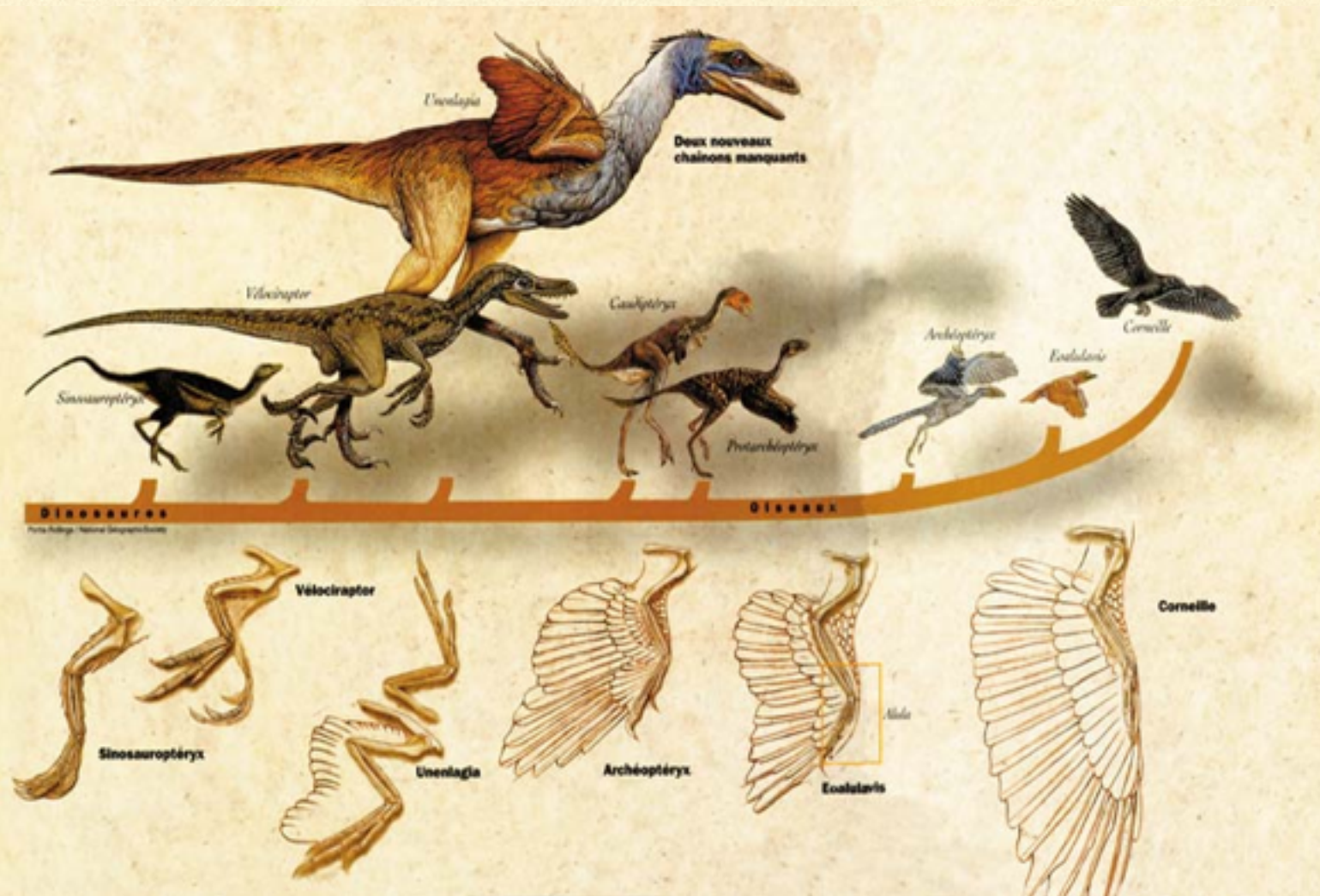


# EVOLUTION AND NATURAL SELECTION





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# HISTORY

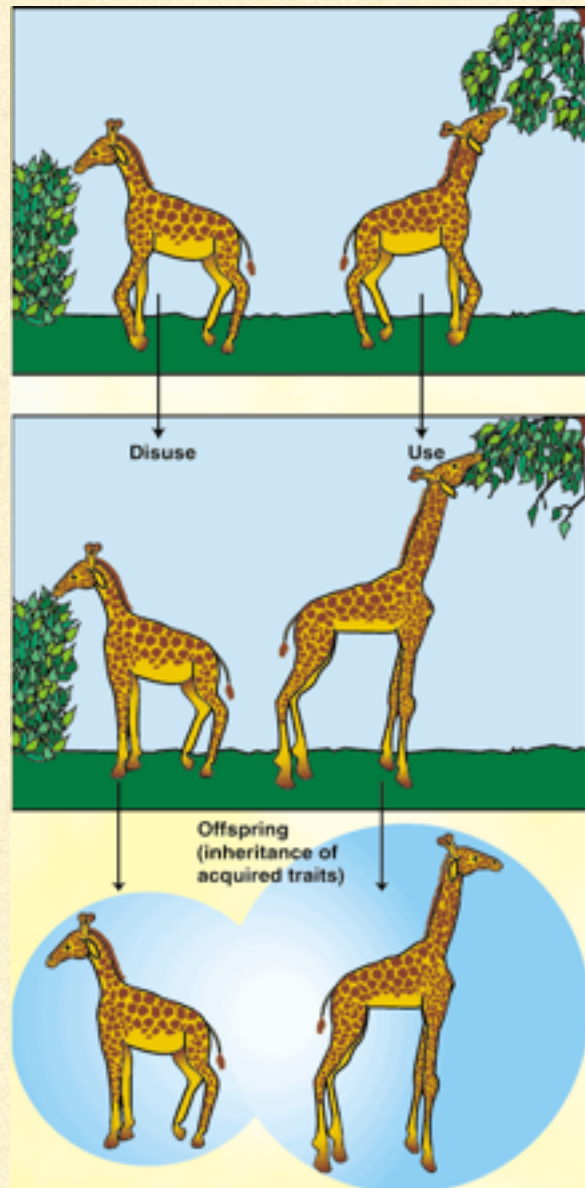
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- Before evolution, the prevailing theory was creationism- the idea that all life was created by a deity (God) in a static (unchanging) form.
  - This idea was based on a 6000 year old earth. This was eventually shown to be way too young by geologists.
  - Scientists started thinking organisms changed over time.
  - Jean-Baptiste Lamarck- 1809, presented the idea that organisms change over time and can inherit changes.
-



