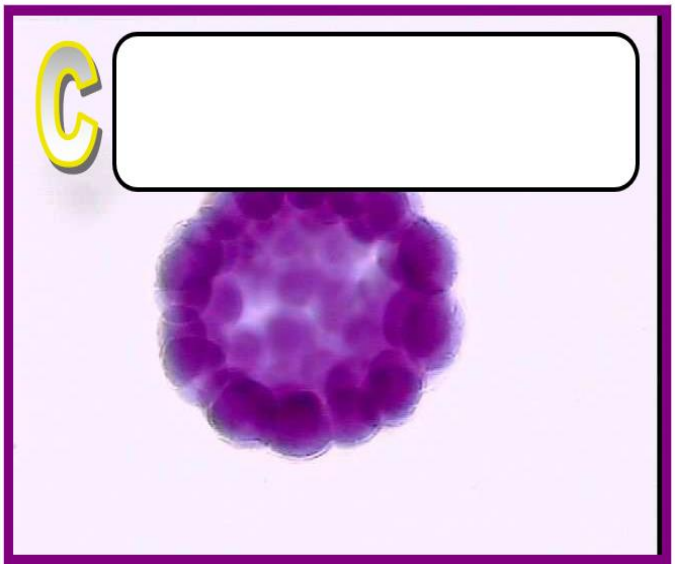
Which is a human? And which is a chimpanzee hand?

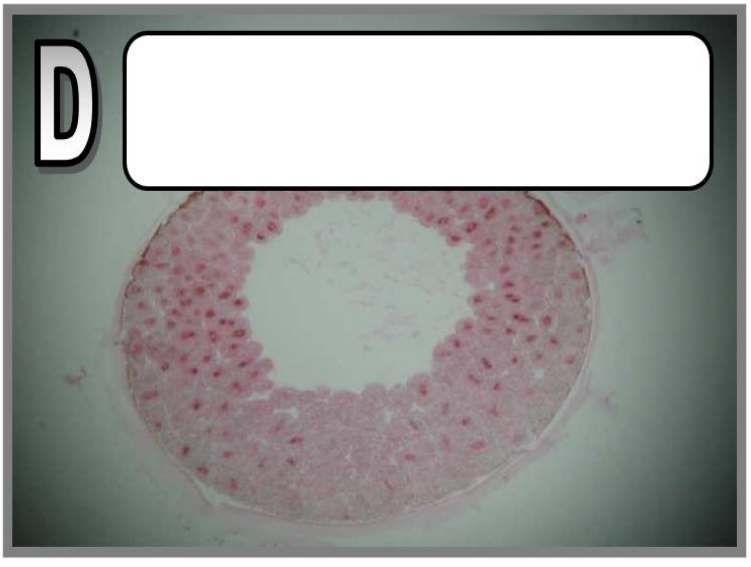




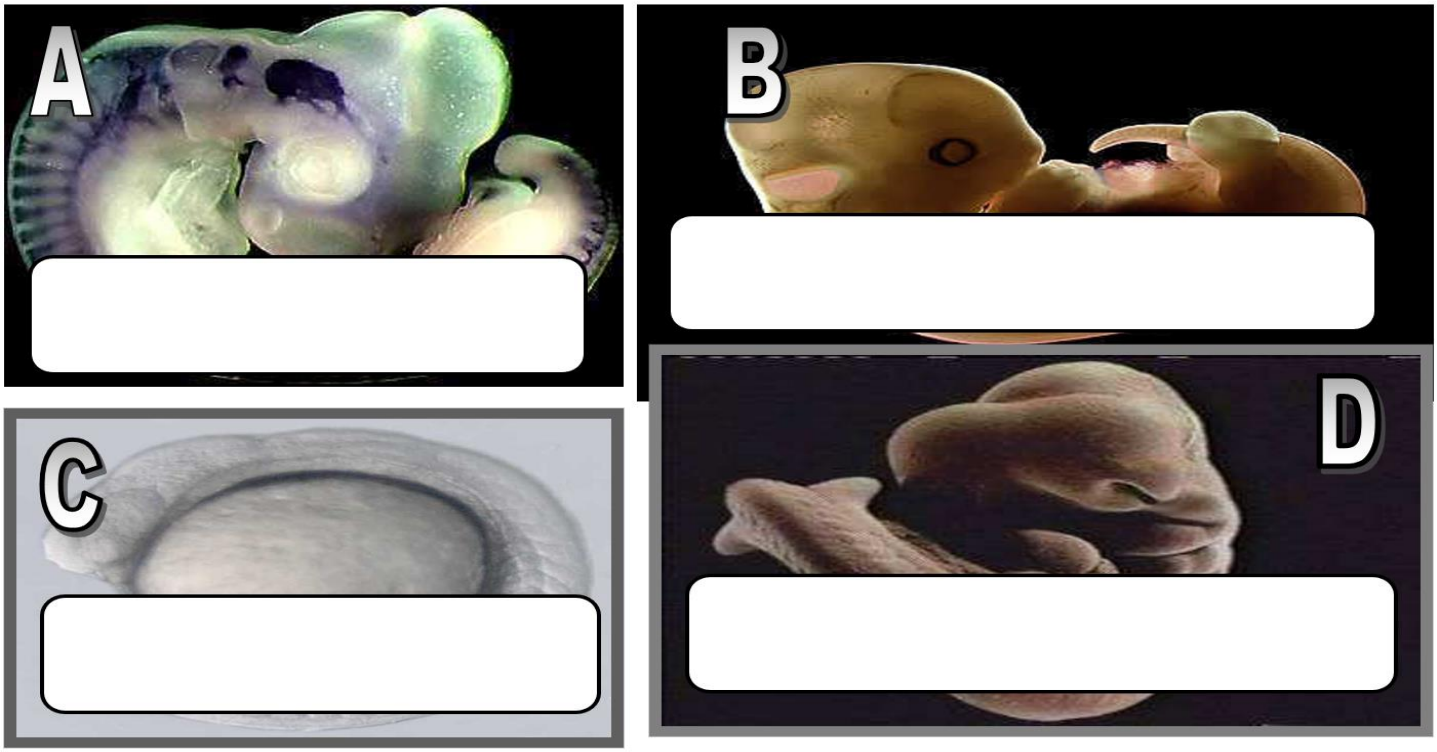
Which of the following is a blastula (early embryo) of a sea urchin, starfish, frog, and human





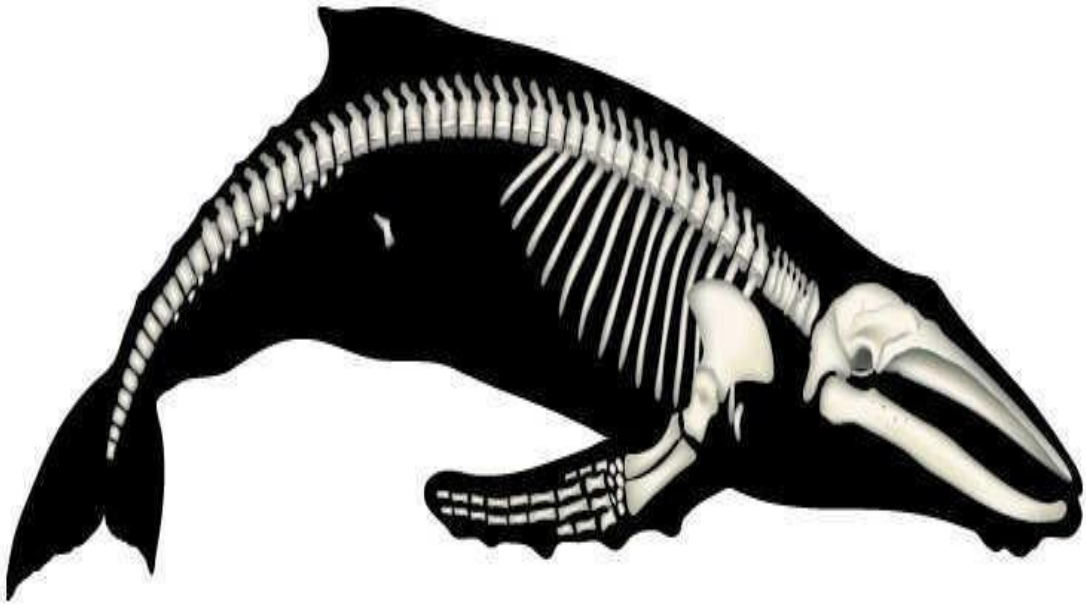


Which of the embryos below is a human, chicken, fish, and cat?



Cells are either prokaryotic (bacteria) or eukaryotic (cells with a nucleus).
All cells are similar in their composition.

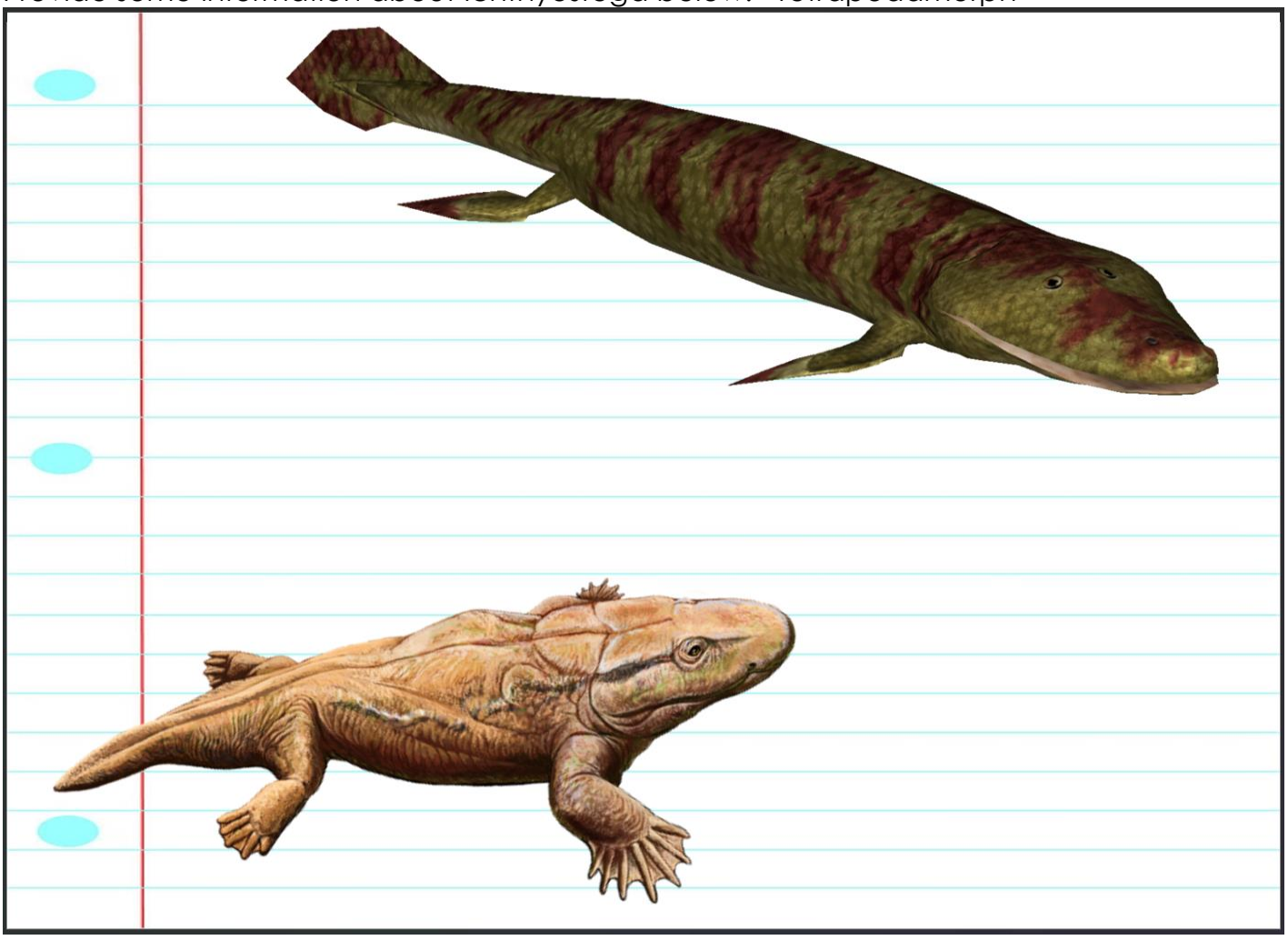
What do some whales have that is a good evidence that they use to be land mammals? Explain below.



