

# BIOLOGICAL CLASSIFICATION OF MARINE ORGANISMS

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MINISTRY OF HIGHER EDUCATION



# TOPIC 6 :

# EVOLUTION AND ITS MECHANISM

An illustration of an underwater scene with various marine life and coral reefs. The background is a gradient of light blue to dark blue. In the foreground, there are dark silhouettes of coral reefs and seaweed. In the middle ground, there are colorful coral reefs in shades of green, yellow, and pink. A large white starfish is visible in the water. A school of small blue fish is swimming in the upper right, and another school is in the lower left. A large blue wave is on the right side. The overall scene is vibrant and detailed.

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## OBJECTIVES



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- Evolution
- Cause of diversity
- Lamarck's Theory of Evolution
- Darwin's Theory of Evolution
- Natural Selection
- Evidence of Evolution
- Misconceptions
- References

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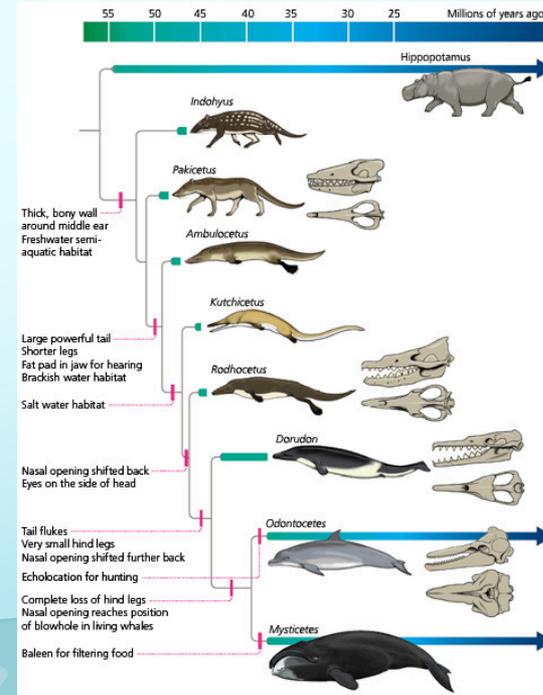
# WHAT IS EVOLUTION?