# LAMARCKIAN EVOLUTION

- People knew that children inherit their parents' traits...kids look like their parents.
- Lamarck said that Animal populations evolve due to physical adaptations being passed down from parents.
- Parents acquired adaptations by changing in their lifetime
- GIRAFFE EXAMPLE: stretches its neck to reach higher leaves. This extends vertebrae in neck, and the giraffe now has a longer neck.
- Passes this trait on to offspring





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# LAMARCKIAN EVOLUTION

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- Lamarck was proven wrong easily.



- If your dad has a leg cut off, does that mean his kids will be born with 1 leg? If he's muscular, are you?
  - He was right about one thing: populations do change, just not in one lifetime. Parents don't pass on the changes they've acquired in their lifetime
-



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# CHARLES DARWIN

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- ✱ Darwin sailed on the HMS Beagle for a 5-year round the world trip at the age of 22.
- ✱ Darwin was a **naturalist**-a person who studies the natural world.
- ✱ Initially questioned whether the natural world was perfect, as creationism said. He wondered, “Why is there so much waste in nature?”



**Control yourselves, Ladies**



---

# EVOLUTION- CHARLES DARWIN

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✱ **Perceived waste-** thousands of pollen grains are made, but only a few end up making new flowers. Hundreds of eggs are laid by insects, but only a few survive to adulthood.



**WHAT A LOOKER!**

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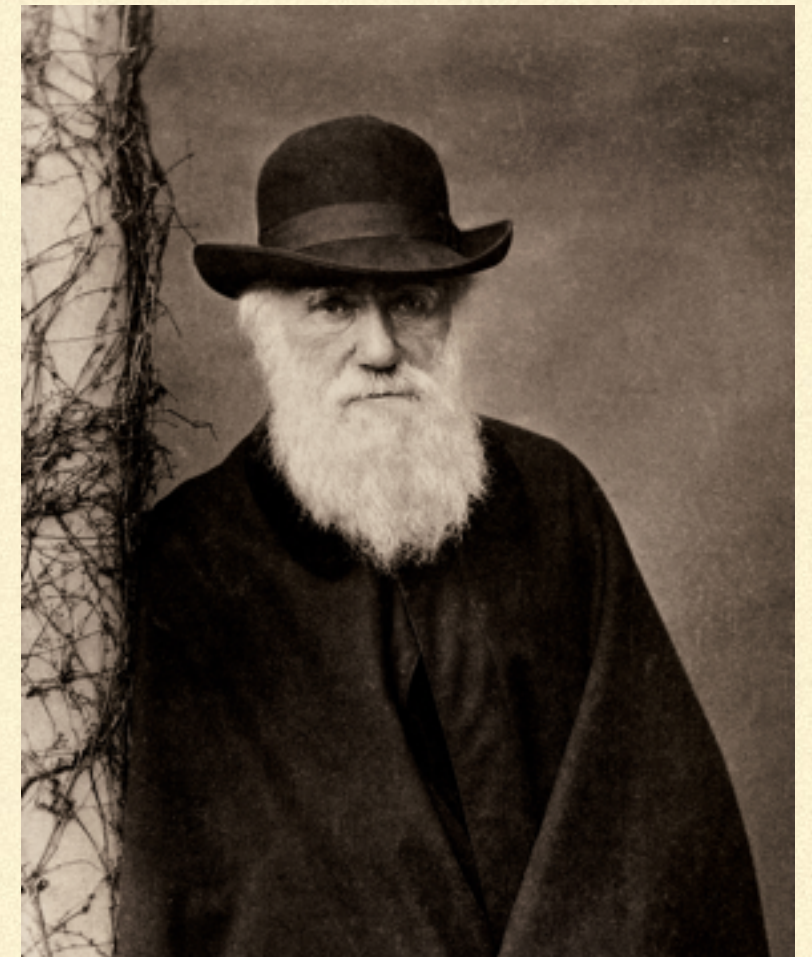
# THE BEAGLE'S VOYAGE





# EVOLUTION- CHARLES DARWIN

✿In the Galapagos, Darwin observed many diverse organisms and fossils



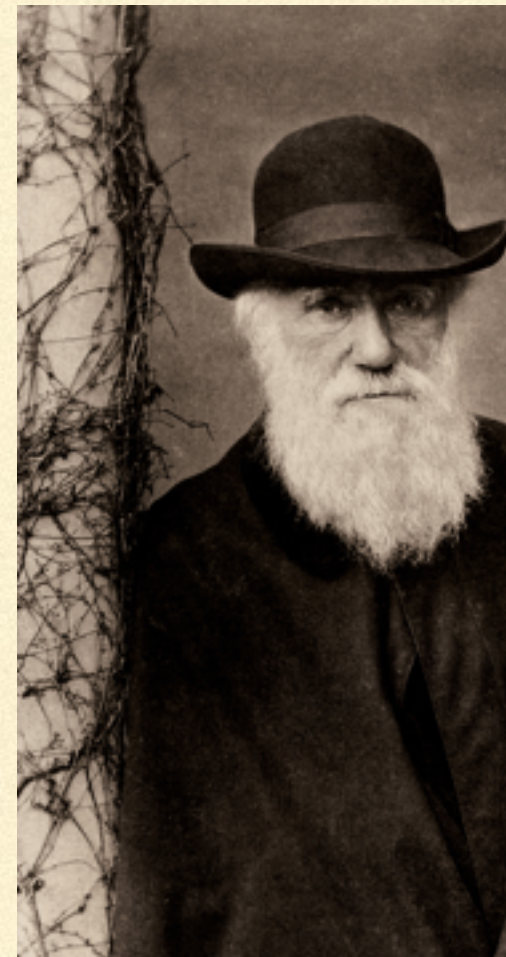
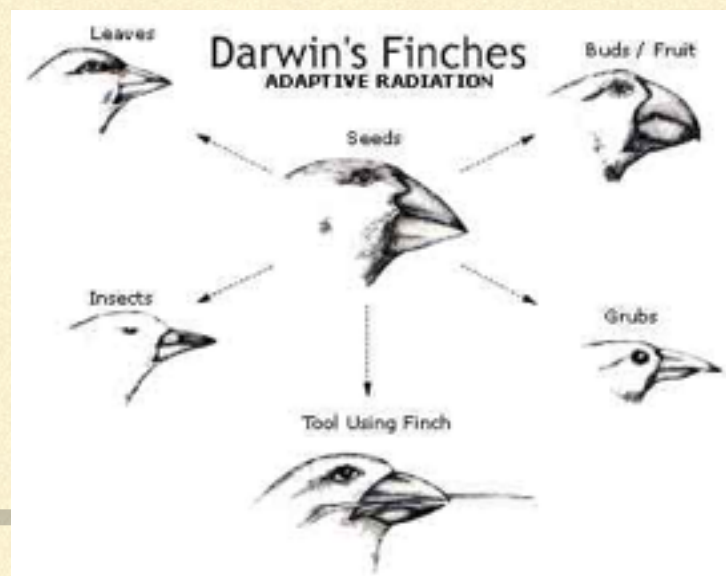
look into his eyes...