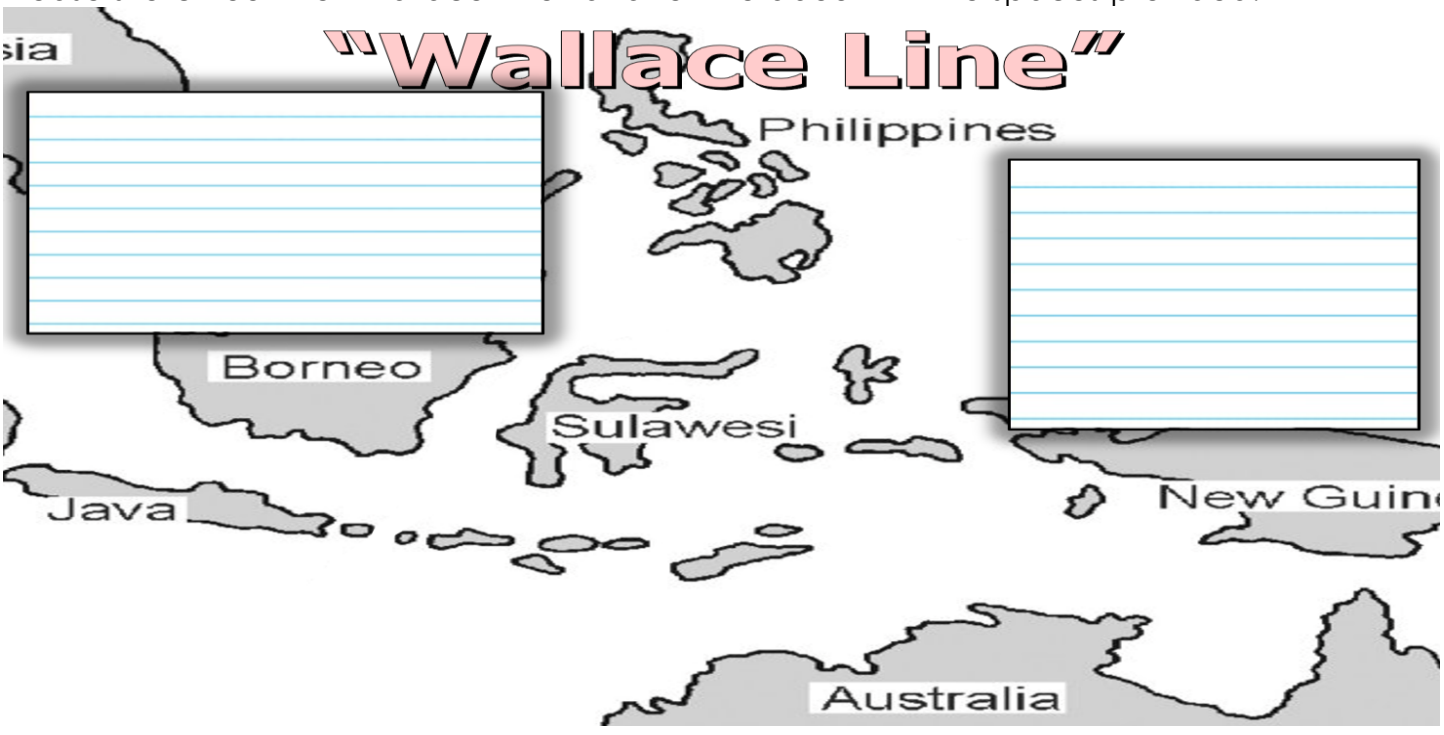
Part 1 Lesson 4 Evolution Continued

Tetrapod: A _____animal, especially a member of a group which includes all vertebrates higher than fishes.
“

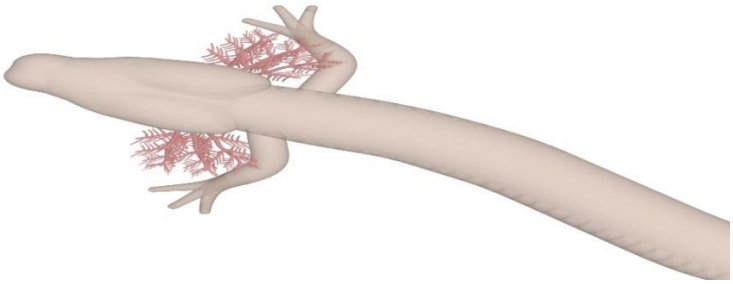
Provide some information about Ichthyostega below. “Tetrapodamorph”



Please sketch out the “Wallace Line” and tell me about it in the spaces provided.



Tell me about this organism? What is so interesting about its evolution.



Part 1 Lesson 5 Mechanisms of Change

Selective Breeding: The _____ breeding of organisms with desirable traits in an attempt to produce offspring with similar desirable characteristics or with improved traits.

_____ (DNA) A more recent branch of science that shows how organisms have evolved and are related on a genetic level.

Evolution is the change in the _____ over time.

Mutation: When a DNA gene is damaged or changed in such a way as to _____ the genetic message carried by that gene.

Trace Your Hand Below and record the five fingers of evolution.

– http://www.youtube.com/watch?v=5NdMnlt2keE

Evolution is the change in the gene pool overtime.

Gene Pools can change when…

Populations can _____

-Diseases, extinctions, introduction of new better adapted species, predators.

Non-_____ mating

-Organisms choose strongest mate, ones in similar boundaries,

_____ in the genes

Genes can change. Some are good, some are bad.

The environment will decide.

_____ in and out of the population

Immigration, gene flow.

_____

Adaptations to the environment that do well replace poor ones. Usually a advancement.

The four parts to Darwin's theories.

-Organisms have _____ over time.

-Organisms share a _____ ancestor.

-Change is a _____ process over many generations.

Punctuated evolution shows us that it can during some periods speed up.

Large extinction events are common.

-The mechanism of evolutionary change was _____ _____.

All organisms are derived from _____by a process of _____ over time…

-Populations _____ into different species, which are related because they are descended from a common ancestor.

-Thus, if one goes far enough back in time, any pair of organisms has a common ancestor.

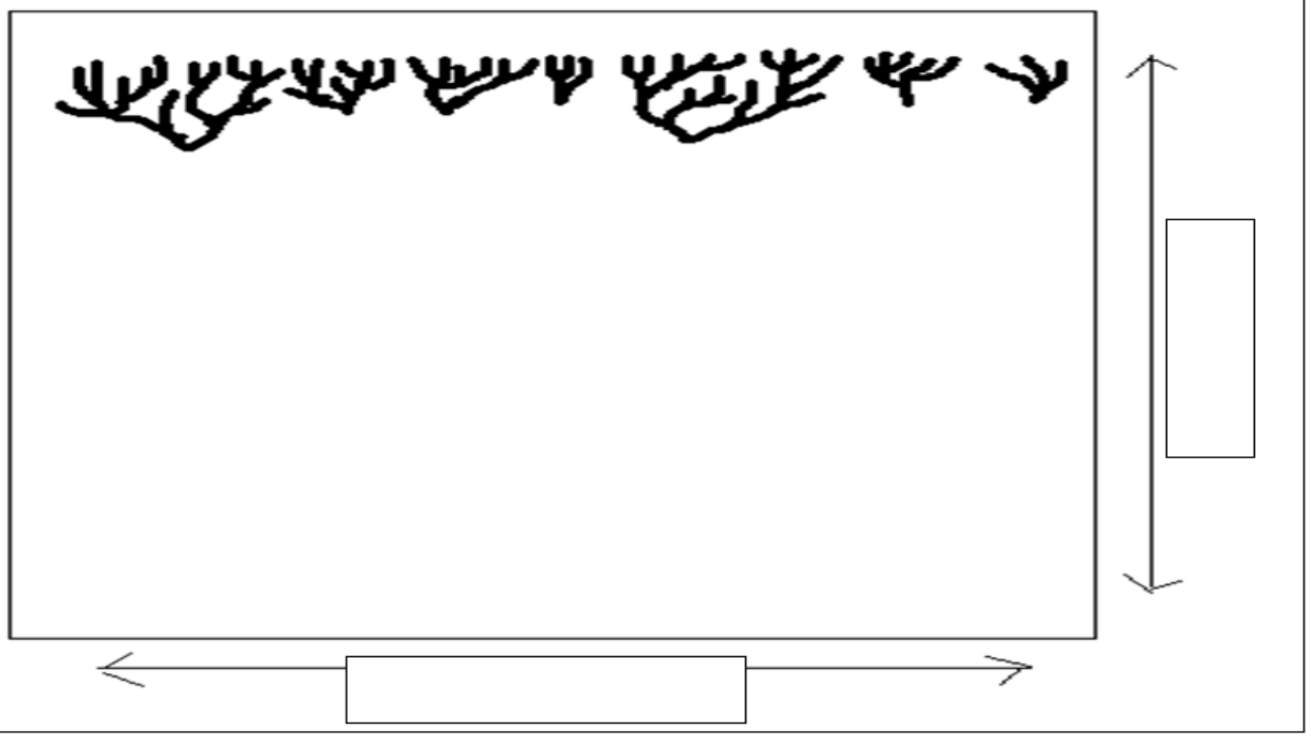
-This explained the _____ of organisms that were classified together - - they were similar because of shared _____ _____ from their common ancestor.

-It also explained why similar species tended to occur in the same _____ region.

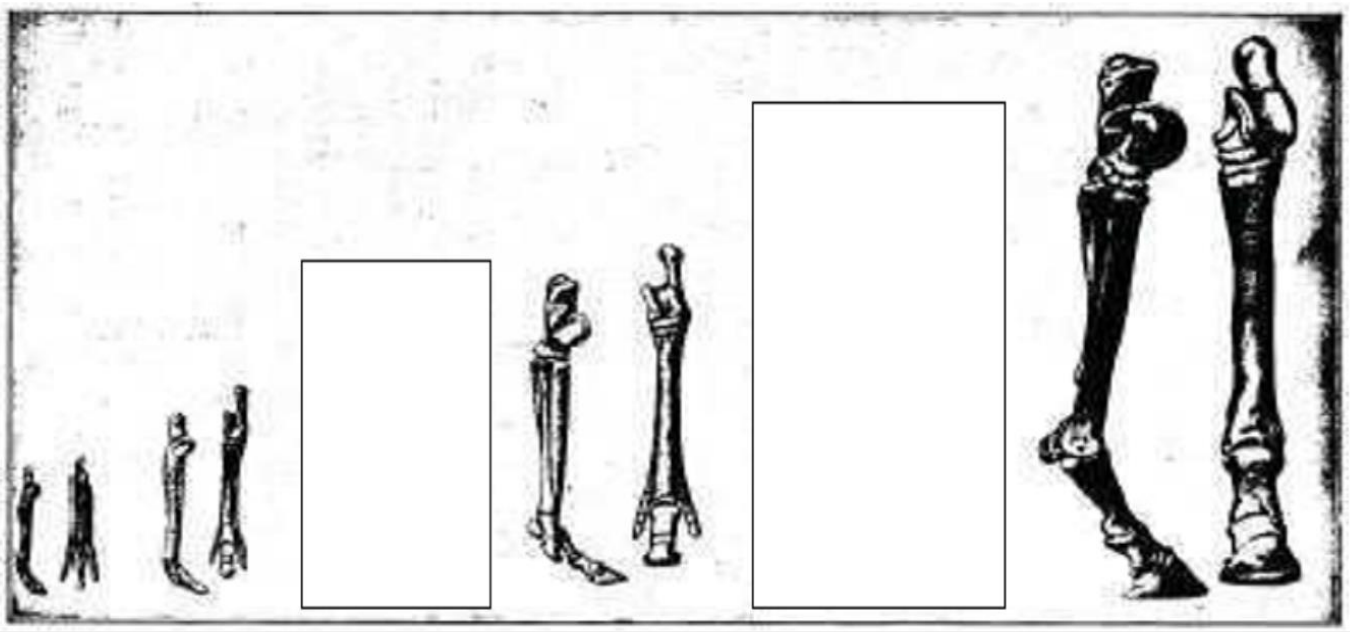
Common Descent: All organisms on Earth are descended from a _____ _____or ancestral gene pool.

-Not observable

Please complete the diagram below so it represents how living things that are on the earth today share a common ancestor. **Please make references to extinctions.** What words are hidden in the boxes?



What changes do you see in bones of these different horse species over the last 30 million years? Sketch in what the missing fossils may look like.



Part 1 Lesson 6 Bear Eating Monsters

Natural Selection: Organisms best suited to their environment _____ more often than others and _____ the adaptation to their offspring (kids).

Mechanisms of Natural Selection

#1.) Without _____ like predators, populations would _____ exponentially. Survival of the fittest!

You are a bear-eating monster. There are two kinds of bears: Happy Bears, and Sad Bears. You can tell the difference between the two by the way they hold their hands. Happy bears hold their hands high in the air dancing around all day. They often go off task in science because they are so happy. They also like to socialize instead of working on their labs. Sad Bears hold their hands down low to the ground because they know not to dance or be affectionate in the classroom.

Procedure

1.) Obtain a population of bears and record in table 1 the number of Happy and Sad Bears.
2.) Eat three happy bears (if you have less than eat them)
3.) Raise your hand to get a new generation of bears from teacher.
4.) Repeat for two more generations
5.) Determine the total numbers of Sad and Happy Bears for each generation.

Record a hypothesis in the space below.

What do you expect to happen to the number of Happy and Sad Bears over time?_____

_____

_____

Table 1: The number of bears for each generation

Generation	# of Happy Bears	# of Sad Bears	Total Bears
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
Total at the end			

How do the results compare to your hypothesis?_____

_____

_____

Graph what happens to the total number of Happy and Sad Bears over time.

Title: Happy and Sad Bears over Generations

What happened to each type of bear over time?_____

How does this lab relate to your knowledge of natural selection?_____

Part 1 Lesson 7 Feeding Simulation

Mechanisms of Change / Natural Selection

#2.) Most populations are _____ in size except for seasonal changes.

Feeding Simulation

First Part	Second Part	Third Part
Seeds are collected at end of each round, they are not rolled over. • If you have less than 30 you die, you will play again soon. • If you have more than 30 you survive again White bean = 1 Energy Units Red Bean = 3 Energy Units Green Bean = 5 Energy Units	Habitat and Predators -Same as first, but this time with predators. -You still need 30 energy units. -You are safe from predators if you are touching Hula-Hoop. -Predators can only walk (no running), only tag someone out if they deliberately don't stop feeding and run away when you are standing over them making hawk noises.	Predator Prey (Round 3) No habitat -A shopping plaza has cut habitat in half. -Only one Hula-Hoop -Predators still exist but in smaller numbers

Describe the competition for resources that you experienced?_____

_____

_____

_____

_____

What type of seeds did you look for? Why?_____

_____

_____

_____

_____

How did predators (hawks) impact your feeding?_____

_____

_____

How did habitat help you?_____

_____

_____

Mechanisms of Change / Natural Selection

#3.) Natural Resources are limited. A struggle for existence.