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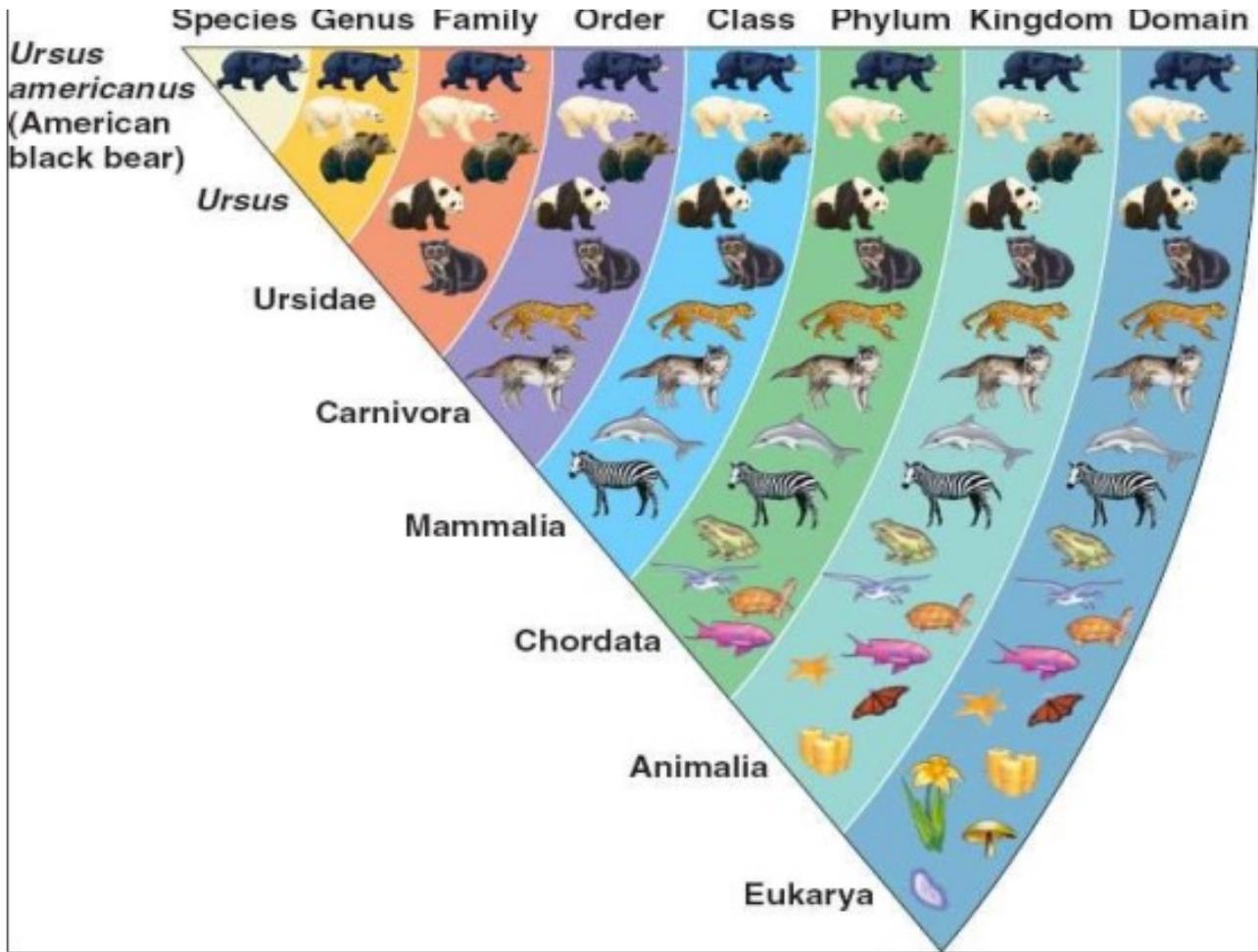


- It's a **gradual change in a species** over time.
- It refers to the **process that have transformed or changed life on earth** from its earliest forms to the vast diversity that we observe today.
- Any **change in the heritable traits** within a population across generation.
- Evolutionary change is based mainly on the interactions between population of organisms and their environment.



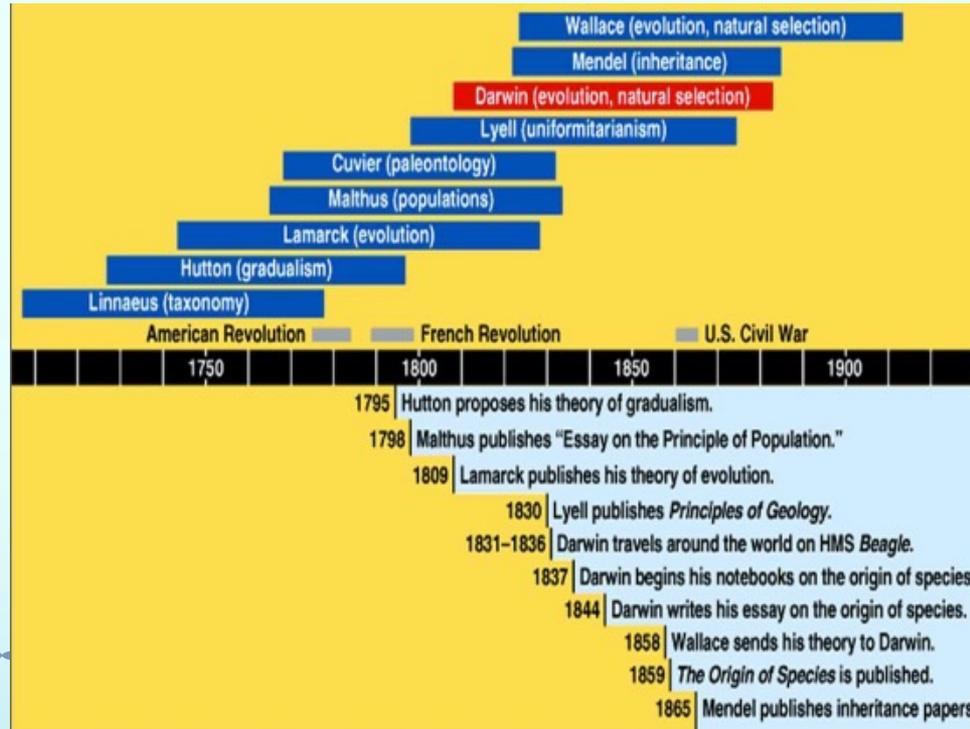
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- 1. Theory of Special Creation
  - Carolus Linnaeus: All living things came into existence in their present forms especially and specifically created by nature