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# EVOLUTION- CHARLES DARWIN

- ✧ On each island were finches that were very similar, must be closely related.
- ✧ Each island had its own kind of finch.
- ✧ Each type of finch had distinct characteristics. Beaks were major difference



**Epic Beard**

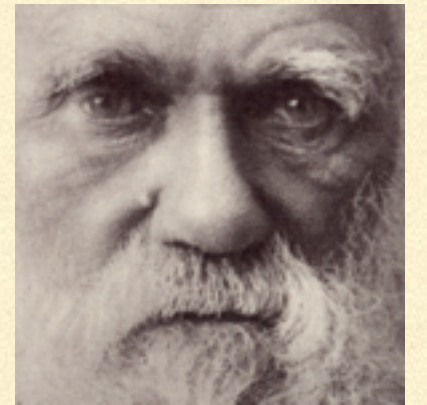


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# EVOLUTION- CHARLES DARWIN

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- ✱ Returned home, with lots of information.
- ✱ Why did the finches change their beaks from one island to the other?
- ✱ Different foods on different islands.
- ✱ Used writings by Malthus (an economist) which said that population growth is suppressed by limiting factors (not enough food, water, disease)



**He has a sensitive side, too.**

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# QUICK CHECK

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- Name 3 observations Darwin had that led to his theory of Evolution.



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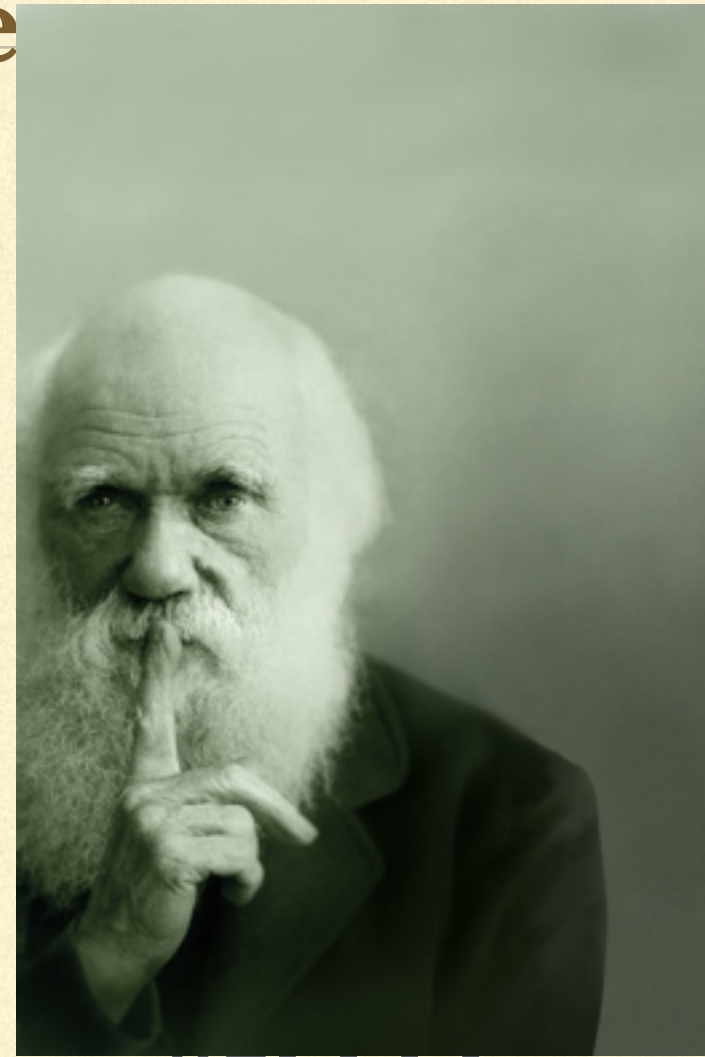
# EVOLUTION

✱ Darwin developed his theory of **The origin of species by natural selection.**

✱ **Origin of species**-organisms are descended from a common ancestor.

✱ Darwin **never** used the term evolution. He said “descent with **modification**”. Why do we care about this terminology?

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**“Shhhh.  
Don’t speak.”**



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# SO WHAT IS EVOLUTION?