#4.) No two individuals are alike. (genetics and reproduction creates variability)

Descent with Modification: The passing on of _____ from parent organisms to their offspring.

Offspring will display small _____.

Part 1 Lesson 8 Peppered Moth

Please sketch a peppered moth on the tree below.	Please sketch a black peppered moth on the tree below.
	

Peppered Moth

2.) Place newspapers flat on a large table (use tape on the bottom so it won't lift). Drop 10 of each type of moth into the tray and spread them out. 10 peppered (newspaper) and 10 black

3.) Have a person be the bird, they have a small beak (clay ball held in their hand) to collect the moths.

4.) They must also wear eye goggles with a clear plastic bag over their eyes to blur their vision. (Not over their mouth!) (Just blurred, not blind vision as you to successfully hunt moths)

5.) The bird begins by removing the 10 **they spot first** by active hunting and not just random chance. Put them aside.

6.) Spread out the moths so they don't overlap. Repeat removal process one two more times for each round by active hunting and not random chance. Record the total from both rounds in table.

7.) What species is left to reproduce?

Round 1 (Collect 10 moths that you find first)

Moth Type	Total from newspaper	Total from black paper
Black Paper Moths		
Peppered (Newspaper) Moths		

Round 2 (Reshuffle) (Collect 10 moths that you find first)

Moth Type	Total from newspaper	Total from black paper
Black Paper Moths		
Peppered (Newspaper) Moths		

Round 3 (Reshuffle) (Collect 10 moths that you find first)

Moth Type	Total from newspaper	Total from black paper
Black Paper Moths		
Peppered (Newspaper) Moths		

Which moth species survived more often on the newspaper background? Why? Use data in your response.

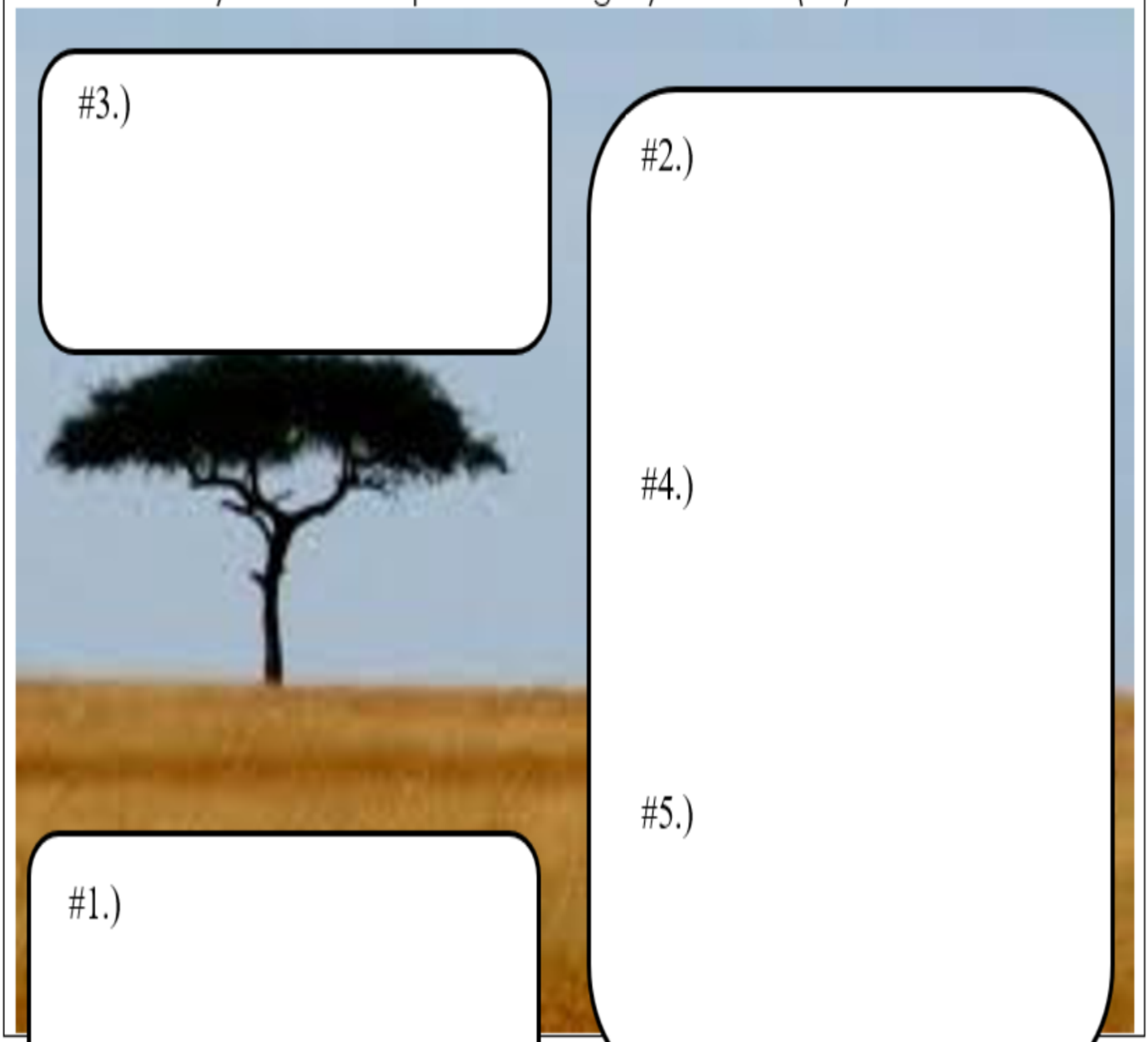
Which moth type survived more often on the black papered tray? Why? Use data in your response.

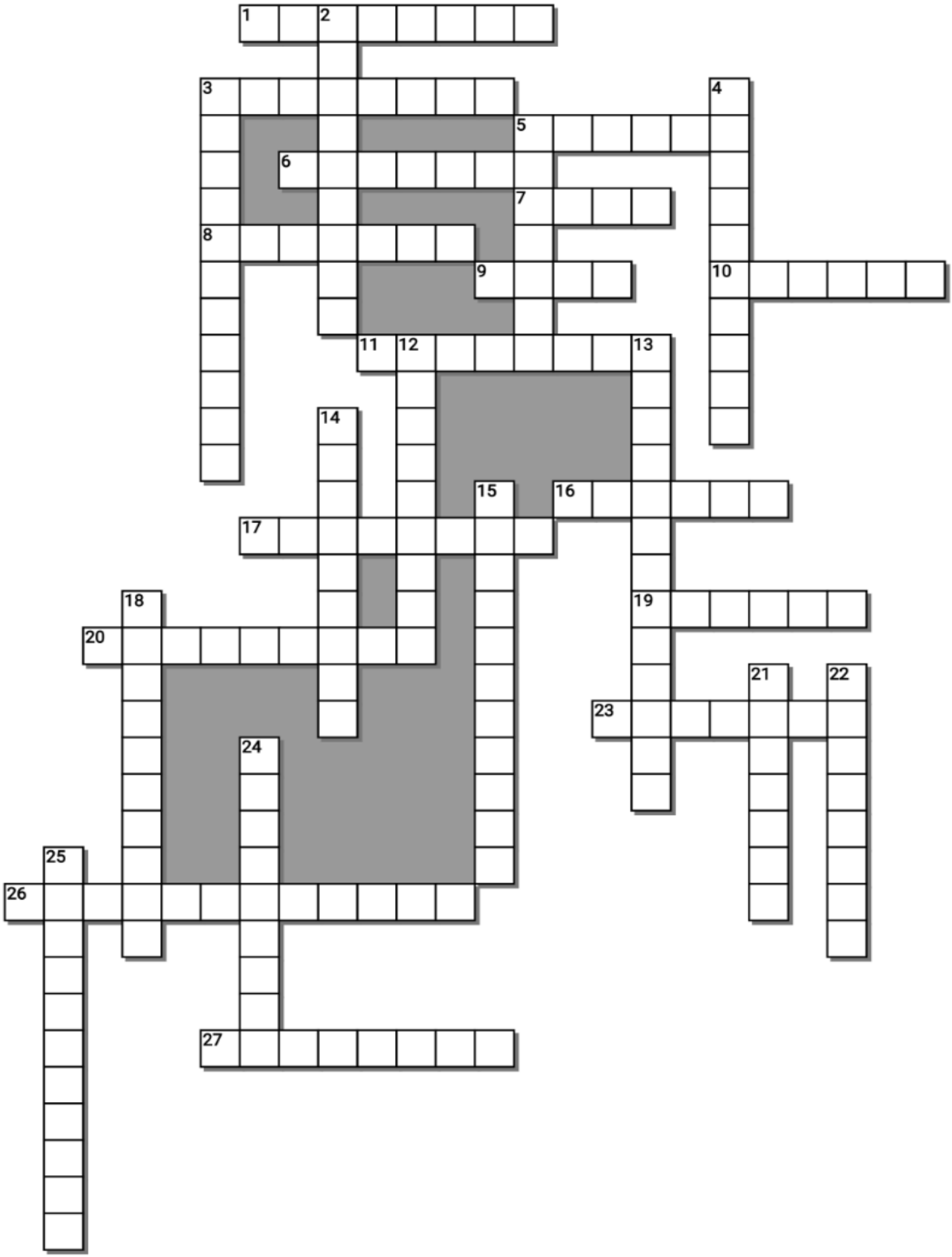
Part 1 Lesson 9 Wrap-Up

#5.) Variation is_____ .

- (Animals pass traits to their young). (DNA)

◊ Draw a lion and describe mechanism #1.
◊ Draw a small herd of zebra and describe mechanism #2.
◊ Draw a giraffe eating from this one tree (#3)
◊ Make each zebra slightly different (#4)
◊ Make a baby zebra like its parent but slightly different (#5)

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Across

1. _____ in and out of the population. Ex- Immigration, gene flow.
3. A four-footed animal, especially a member of a group which includes all vertebrates higher than fishes.
5. Charles _____: English naturalist, geologist and biologist, best known for his contributions to the science of evolution. His proposition that all species of life have descended over time from common ancestors is now widely accepted, and considered a foundational concept in science
7. Change is a _____ process over many generations.
8. Natural Resources are _____. A struggle for existence.
9. A _____ is a unit of heredity that is transferred from a parent to offspring.
10. Non-random_____: Organisms choose strongest mate, ones in similar boundaries,
11. _____ (DNA) A more recent branch of science that shows how organisms have evolved and are related on a genetic level.
16. Populations can _____. Ex- Diseases, extinctions, introduction of new better adapted species, predators.
17. _____: When a DNA gene is damaged or changed in such a way as to alter the genetic message carried by that gene.
19. In 1925, The _____ Monkey Trials occurred.
20. Natural _____. Adaptations to the environment that do well replace poor ones. Usually an advancement.
23. The earth is roughly 4.543 _____ years old.
26. Descent with _____. The passing on of traits from parent organisms to their offspring. Offspring will display small changes.
27. The _____ moth is a temperate species of night-flying moth.It is mostly found in the northern hemisphere in places like Asia, Europe and North America. Peppered moth evolution is an example of population genetics and natural selection.

Down

2. V_____ is inheritable. (Animals pass traits to their young). (DNA)
3. T_____ are small creatures that have adapted to a permanent life in a cave.
4. One evidence of evolution is there's Chemical and a_____ similarities of related life forms.
5. Common _____: All organisms on Earth are descended from a common ancestor or ancestral gene pool.
12. This is the change in the gene pool from one organism to the next over time.
13. Principle of _____. The rock layers on the bottom are older and will contain older specimens.
14. _____ Structure: Is a structure in an organism that has lost all or most of its original function over the course of its evolution.
15. Most _____ are stable in size except for seasonal changes.
18. One evidence of evolution is the _____ distribution of related species.
21. Survival of the _____
22. Without checks like predators, populations would _____ exponentially. Survival of the fittest!
24. _____Breeding: The intentional breeding of organisms with desirable traits in an attempt to produce offspring with similar desirable characteristics or with improved traits.
25. The fossil record shows changes in plants and animals over millions of years. The fossils go from simple to more _____.

----------Teacher can remove this word bank to make crossword more challenging----------

Possible Answers

BILLION, COMPLICATED, DARWIN, DESCENT, EVOLUTION, FITTEST, GENE, GENETICS, INCREASE, LIMITED, MATING, MODIFICATION, MOVEMENT, MUTATION: , SCOPES, SELECTION, SELECTIVE , SLOW, TETRAPOD, TROGLOBITES, VARIATION, VESTIGIAL, WALLACE, ANATOMICAL, GEOGRAPHIC, PEPPERED, POPULATIONS, SHRINK, SUPERPOSITION

Part 1 Review Game Lesson 10

Name:

1-10 = 10 pts * = Bonus + 1 pt,
(Secretly write owl in correct space +1 pt)
Final Question = 5 pt wager

Due: Today
Score ____ / 100

THINGS PAST	DARWIN AND EVOLUTION	WHICH MECHANISMS	STILL CHANGING	SECRET IDENTITY Bonus round 1 pt each
1)	6)	11)	16)	*21)
2)	7)	12)	17)	*22)
3)	8)	13)	18)	*23)
4)	9)	14)	19)	*24)
5)	10)	15)	20)	*25)

Final Question Wager ___ /5 Answer: _____

Part 1 Evolution

Name:

Part 1 Lesson 1 Darwin, Wallace, Evolution

The earth is roughly 4.5 Billion years old.

Primitive life is believed to have formed 3.85 Billion years ago.