## • 2. Theory Of Natural Selection

- Organisms might **EVOLVE** through time, with one type of organisms giving rise to another type of organisms.
  - Aristotle
  - Jean Baptiste Lamarck
  - Charles Darwin



## BIOLOGICAL CLASSIFICATION OF MARINE ORGANISMS

# LAMARCK'S THEORY OF EVOLUTION



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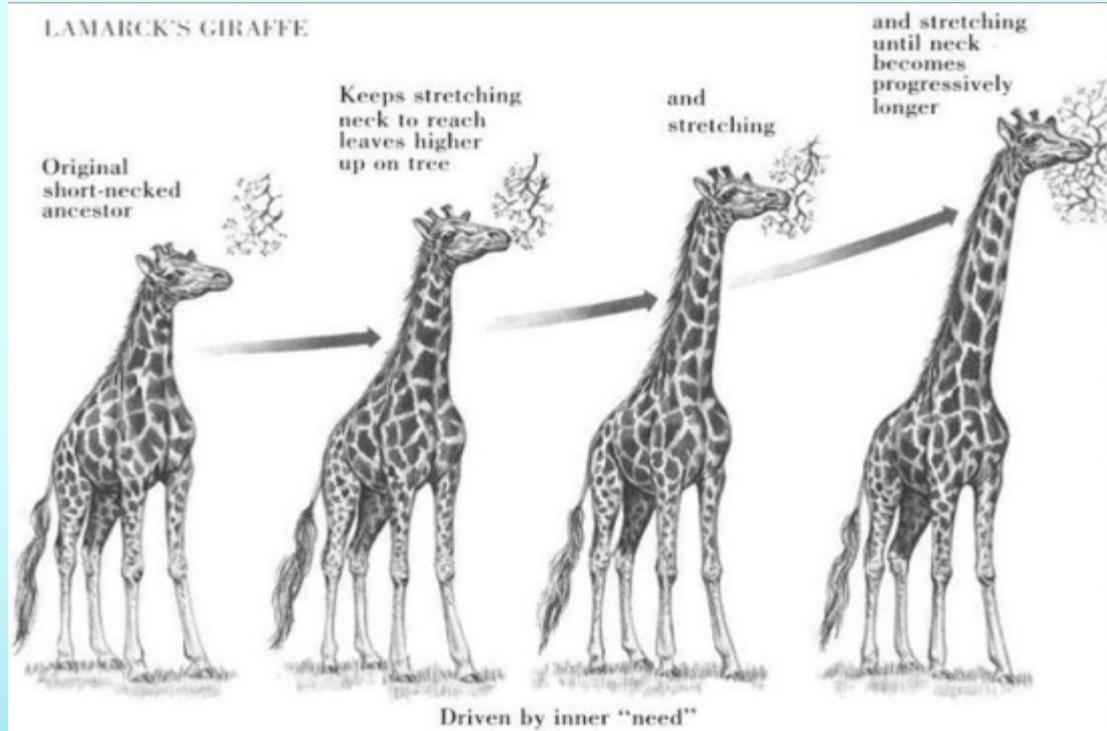
- Organisms constantly strive to improve themselves by changing.
- Changes are adaptations to environment acquired in an organism's lifetime.
- A structure is modified or changed by use or disuse
- The modification is inherited to the offspring.
- Inheritance of acquired characteristics.