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- Any change in the heritable traits, or the frequency of heritable traits, within a generation across a time span
  - 8th grade definition: Populations change their overall traits over time from one generation to the next.
  - Dandelion and lawn-mowing example.
-



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# DARWIN'S TIMELINE

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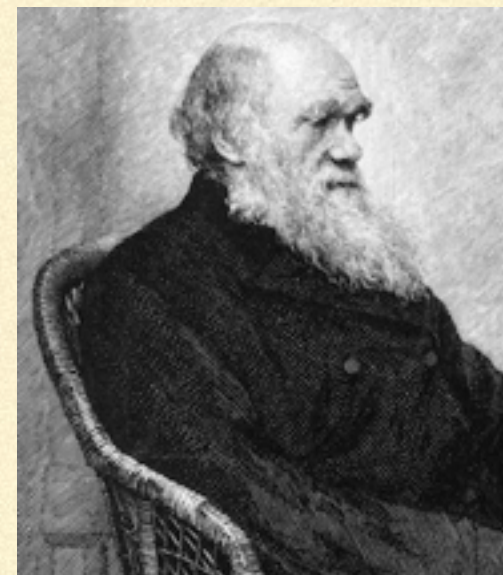
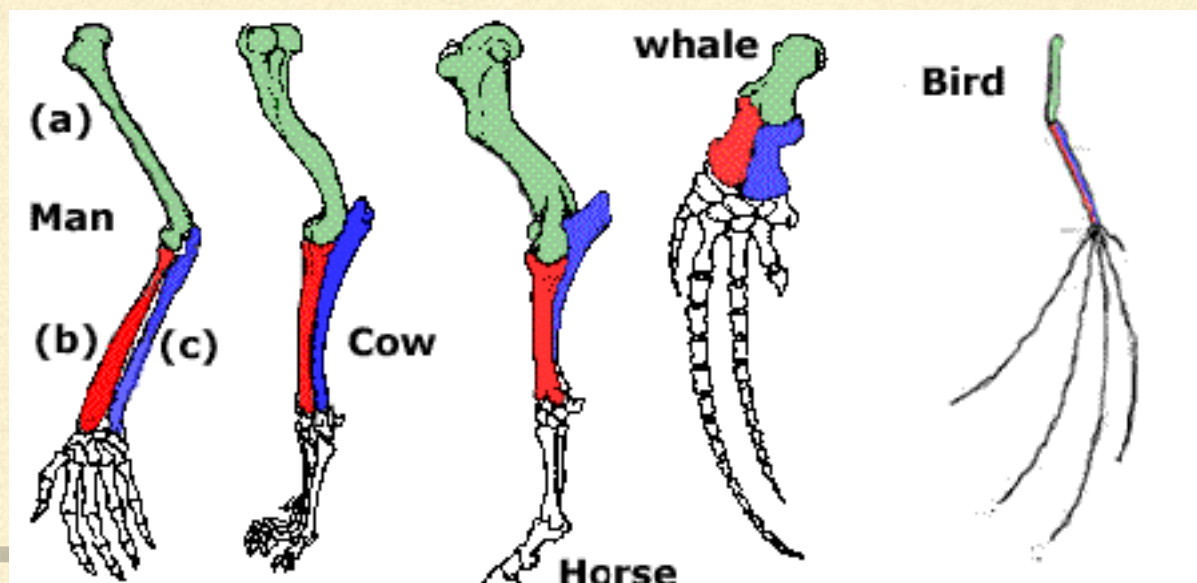
- Sailing on the HMS Beagle from 1831-1836
  - Developed the mechanism for evolution as Natural Selection by December 1838
  - Published Origin of the Species on November 24, 1859
  - February 19, 1872, Darwin releases the 6th edition of his work, including a section to address many “objections” made by other scientists about his theory.
-



# EVOLUTION- EVIDENCE

◀ Evidence for Descent with Modification:

◀ Homologous Structures: features that share a similar structure due to shared ancestry.

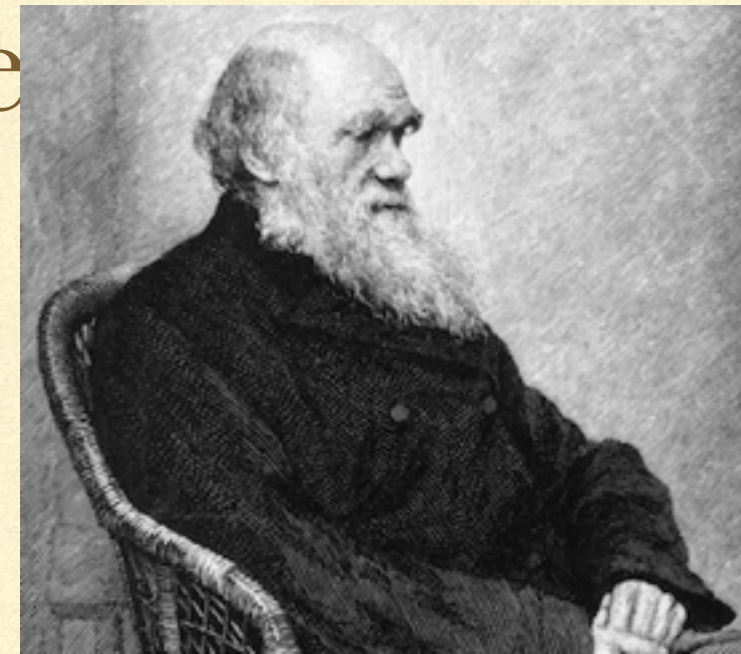
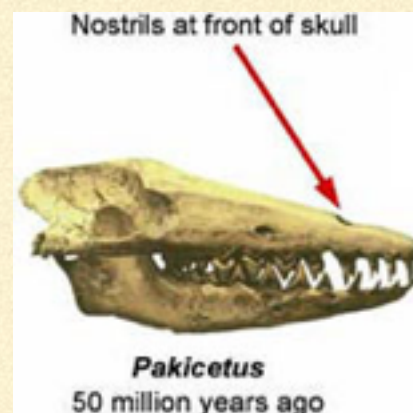
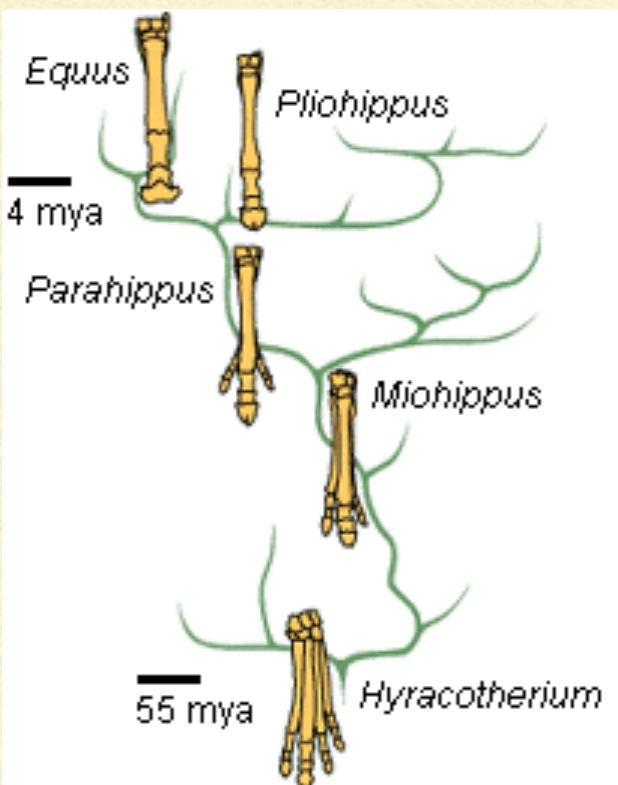