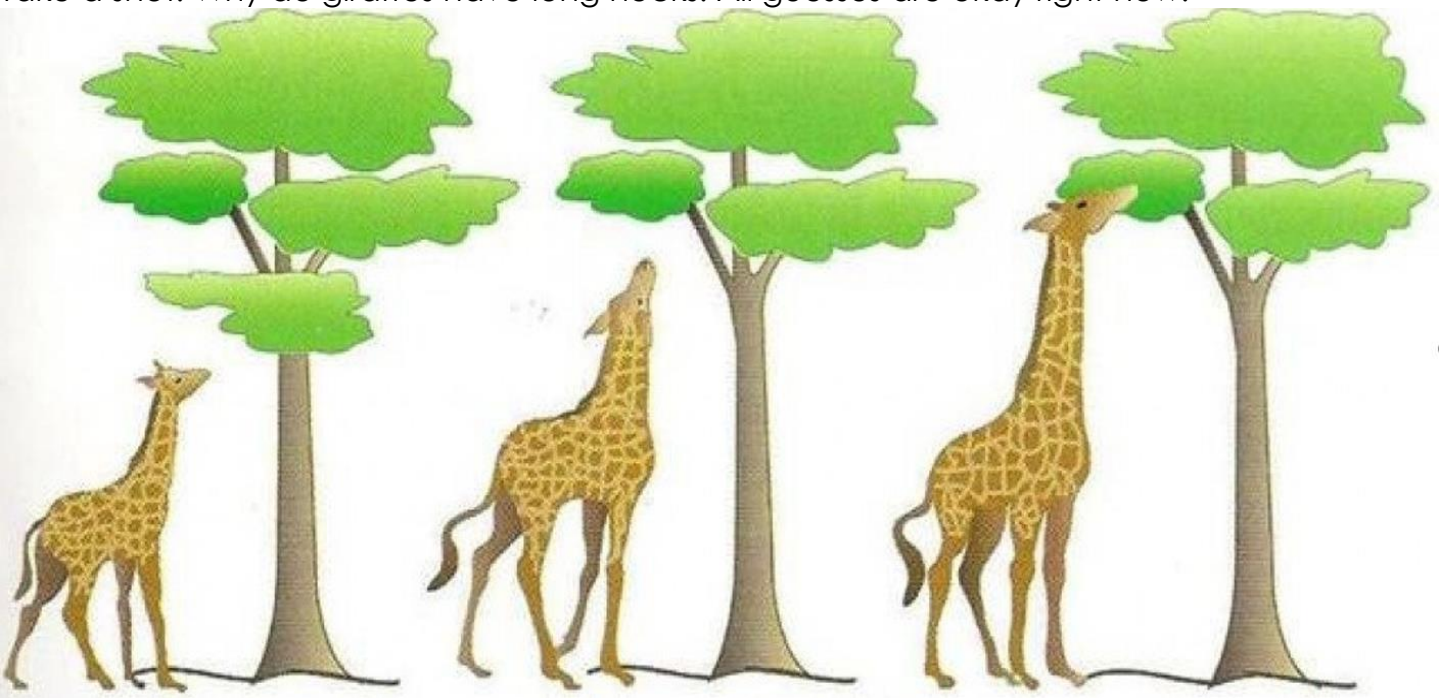
The Earth is old, and a lot has changed over time.

Evolution: Evolution is change in the gene pool of a population of organisms from one generation to the next.

Usually an advancement.

A gene is a unit of heredity that is transferred from a parent to offspring.

Take a shot! Why do giraffes have long necks. All guesses are okay right now.

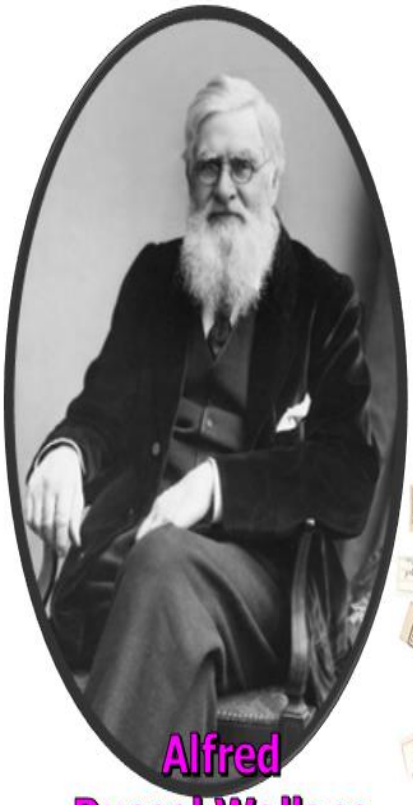


Any answer is okay here. Most likely some responses will be about how the neck stretches so the giraffe can reach the leaves in the tree (Lamarck). Very few responses will be correct at this time. The correct answers are coming.

Jean-Baptiste Lamarck proposed the theory of transmutation of species, which turned out to have some flaws. Nonetheless, it was the first theory of evolution.

It wasn't until Charles Darwin and Alfred Russel Wallace published their views of evolutionary theory in 1859 that science finally had an explanation for evolution.

Describe Charles Darwin and Alfred Russel Wallace in the space below. What contributions did they make to science and how did they do it?

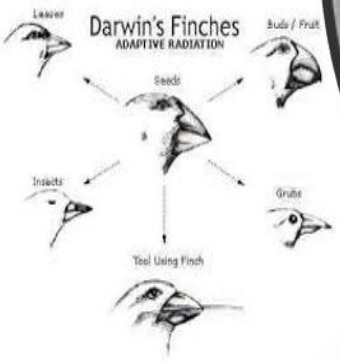


Alfred Russel Wallace

Also studied evolution. Wrote to Darwin. Went to Amazon to collect specimens. Boat with specimens caught fire and sank. Wrote a joint paper with Darwin. Invented Biogeography.

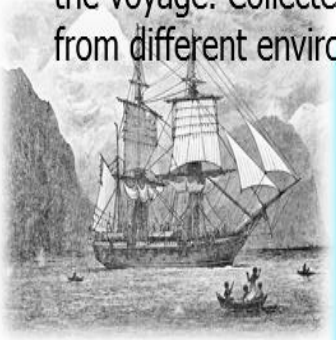
Early 1800's in England

Darwin used his field notes and specimens collected to develop a theory of evolution by natural selection. This theory took many years after his voyage. Wrote *On the Origin of Species* in 1859. Described how Evolution happens.



Charles Darwin

Charles Darwin was hired to be the naturalist onboard the boat H.M.S Beagle. He went from collector to natural theorist during the voyage. Collected many species that were slightly similar from different environments including the Galapagos Islands

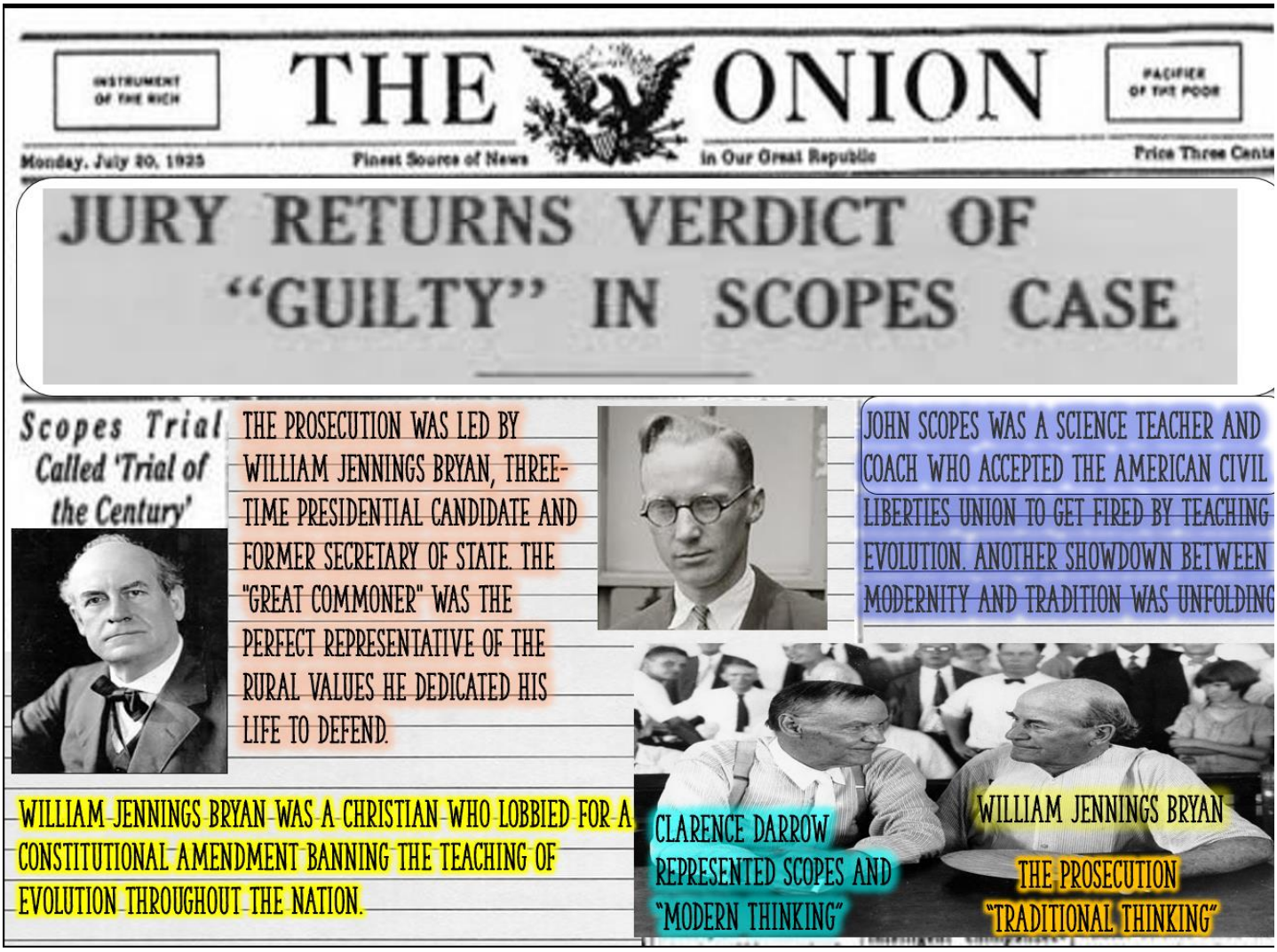


Part 1 Lesson 2

In 1925, The Scopes Monkey Trials occurred.

"Science teacher" John Scopes was arrested for teaching evolution which was against state law in Tennessee.

Create a newspaper front page about the monkey trials including a headline. Who were some people involved? What was it about?



Charles Darwin

Most educated people in Europe and the Americas during the 19th century had their first full exposure to the concept of evolution through the writings of Charles Darwin Clearly, he did not invent the idea. That happened long before he was born. However, he carried out the necessary research to conclusively document that evolution has occurred and then made the idea acceptable for scientists and the general public. This was not easy since the idea of evolution had been strongly associated with radical scientific and political views coming out of post-revolutionary France. These ideas were widely considered to be a threat to the established social and political order.

Charles Darwin was born into a moderately wealthy family in Shrewsbury, England. His father, Robert, had the largest medical practice outside of London at the time and his mother, Susannah Wedgwood, was from a family of wealthy pottery manufacturers. She died when Charles was only 8 years old. Thereafter, he was raised mostly by his father and older sisters. Charles grew up in comparative luxury in a large house with servants. However, this was a socially very conservative time in England that set narrow limits on a young man's behavior and future possibilities. The constraints on women in Darwin's social class were even greater. Most were given only enough education to efficiently manage the homes of their future husbands and raise their children. Young men were expected to go to university in order to prepare themselves to become medical doctors, military officers, or clerics in the Church of England. Most other occupations were considered somewhat unsavory.

Charles Darwin
1809-1882

At his father's direction, Charles Darwin started university at 16 in Edinburgh, Scotland as a medical student. He showed little academic interest in medicine and was revolted by the

brutality of surgery. He dropped out after two years of study in 1827. His father then sent him to Cambridge University to study theology. It was there that his life's direction took a radical change. He became very interested in the scientific ideas of the geologist Adam Sedgwick and especially the naturalist John Henslow with whom he spent considerable time collecting specimens from the countryside around the university. At this time in his life, Darwin apparently rejected the concept of biological evolution, just as his mentors Sedjwick and Henslow did. However, Darwin had been exposed to the ideas of Lamarck about evolution earlier while he was a student in Edinburgh.

Following graduation from Cambridge with a degree in theology, Darwin was clearly more interested in biology than he was in a clerical career. Fortunately, John Henslow was able to help him secure a berth on a British Navy mapping expedition that was going around the world on what would ultimately become a five year long voyage. Initially, Darwin's father refused to allow him to go but was eventually persuaded by Charles and even agreed to pay for his passage and for that of his man servant on the journey. They sailed in 1831 aboard the survey ship H.M.S. Beagle with Darwin acting as an unpaid naturalist and gentleman companion for the aristocratic captain, Robert Fitzroy. Darwin was only 22 years old at the time. The Beagle was a compact 90 foot long ship with a crew of 74. There was little space, even for the captain. Because of its small size, it was generally thought by naval men that the Beagle was ill suited for the rough seas it would encounter, especially at the southern tip of South America.

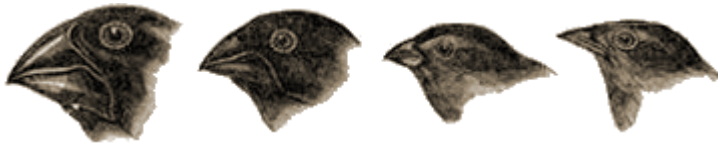
It was during the beginning of the voyage that Darwin read the early books of Charles Lyell and became convinced by his proof that uniformitarianism. provided the correct understanding of the earth's geological history. This intellectual preparation along with his research on the voyage were critical in leading Darwin to accept evolution. Especially important to the development of this understanding was his 5 weeks long visit to the Galápagos Islands in the Eastern Pacific Ocean. It was there that he began to comprehend what causes plants and animals to evolve.