**Guess I'll just sit here and look pre**

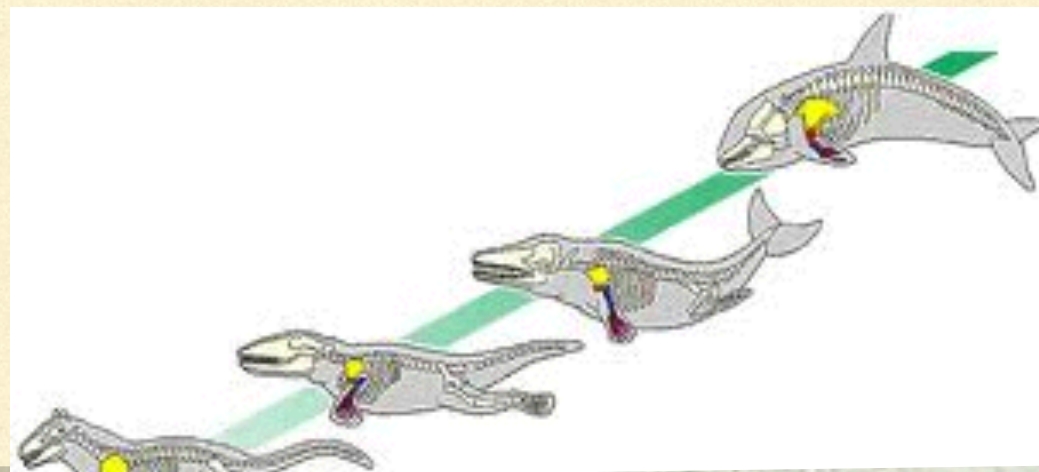


# EVOLUTION- EVIDENCE

✱ Transitional Forms- fossils that show intermediate stages between ancestral forms and later descendants



**Guess I'll just sit here and look pret**

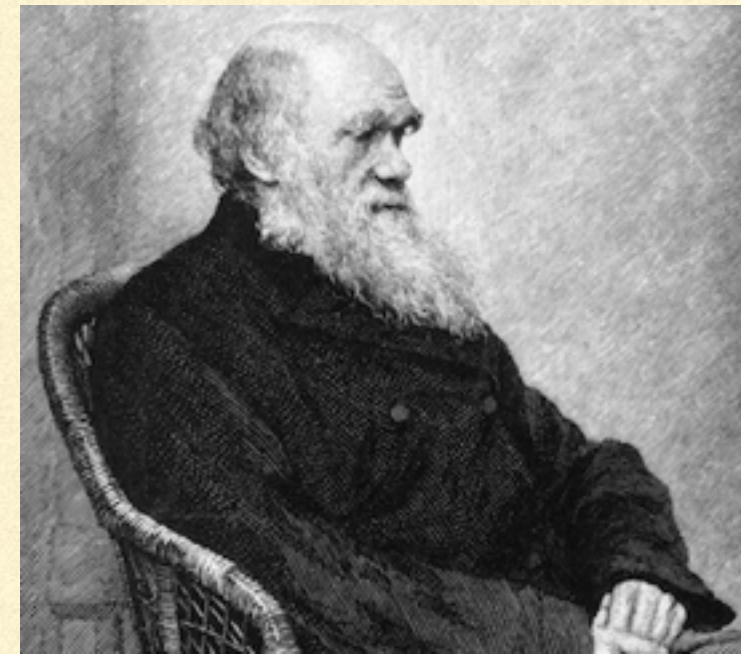
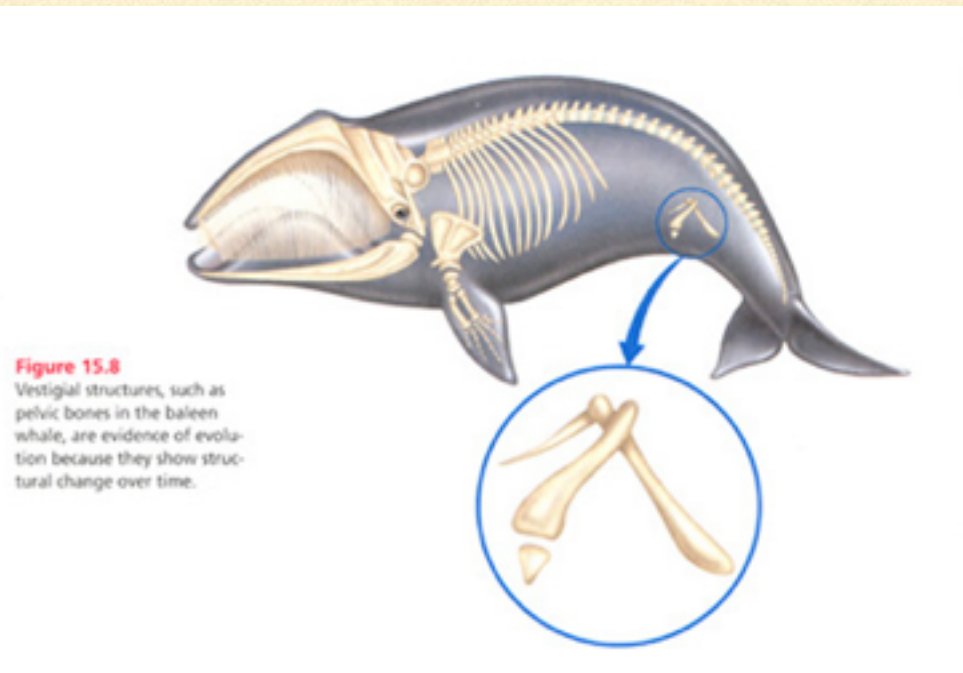
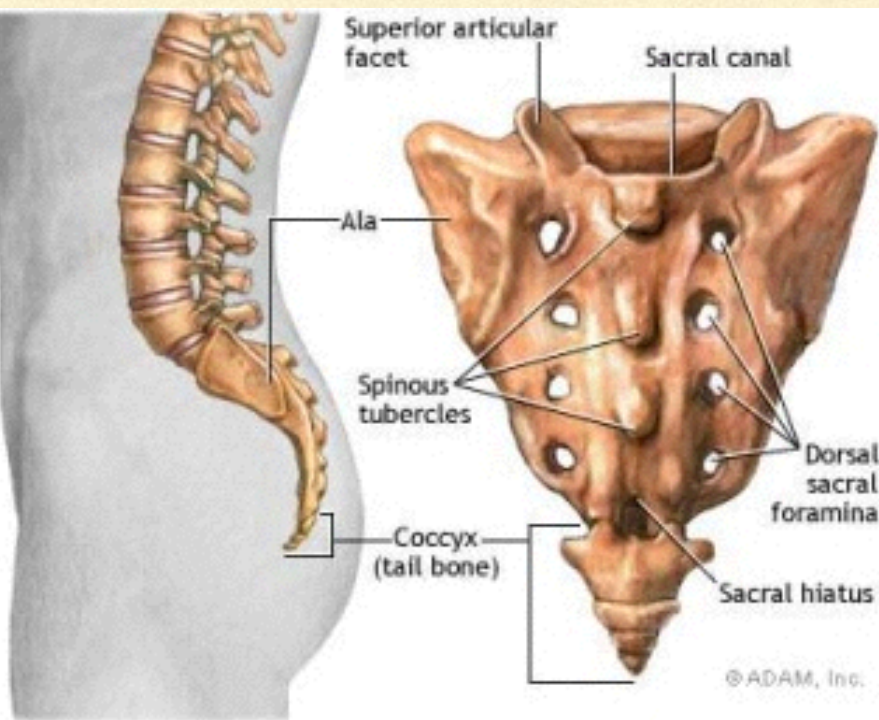




# EVOLUTION- EVIDENCE

## ✿ Vestigial Structures-

structures that have lost most or all of their ancestral purpose.



**Control yourself  
Ladies.**



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# EVOLUTION- EVIDENCE

✱Biggest evidence of all:

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✱All living things have DNA, and the same type of DNA.

✱WHY: the original ancestor of all species had DNA. It's a **homologous** structure.





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# QUICK CHECK

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- Name 3 pieces of evidence for Evolution
  - What does the theory say?
-



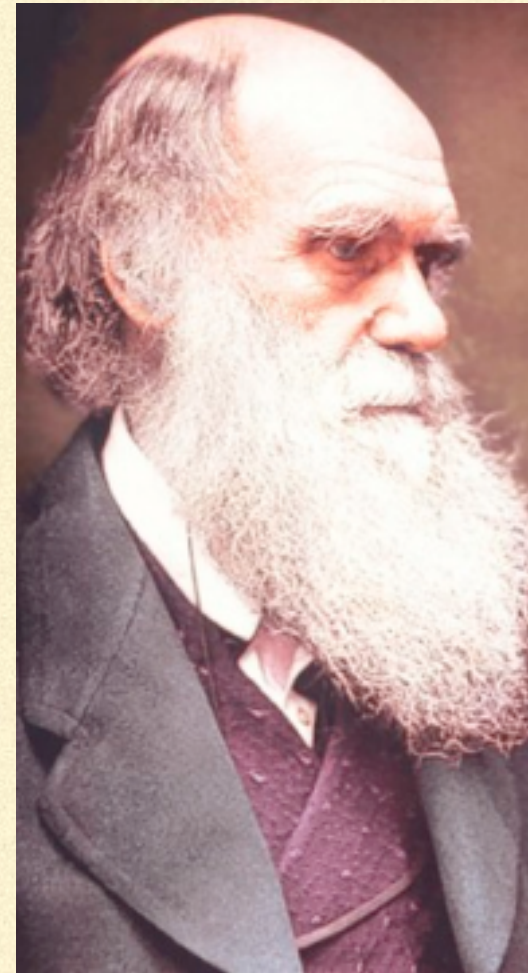
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# EVOLUTION- NATURAL SELECTION

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✧ **Natural Selection-** This is what Darwin proposed as the driving force behind evolution.

✧ “INDIVIDUALS THAT ARE BETTER ADAPTED TO THEIR ENVIRONMENT ARE MORE LIKELY TO SURVIVE AND REPRODUCE THAN MEMBERS OF THE SAME SPECIES.”