H.M.S. Beagle

Five year voyage of H.M.S. Beagle (1831-1836)

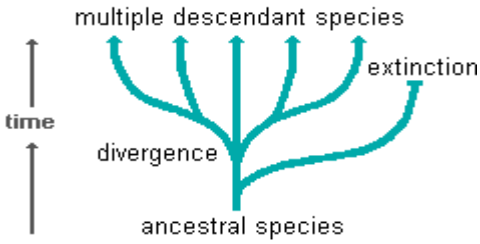
The Galápagos Islands have species found in no other part of the world, though similar ones exist on the west coast of South America. Darwin was struck by the fact that the birds were slightly different from one island to another. He realized that the key to why this difference existed was connected with the fact that the various species live in different kinds of environments.

Darwin identified 13 species of finches in the Galápagos Islands. This was puzzling since he knew of only one species of this bird on the mainland of South America, nearly 600 miles to the east, where they had all presumably originated. He observed that the Galápagos species differed from each other in beak size and shape. He also noted that the beak varieties were associated with diets based on different foods. He concluded that when the original South American finches reached the islands, they dispersed to different environments where they had to adapt to different conditions. Over many generations, they changed anatomically in ways that allowed them to get enough food and survive to reproduce.



Finches from the Galápagos Islands

Today we use the term adaptive radiation to refer to this sort of branching evolution in which different populations of a species become reproductively isolated from each other by adapting to different ecological niches and eventually become separate species.



Darwin came to understand that any population consists of individuals that are all slightly different from one another. Those individuals having a variation that gives them an advantage in staying alive long enough to successfully reproduce are the ones that pass on their traits more frequently to the next generation. Subsequently, their traits become more common and the population evolves. Darwin called this "descent with modification."

The Galápagos finches provide an excellent example of this process. Among the birds that ended up in arid environments, the ones with beaks better suited for eating cactus got more food. As a result, they were in better condition to mate. Similarly, those with beak shapes that were better suited to getting nectar from flowers or eating hard seeds in other environments were at an advantage there. In a very real sense, nature selected the best adapted varieties to survive and to reproduce. This process has come to be known as **natural selection**.

Darwin did not believe that the environment was producing the variation within the finch populations. He correctly thought that the variation already existed and that nature just selected for the most suitable beak shape and against less useful ones. Some of Darwin's supporters ultimately described this process as the "survival of the fittest." This is very different from Lamarck's incorrect idea that the environment altered the shape of individuals and that these acquired changes were then inherited.

Nineteenth century critics of Darwin thought that he had misinterpreted the Galápagos finch data. They said that God had created the 13 different species as they are and that no evolution in beak shape has ever occurred. It was difficult to conclusively refute such counter arguments at that time. However, 20th century field research has proven Darwin to be correct.

#1.) Describe Darwin's Journey? (Question meant to be vague)

After trying out several career fields, Darwin joined the crew of the H.M.S Beagle for a 5-year trip around the world as a naturalist. He visited many countries including the Galapagos Islands. He collected specimens, read books, made observations, and had many questions. Many years later, he drew upon his own experiences, the research of others, to write a book *On the Origins of Species* that describes the mechanisms of evolution

#2.) Name a few words that you did not understand from the reading and look up their definitions?

Variation: a change in the form, position, condition, or amount of something. : something that is similar to something else but different in some way.

Adaptation: The biological mechanism by which organisms adjust to new environments or to changes in their current environment. ... This enables better survival and reproduction compared with other members of the species, leading to evolution.

#3.) How did Darwin's ideas differ from the other scientist who studied natural selection?

Darwin did not believe that the environment was producing the variation. He correctly thought that the variation already exists and that nature just selected for the most suitable for survival and against less useful ones. This was different from Lamarck's incorrect idea that the environment altered the shape of individuals and that these acquired changes were then inherited. Other critics suggested that God made the animals and they were unalterable.

#4.) What observations did Darwin make to lead him to his conclusions about the theory of natural selection?

Darwin identified 13 species of finches in the Galápagos Islands. This was puzzling since he knew of only one species of this bird on the mainland of South America, nearly 600 miles to the east, where they had all presumably originated. He observed that the Galápagos species differed from each other in beak size and shape. He also noted that the beak varieties were associated with diets based on different foods

#5.) Discuss the finches that Darwin looked at. What made them so special?

Darwin observed 13 different finch species on the Galapagos Islands. He was aware on only one type on the mainland of Ecuador. He thought the difference between the species was that they lived in different kids of environments. He concluded that an original finch group must of made it to the islands and then spread out to the different islands and adapted / changed to these new environments.

#6.) What is the theory of the natural selection? Give a strong example of an animal mentioned in the text or one that you are aware of.

Natural Selection: Is the process whereby organisms better adapted to their environment tend to survive and produce more offspring. Nature just selects the adaptations that promote survival to reproduction. If you're trait doesn't help you to survive, you won't be around to reproduce and pass those surviving traits to the next generation.

What is the modern importance of evolution?

- Evolution is the change in species over long periods of time.
- Today, the environment is changing at an alarming rate.
- Can organisms evolve to this rapid environmental change? Is it occurring too fast? Will they change or will they be wiped out.

Part 1 Lesson 3 Evidence of Evolution

Evidence of Evolution

-The fossil record of changes in plants and animals over millions of years.
From simple to more complicated.

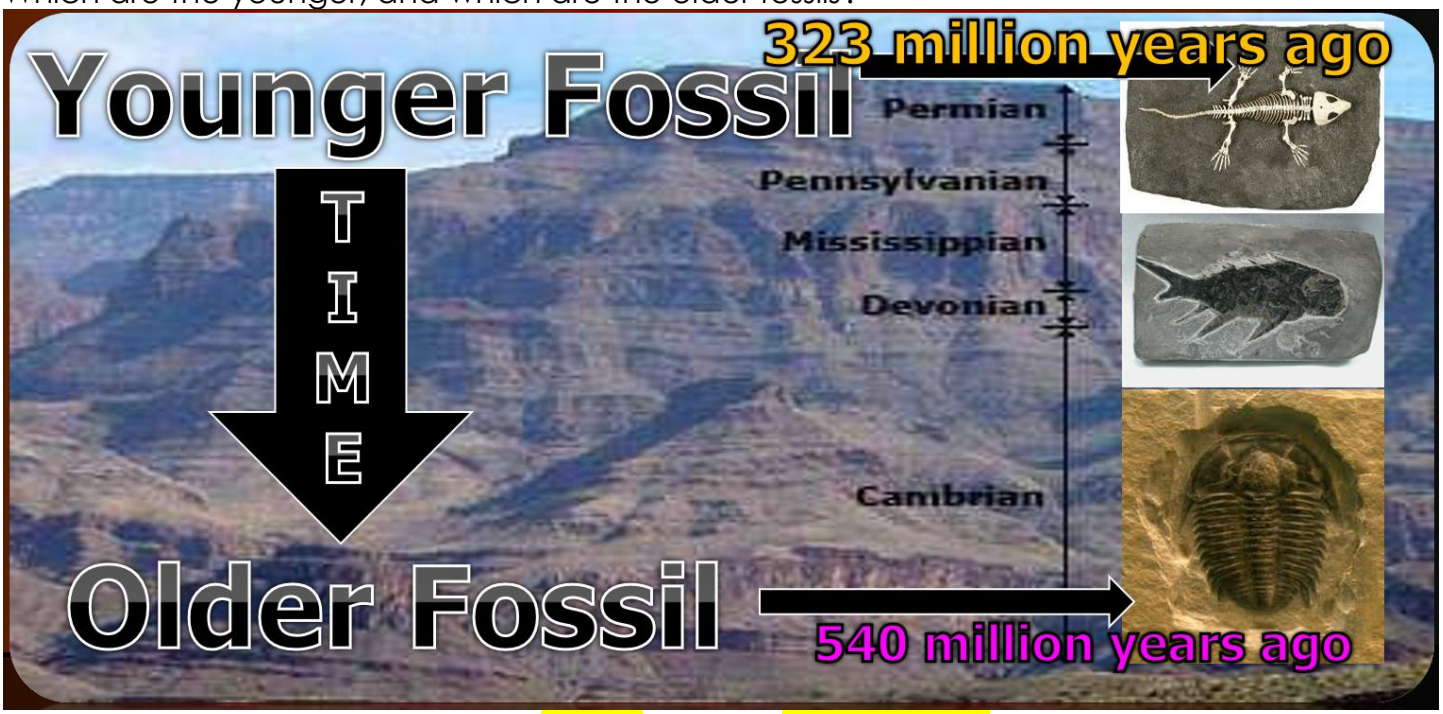
-Chemical and anatomical similarities of related life forms.

-The geographic distribution of related species.

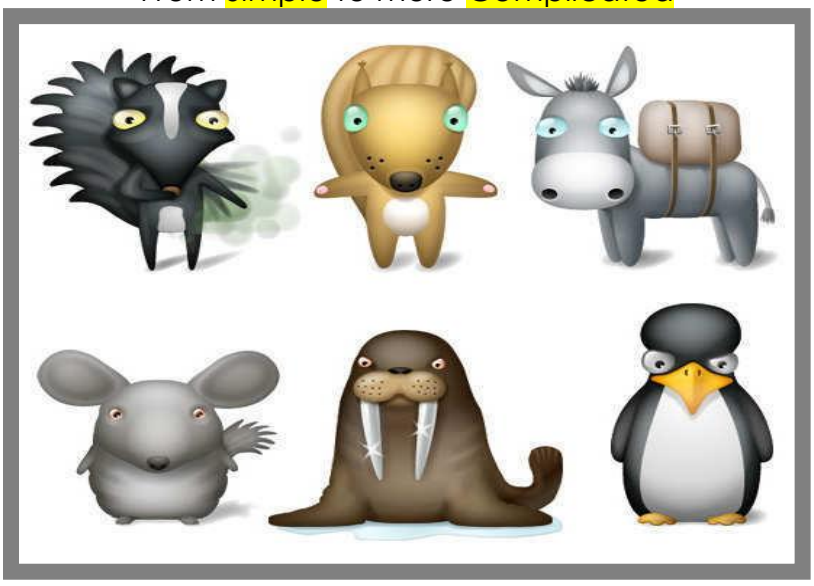
Principle of superposition. The rock layers on the bottom are older and will contain older fossils.

More primitive species on the bottom.

Which are the younger, and which are the older fossils?

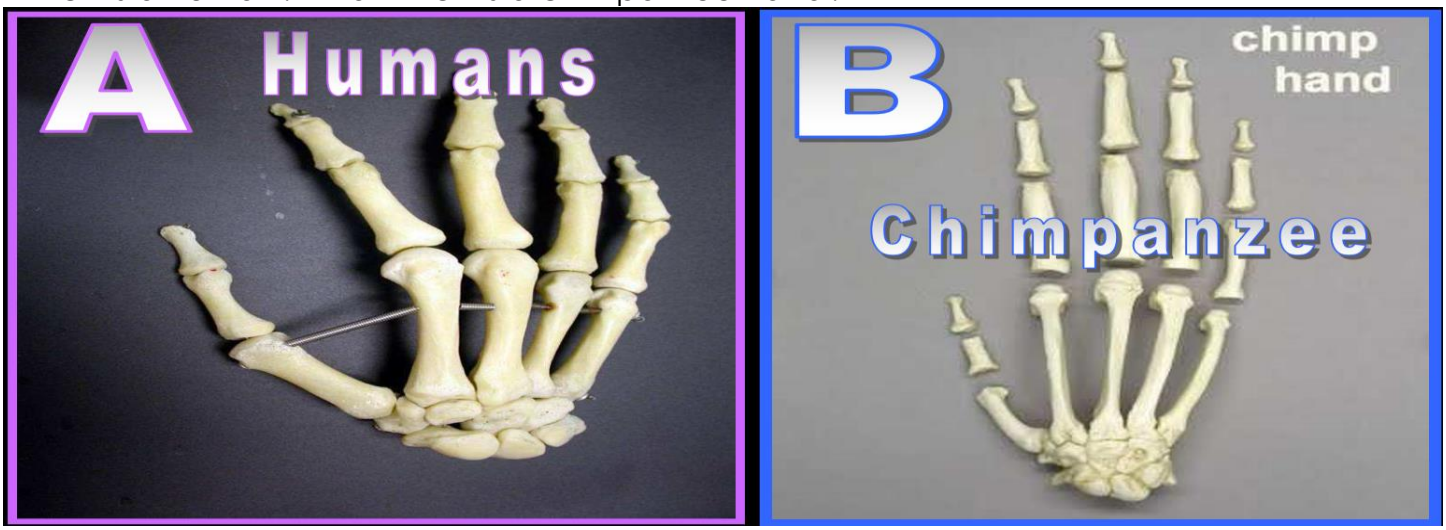


From Simple to more Complicated

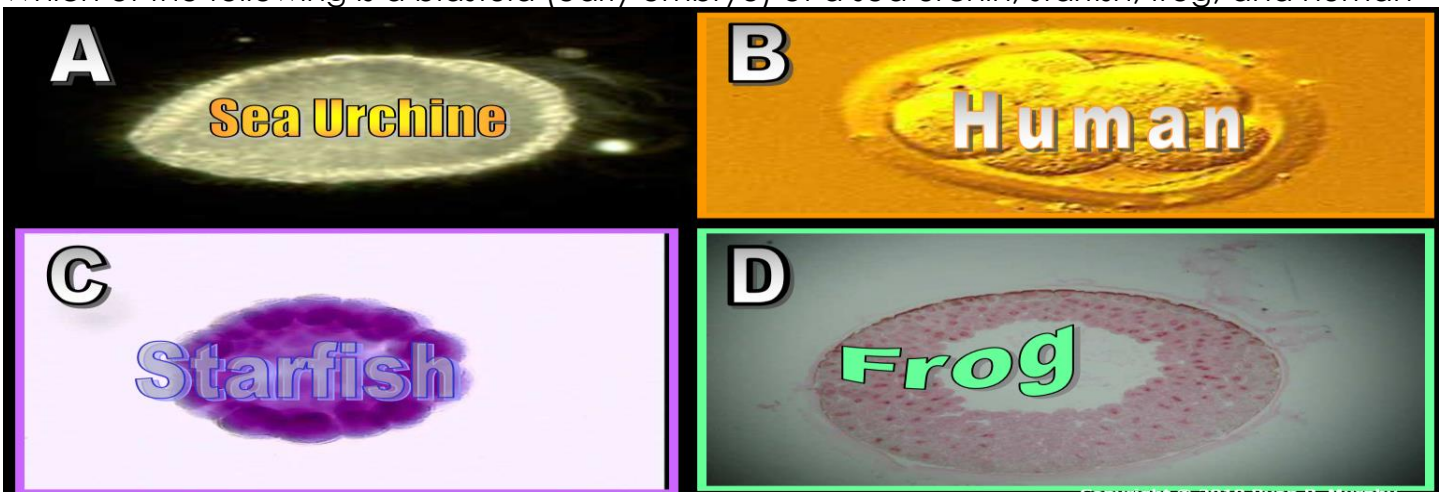


They all have...	Some have...
Eyes, Nose, Ears, Mouth Warm-bloodedness Heart, Lungs, Organs Eat Food, Move Tetrapods (four limbs)	Teeth, Fur or Feathers Hoofs, Smell Glands Eggs Live Birth