**Even better in  
COLOR.**



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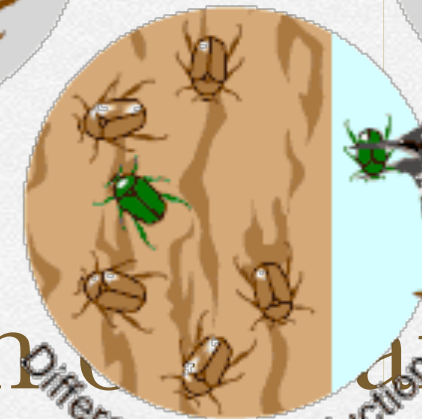
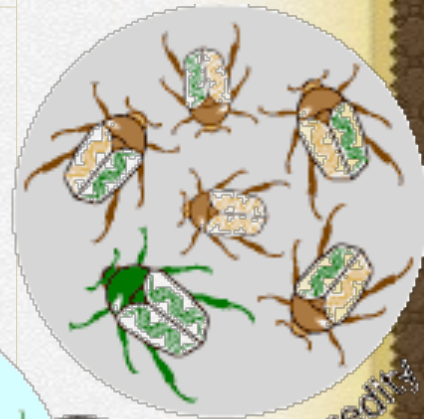
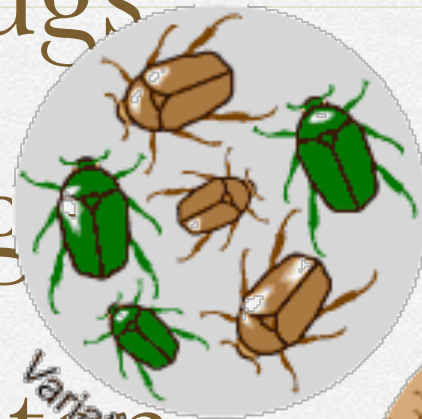
# 5 POINTS OF NATURAL SELECTION

- ✿ 1. Populations have variation
  - ✿ 2. Some variations are favorable
  - ✿ 3. More offspring are produced than will survive
  - ✿ 4. Organisms compete, and those with more favorable traits will survive.
  - ✿ 5. Populations change over time.
-



# EXAMPLE:

- ✿ 1. Green and Brown Bugs
- ✿ 2. Brown are camouflaged
- ✿ 3. Some bugs will be eaten
- ✿ 4. Bugs hide, and fewer brown ones are eaten
- ✿ 5. More brown ones reproduce





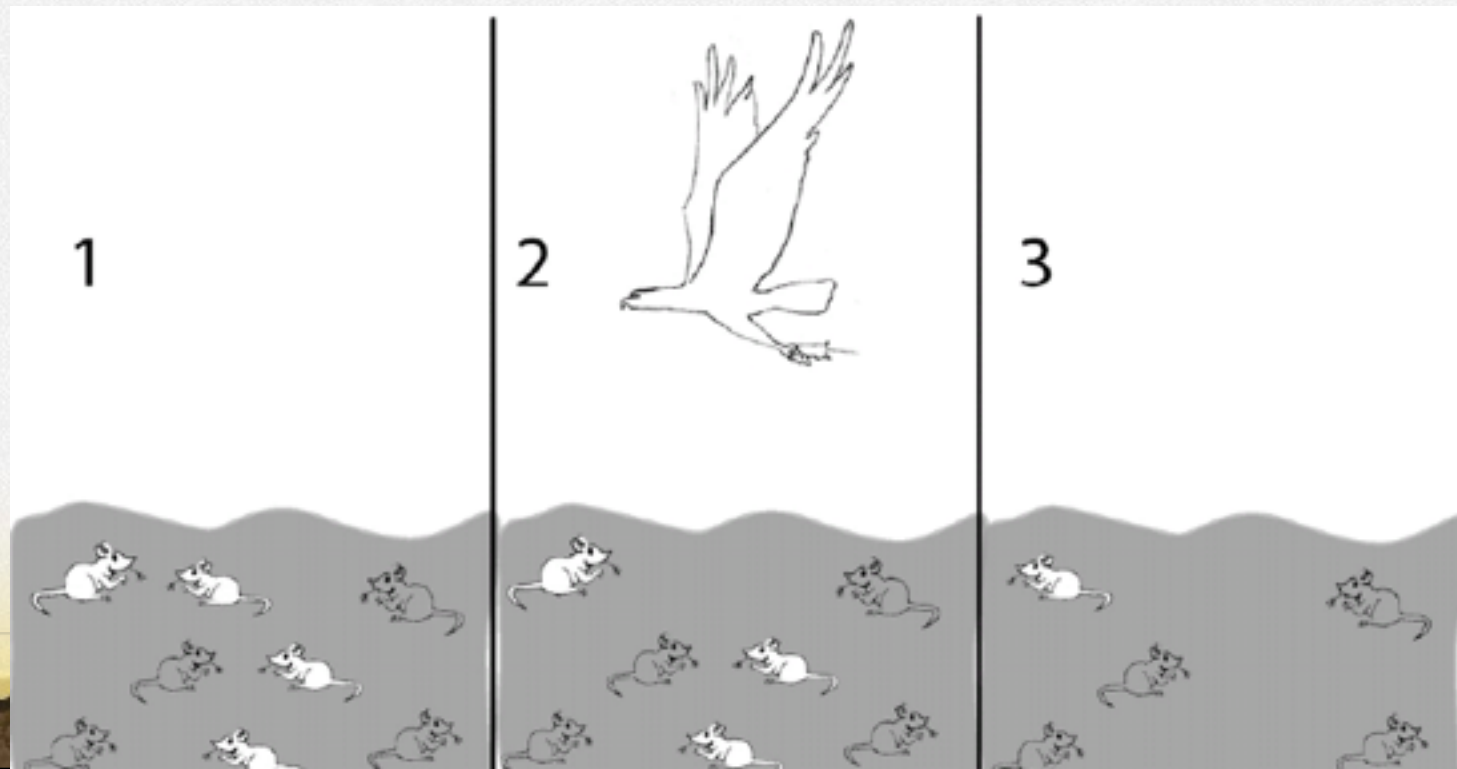
# EXAMPLE: DARWIN'S FINCHES.

- ✱ 1. 3 beak types (thick, medium, thin)
- ✱ 2. Thick ones crack nuts easier, thin ones catch insects better, medium eat seeds and fruit faster
- ✱ 3. A drought comes and takes out all fruit and seeds.
- ✱ 4. Birds with thick beaks and thin beaks can crack nuts and insects more easily. Medium have less food, and some die.
- ✱ 5. Birds reproduce, and more thick and thin beaks are present in the next generation.



# NOTE:

- ❖ The favorability of a trait depends entirely on the environment.
- ❖ If the environment changes, a trait could be harmful to an organism
- ❖ Example: A white mouse can hide well in the arctic, but would stick out to predators in a green field.





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# THINKING QUESTION:

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- Variation in a population is a necessary thing for selection to occur. Think of two ways that variation can be introduced into a population.
  - How does evolution connect to natural selection?
-



# EXAMPLE:

- ✿ Kids, this is why we try to educate you.
- ✿ Don't be “selected” against..



NATURAL SELECTION

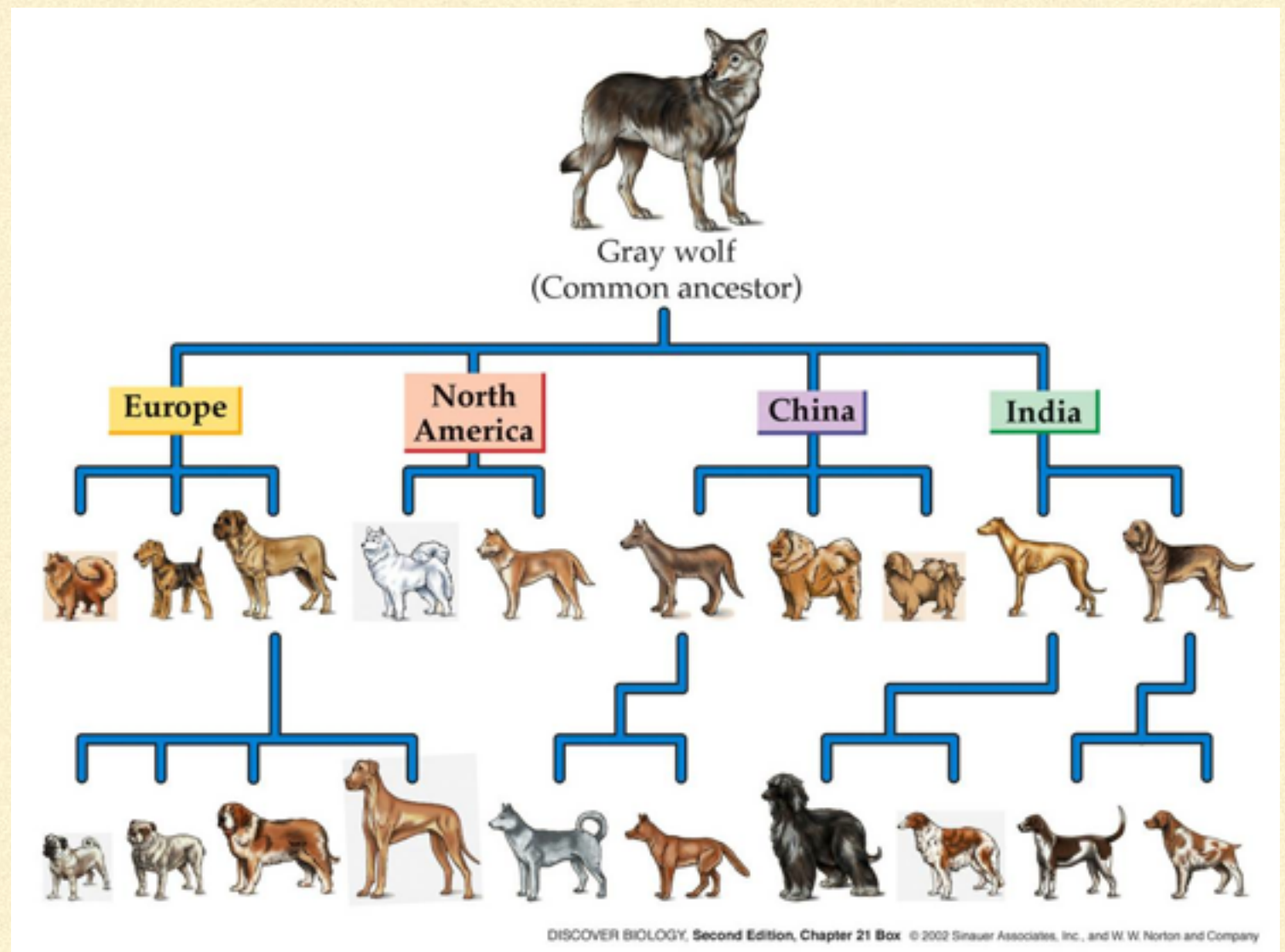
Yes, it does work.







ARTIFICIAL SELECTION :  
DOMESTICATION  
HUMANS  
BREED  
ORGANISMS  
FOR SPECIFIC  
TRAITS THAT  
ARE DESIRABLE.





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# IMPORTANT POINTS ABOUT DESCENT WITH MODIFICATION BY NATURAL SELECTION

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- THE ENVIRONMENT DETERMINES SUCCESS.
  - IF THE ENVIRONMENT CHANGES, A GOOD TRAIT CAN BECOME A BAD ONE, AND VICE VERSA.
  - THE SUCCESS OF A SPECIES IS OFTEN TIED TO DIVERSITY.
  - MORE DIVERSITY IN A POPULATION=SUCCESS
  - LESS DIVERSITY IN A POPULATION=EXTINCTION
-



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# COMMON QUESTIONS

- IF WE HAVE DESCENT WITH MODIFICATION, WHERE DOES ALL THIS VARIETY COME FROM? SHOULDN'T THINGS GET LESS COMPLEX OVER TIME?
  - WHAT CONTROLS WHETHER AN ORGANISM RECEIVES A FAVORABLE TRAIT OR AN UNFAVORABLE ONE?
  - WHY DON'T SOME ORGANISMS JUST EVOLVE INSTEAD OF GOING EXTINCT?
  - DOES EVOLUTION DISPROVE GOD? (Theistic evolution?)
  - DOES EVOLUTION AFFECT US? CAN THE EVOLUTION OF ONE ORGANISM AFFECT ANOTHER?
  - IF THEY LOOK SIMILAR, ARE THEY CLOSELY RELATED?
  - Does evolution mean becoming more advanced? Why are there still simple organisms?
-