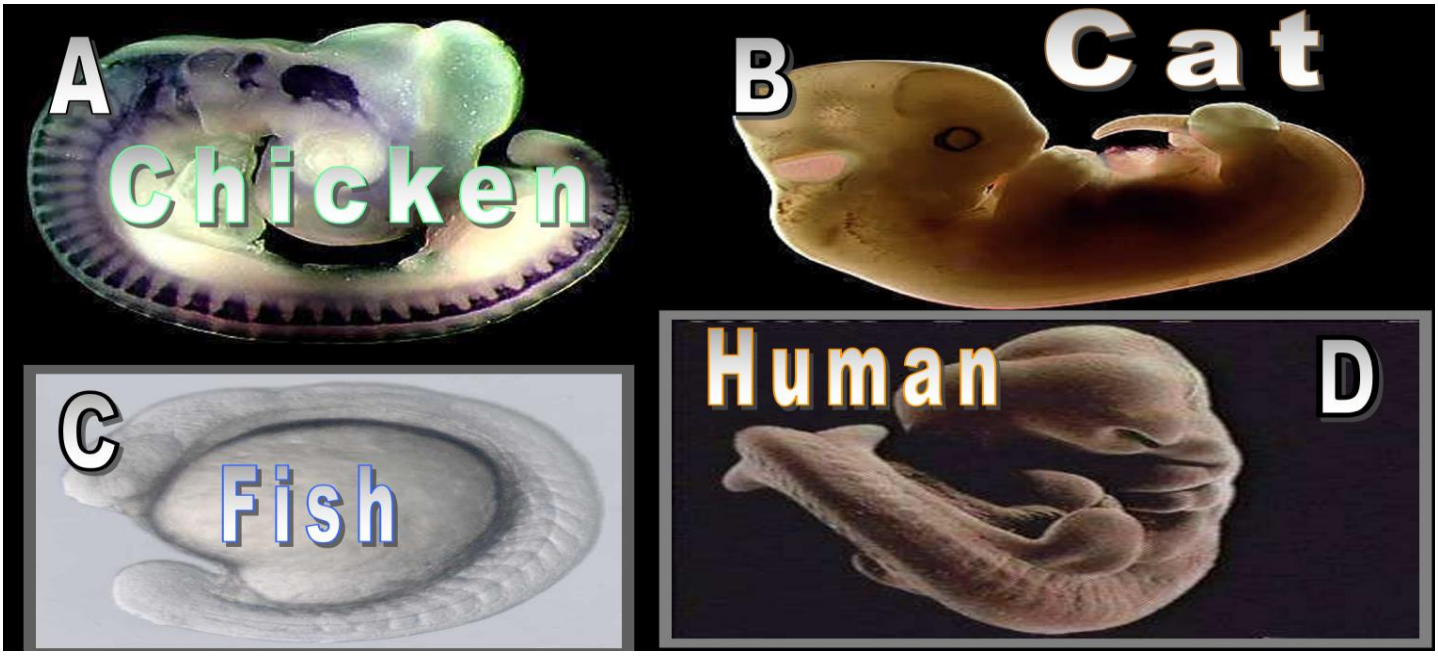
Which is a human? And which is a chimpanzee hand?



Which of the following is a blastula (early embryo) of a sea urchin, starfish, frog, and human



Which of the embryos below is a human, chicken, fish, and cat?

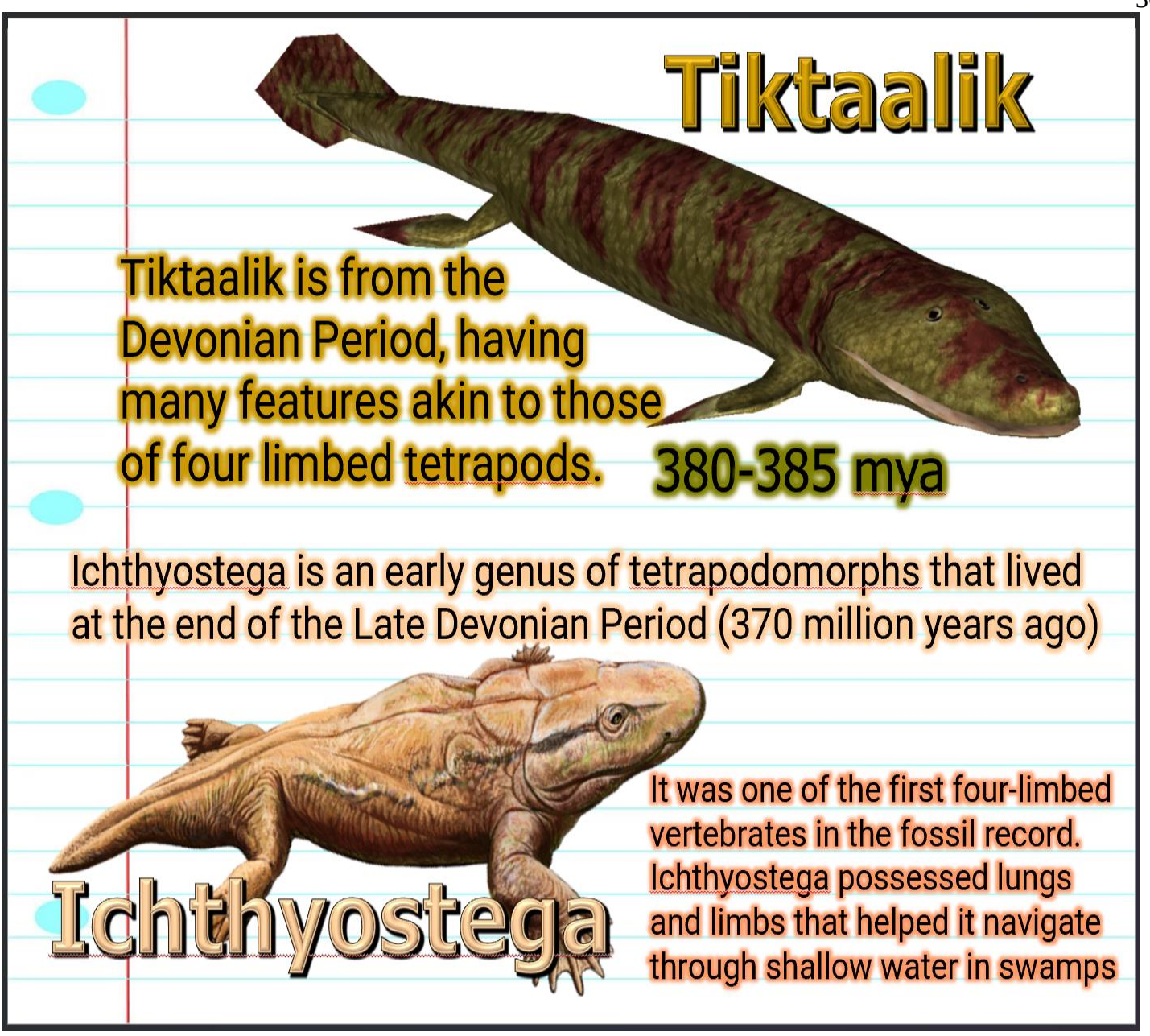


Cells are either prokaryotic (bacteria) or eukaryotic (cells with a nucleus).
All cells are similar in their composition.

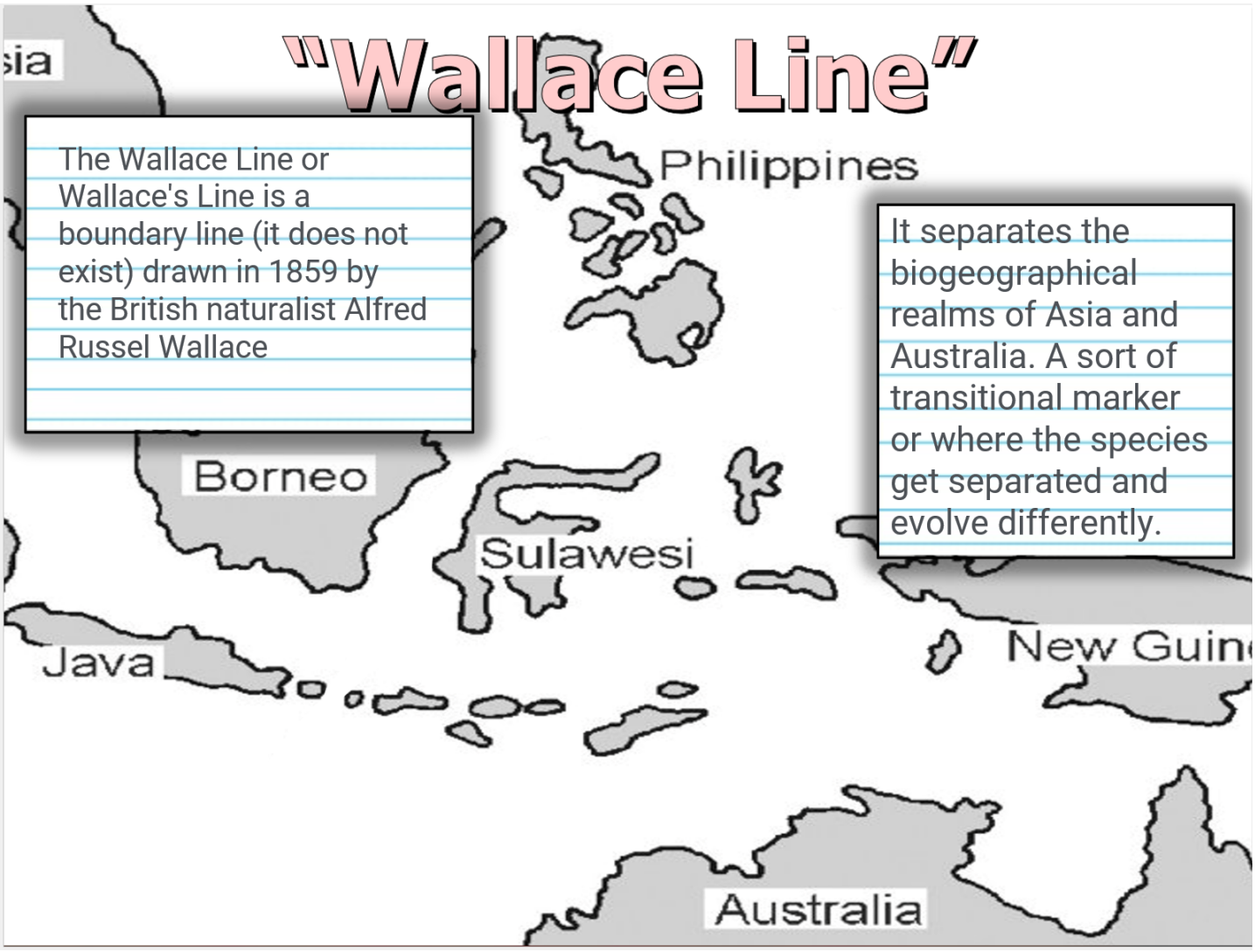
What do some whales have that is a good evidence that they use to be land mammals? Explain below.
Vestigial Structure: Is a structure in an organism that has lost all or most of its original function over the course of its evolution.

Part 1 Lesson 4 Evolution Continued

Tetrapod: A four limbed animal, especially a member of a group which includes all vertebrates higher than fishes.
"
Provide some information about Ichthyostega below. "Tetrapodamorph"

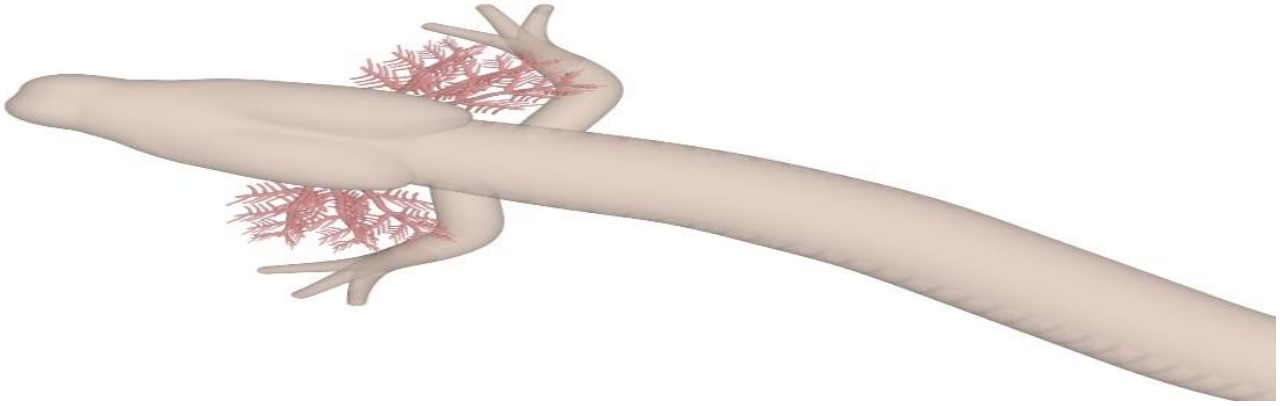


Please sketch out the "Wallace Line" and tell me about it in the spaces provided.



Tell me about this organism? What is so interesting about its evolution.

- Troglobites are small creatures that have adapted to a permanent life in a cave.
  - They are so well-adapted to life in a cave that they would be unable to survive in the surface environment. To survive in the darkness, troglobites have highly-developed senses of hearing, touch and smell.



Selective Breeding: The intentional breeding of organisms with desirable traits in an attempt to produce offspring with similar desirable characteristics or with improved traits.

Genetics (DNA) A more recent branch of science that shows how organisms have evolved and are related on a genetic level.

Evolution is the change in the gene pool over time.

Mutation: When a DNA gene is damaged or changed in such a way as to alter the genetic message carried by that gene.

Trace Your Hand Below and record the five fingers of evolution.

- http://www.youtube.com/watch?v=5NdMnlt2keE

- Evolution is the change in the gene pool overtime.
  - Gene Pools can change when…
    -Populations can shrink (Pinky Finger)
    - Diseases, extinctions, introduction of new better adapted species, predators.
  - Non-random mating (Ring Finger)
    - Organisms choose strongest mate, ones in similar boundaries,
  - Mutations in the genes (Middle Finger)
    - Genes can change. Some are good, some are bad.
    - The environment will decide.
  - Movement in and out of the population (Pointer Finger)
    - Immigration, gene flow.
  - Natural selection (Thumb)
    - Adaptations to the environment that do well replace poor ones. Usually an advancement.

Evolution is the change in the gene pool overtime.

Gene Pools can change when…

Populations can Shrink

-Diseases, extinctions, introduction of new better adapted species, predators.

Non-random mating

-Organisms choose strongest mate, ones in similar boundaries,

Mutations in the genes

Genes can change. Some are good, some are bad.

The environment will decide.

Movement in and out of the population

Immigration, gene flow.

Natural Selection

Adaptations to the environment that do well replace poor ones. Usually a advancement.

The four parts to Darwin's theories.

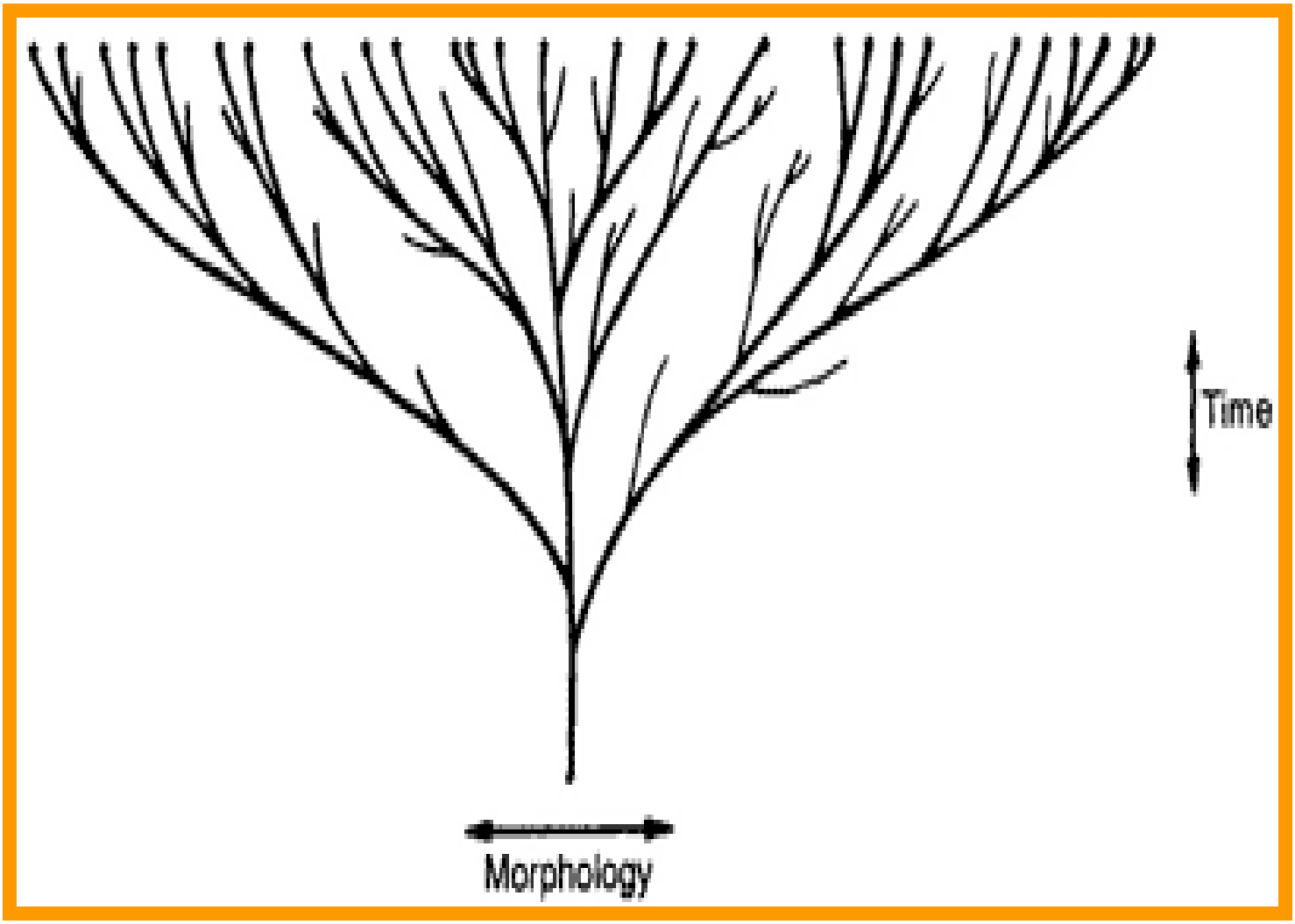
-Organisms have changed over time.

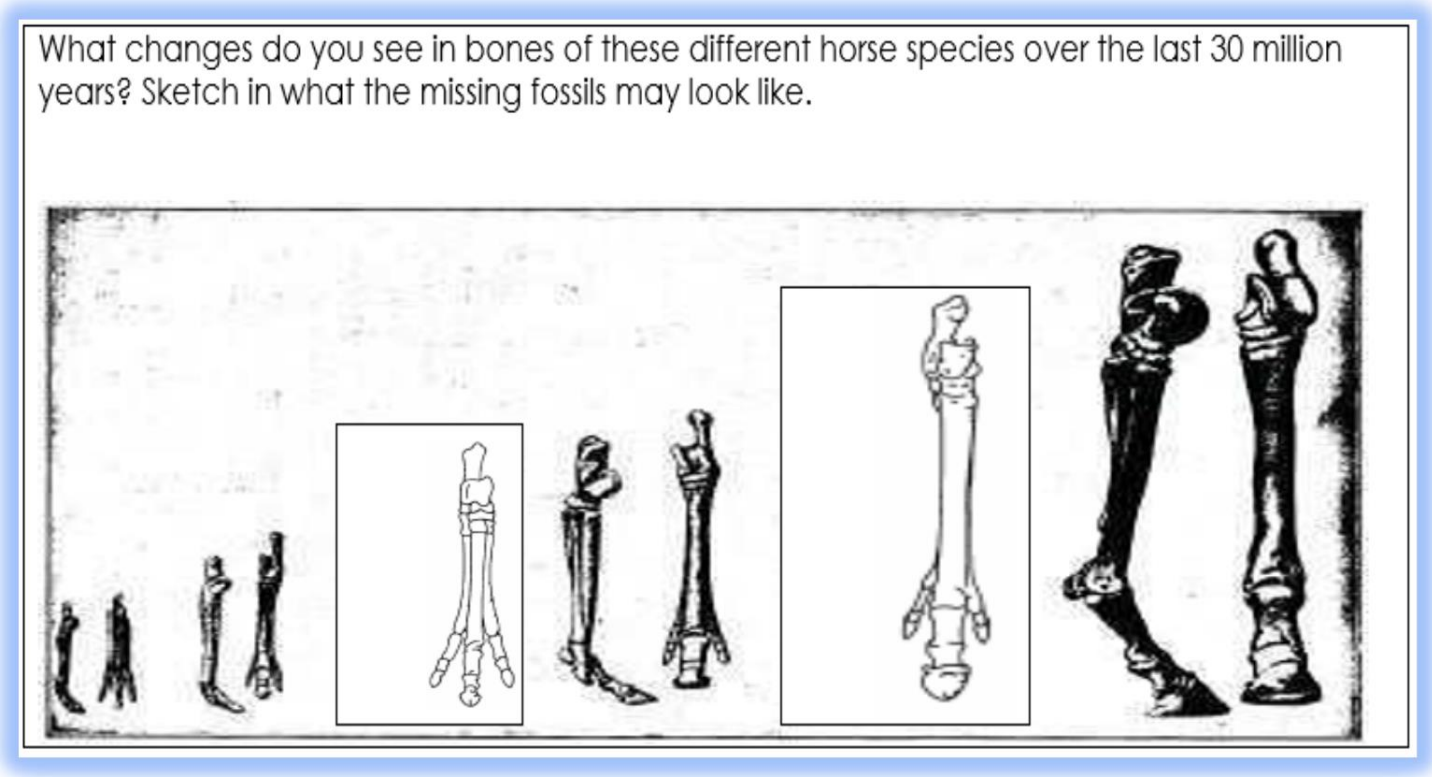
-Organisms share a common ancestor.

-Change is a slow process over many generations.
Punctuated evolution shows us that it can during some periods speed up.
Large extinction events are common.
-The mechanism of evolutionary change was natural selection

All organisms are derived from a common ancestor by a process of branching over time…
-Populations split into different species, which are related because they are descended from a common ancestor.
-Thus, if one goes far enough back in time, any pair of organisms has a common ancestor.
-This explained the similarities of organisms that were classified together -- they were similar because of shared traits inherited from their common ancestor.
-It also explained why similar species tended to occur in the same geographic region.

Common Descent: All organisms on Earth are descended from a common ancestor or ancestral gene pool.
-Not observable





Part 1 Lesson 6 Bear Eating Monsters

Natural Selection: Organisms best suited to their environment survive more often than others and pass the adaptation to their offspring (kids).

Mechanisms of Natural Selection

#1.) Without checks like predators, populations would increase exponentially. Survival of the fittest!

You are a bear-eating monster. There are two kinds of bears: Happy Bears, and Sad Bears. You can tell the difference between the two by the way they hold their hands. Happy bears hold their hands high in the air dancing around all day. They often go off task in science because they are so happy. They also like to socialize instead of working on their labs. Sad Bears hold there hands down low to the ground because they know not to dance or be affectionate in the classroom.

Procedure

6.) Obtain a population of bears and record in table 1 the number of Happy and Sad Bears.
7.) Eat three happy bears (if you have less than eat them)
8.) Raise your hand to get a new generation of bears from teacher.
9.) Repeat for two more generations
10.) Determine the total numbers of Sad and Happy Bears for each generation.

Record a hypothesis in the space below.

What do you expect to happen to the number of Happy and Sad Bears over time? The hypothesis should be that the happy bear population should decrease and the sad bear population should increase

Table 1: The number of bears for each generation

Generation	# of Happy Bears	# of Sad Bears	Total Bears

1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
Total at the end			

How do the results compare to your hypothesis?_____

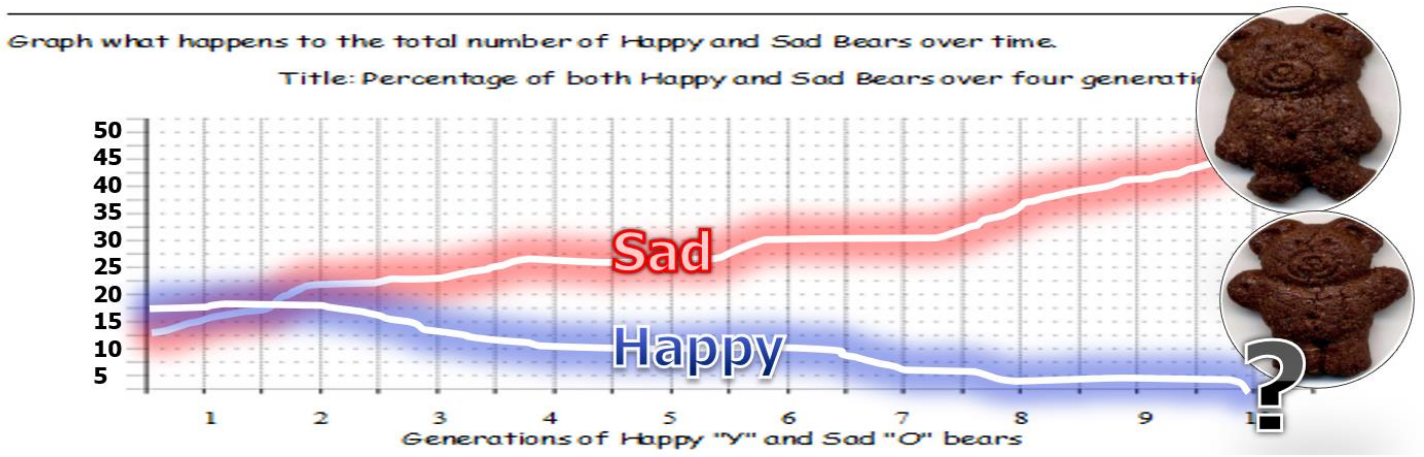
_____

_____

_____

Graph what happens to the total number of Happy and Sad Bears over time.

Title: Happy and Sad Bears over Generations



1 2 3 4 5 6 7 8 9 10

Generations of Happy "Y" and Sad "O" bears

What happened to each type of bear over time?

The happy bear population would start declining. Eventually the population would have problems reproducing and would go extinct.

How does this lab relate to your knowledge of natural selection?

#1.) Without checks like predators, populations would increase exponentially. Survival of the fittest!

Part 1 Lesson 7 Feeding Simulation

Mechanisms of Change / Natural Selection

#2.) Most populations are stable in size except for seasonal changes.

Feeding Simulation

First Part	Second Part	Third Part
Seeds are collected at end of each round, they are not rolled over. • If you have less than 30 you die, you will play again soon. • If you have more than 30 you survive again White bean = 1 Red Bean = 5 Green Bean = 10	Habitat and Predators -Same as first, but this time with predators. -You still need 30 energy units. -You are safe from predators if you are touching Hula-Hoop. -Predators can only walk (no running), only tag someone out if they deliberately don't stop feeding and run away when you are standing over them making hawk noises.	Predator Prey (Round 3) No habitat -A shopping plaza has cut habitat in half. -Only one Hula-Hoop -Predators still exist but in smaller numbers

Describe the competition for resources that you experienced? There should have been competition for resources between all of the mice (interspecific competition) as you were all eating the same food. Some people would have collected enough seeds and passed on their traits to the next generation, others will have died. Survival of the Fittest.

What type of seeds did you look for? Why? Answers will vary, but usually the white seeds go first and then students look for the green or brown.

How did predators (hawks) affect your feeding? Predators make feeding more challenging because you constantly watching your back and moving to avoid them. When your watching for predators or moving you can't feed which makes getting your energy requirements a challenge.

How did habitat help you? The habitat made feeding easier because you didn't need to worry about predators as much. This allowed you to feed more easily.

Mechanisms of Change / Natural Selection

#3.) Natural Resources are limited. A struggle for existence.

#4.) No two individuals are alike. (genetics and reproduction creates variability)

Descent with Modification: The passing on of genes from parent organisms to their offspring.

Offspring will display small changes.

Part 1 Lesson 8 Peppered Moth

Please sketch a peppered moth on the tree below.	Please sketch a black peppered moth on the tree below.
	

Peppered Moth

2.) Place newspapers flat on a large table (use tape on the bottom so it won't lift). Drop 10 of each type of moth into the tray and spread them out. 10 peppered (newspaper) and 10 black

3.) Have a person be the bird, they have a small beak (clay ball held in their hand) to collect the moths.

4.) They must also wear eye goggles with a clear plastic bag over their eyes to blur their vision. (Not over their mouth!) (Just blurred, not blind vision as you to successfully hunt moths)

5.) The bird begins by removing the 10 **they spot first** by active hunting and not just random chance. Put them aside.

6.) Spread out the moths so they don't overlap. Repeat removal process one two more times for each round by active hunting and not random chance. Record the total from both rounds in table.

7.) What species is left to reproduce?

Round 1 (Collect 10 moths that you find first)

Moth Type	Total from newspaper	Total from black paper
Black Paper Moths		
Peppered (Newspaper) Moths		

Round 2 (Reshuffle) (Collect 10 moths that you find first)

Moth Type	Total from newspaper	Total from black paper
Black Paper Moths		
Peppered (Newspaper) Moths		

Round 3 (Reshuffle) (Collect 10 moths that you find first)

Moth Type	Total from newspaper	Total from black paper
Black Paper Moths		
Peppered (Newspaper) Moths		

Which moth species survived more often on the newspaper background? Why? Use data in your response.

The newspaper / peppered moth should have survived more often as it blended into the newspaper background. The black moth would stand out and get eaten more often.

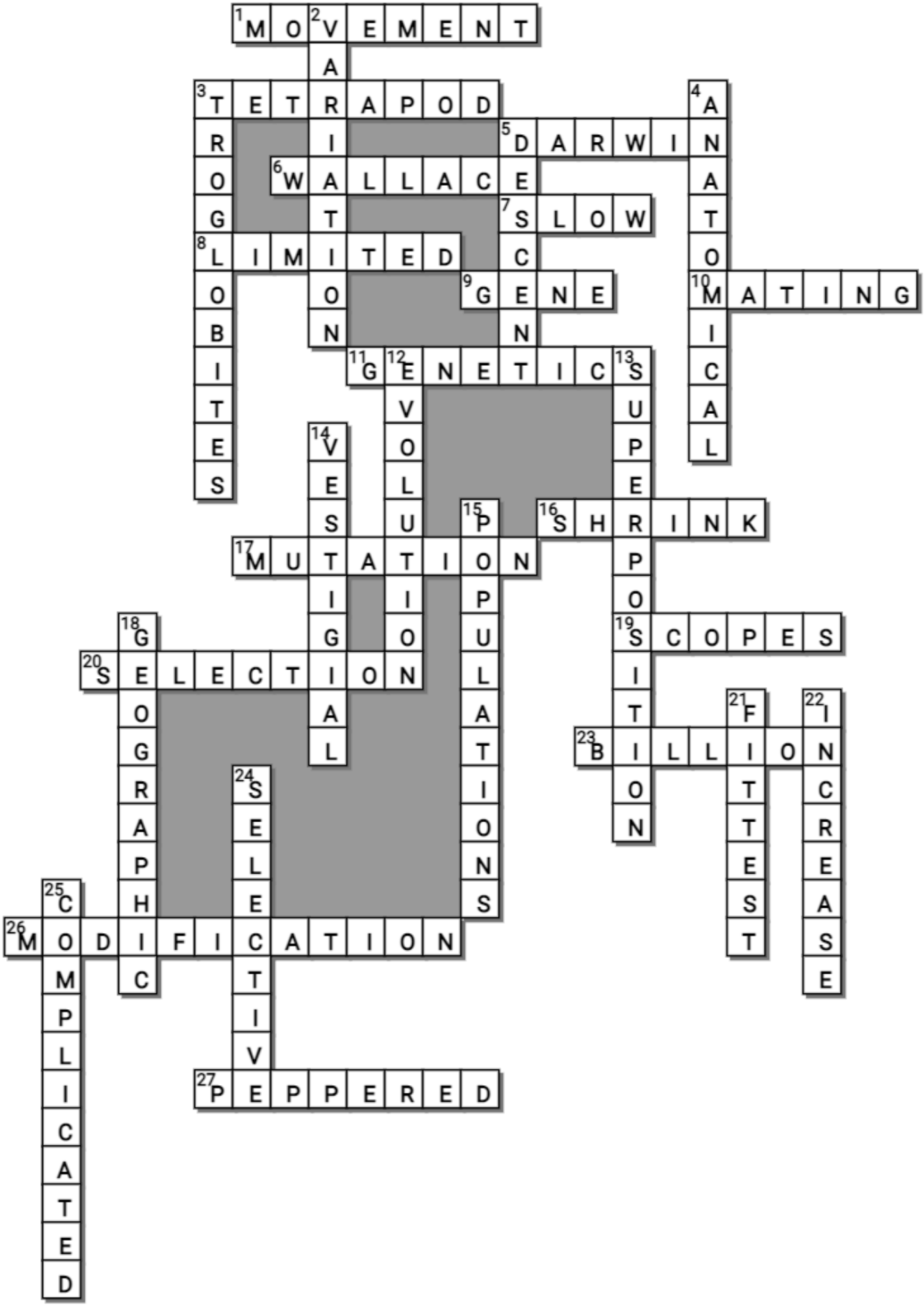
Which moth type survived more often on the black papered tray? Why? Use data in your response.

The reverse would have with the black background. The peppered moth now stands out and would get eaten more often.

Part 1 Lesson 9 Wrap-Up

#5.) Variation is inheritable.

- (Animals pass traits to their young). (DNA)


1 MOVEMENT
2 VARIATION
3 TETRAPOD
4 ANATOMICAL
5 DARWIN
6 WALLACE
7 SLOW
8 LIMITED
9 GENE
10 MATING
11 GENETICS
12 EVOLUTION
13 SUPPORTS
14 VESTIGIAL
15 POPULATION
16 SHRINK
17 MUTATION
18 GEOGRAPHIC
19 SCOPES
20 SELECTION
21 FITTEST
22 INCREASE
23 BILLION
24 SELECTIVE
25 COMPLICATED
26 MODIFICATION
27 PEPPERED

Across

1. _____ in and out of the population. Ex- Immigration, gene flow.
3. A four-footed animal, especially a member of a group which includes all vertebrates higher than fishes.
5. Charles _____: English naturalist, geologist and biologist, best known for his contributions to the science of evolution. His proposition that all species of life have descended over time from common ancestors is now widely accepted, and considered a foundational concept in science
7. Change is a _____ process over many generations.
8. Natural Resources are _____. A struggle for existence.
9. A _____ is a unit of heredity that is transferred from a parent to offspring.
10. Non-random_____: Organisms choose strongest mate, ones in similar boundaries,
11. _____ (DNA) A more recent branch of science that shows how organisms have evolved and are related on a genetic level.
16. Populations can _____. Ex- Diseases, extinctions, introduction of new better adapted species, predators.
17. _____: When a DNA gene is damaged or changed in such a way as to alter the genetic message carried by that gene.
19. In 1925, The _____ Monkey Trials occurred.
20. Natural _____. Adaptations to the environment that do well replace poor ones. Usually an advancement.
23. The earth is roughly 4.543 _____ years old.
26. Descent with _____. The passing on of traits from parent organisms to their offspring. Offspring will display small changes.
27. The _____ moth is a temperate species of night-flying moth.It is mostly found in the northern hemisphere in places like Asia, Europe and North America. Peppered moth evolution is an example of population genetics and natural selection.

Down

2. V_____ is inheritable. (Animals pass traits to their young). (DNA)
3. T_____ are small creatures that have adapted to a permanent life in a cave.
4. One evidence of evolution is there's Chemical and a_____ similarities of related life forms.
5. Common _____: All organisms on Earth are descended from a common ancestor or ancestral gene pool.
12. This is the change in the gene pool from one organism to the next over time.
13. Principle of _____. The rock layers on the bottom are older and will contain older specimens.
14. _____ Structure: Is a structure in an organism that has lost all or most of its original function over the course of its evolution.
15. Most _____ are stable in size except for seasonal changes.
18. One evidence of evolution is the _____ distribution of related species.
21. Survival of the _____
22. Without checks like predators, populations would _____ exponentially. Survival of the fittest!
24. _____Breeding: The intentional breeding of organisms with desirable traits in an attempt to produce offspring with similar desirable characteristics or with improved traits.
25. The fossil record shows changes in plants and animals over millions of years. The fossils go from simple to more _____.

----------Teacher can remove this word bank to make crossword more challenging----------

Possible Answers

BILLION, COMPLICATED, DARWIN, DESCENT, EVOLUTION, FITTEST, GENE, GENETICS, INCREASE, LIMITED, MATING, MODIFICATION, MOVEMENT, MUTATION: , SCOPES, SELECTION, SELECTIVE , SLOW, TETRAPOD, TROGLOBITES, VARIATION, VESTIGIAL, WALLACE, ANATOMICAL, GEOGRAPHIC, PEPPERED, POPULATIONS, SHRINK, SUPERPOSITION

Part 1 Review Game Lesson 10

Name:

1-10 = 10 pts * = Bonus + 1 pt,
(Secretly write owl in correct space +1 pt)
Final Question = 5 pt wager

Due: Today
Score ____ / 100

THINGS PAST	DARWIN AND EVOLUTION	WHICH MECHANISMS	STILL CHANGING	SECRET IDENTITY Bonus round 1 pt each
1) How old is the earth? 4.543 Billion years When did life begin? 3.85 billion years	6) Galapagos Islands	11) #1.) Without checks like predators, populations would increase exponentially. Survival of the fittest!	16) Peppered Moth	*21) BRUCE BANNER
2) Principle of Superposition	7) John Scopes	12) #4.) No two individuals are alike.	17) Tetrapods	*22) PETER PARKER
3) D is the oldest, and A is the youngest	8) Lives in Caves	13) #2.) Most populations are stable in size except for seasonal changes.	18) Vestigial Structure	*23) MR. INCREDIBLE
4) Darwin Info	9) C.) Selective Breeding	14) #3.) Natural Resources are limited. – A struggle for existence	19) Wallace Line B.) The geographic distribution of related species.	*24) SAM WILSON
5) Incorrect Jean Baptiste Lamarck	10) Letter B	15) #5.) Variation is inheritable. (Animals pass their traits to their young).	20) Gene Pool Over Time	*25) POWER PUFF GIRLS

Final Question Wager ___ /5 Answer: Populations, Non-random, Genes, Movement, Adaptations