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# LAMARCK'S THEORY OF EVOLUTION

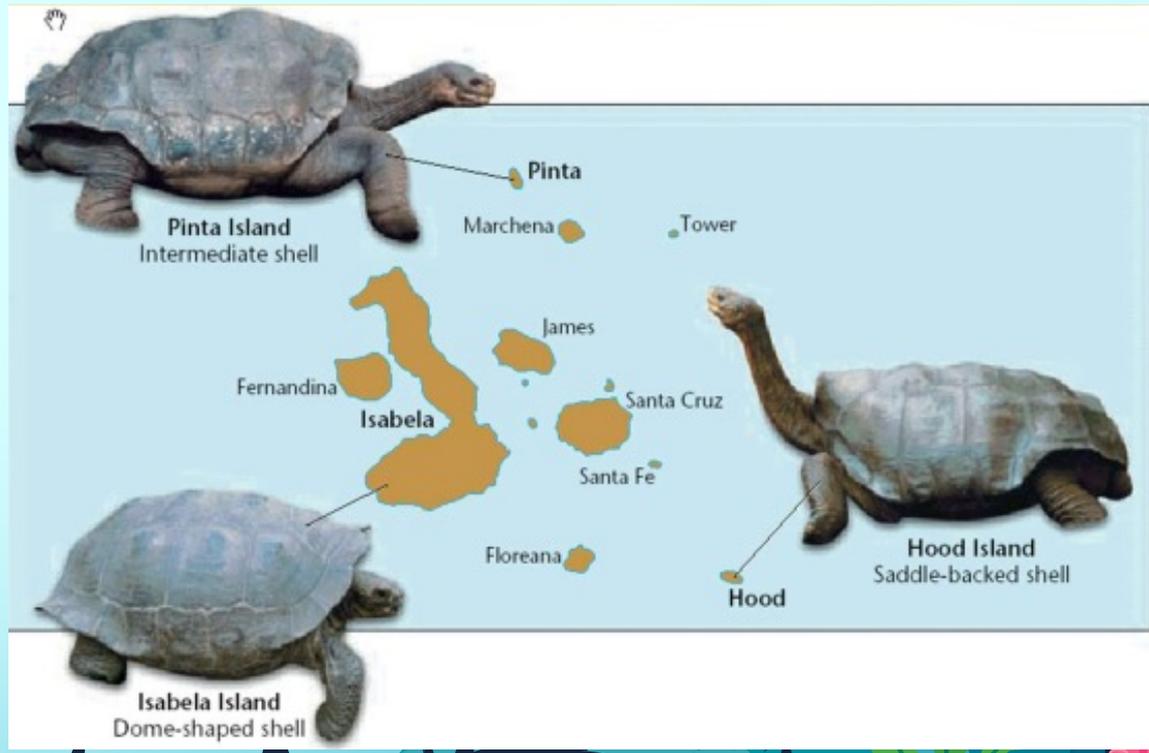


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# DARWIN'S THEORY OF EVOLUTION



## BIOLOGICAL CLASSIFICATION OF MARINE ORGANISMS



# DARWIN'S THEORY OF EVOLUTION



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| Galápagos Islands Finches |                       |                                |                    |                     |                           |                     |
|---------------------------|-----------------------|--------------------------------|--------------------|---------------------|---------------------------|---------------------|
| Shape of Head and Beak    |                       |                                |                    |                     |                           |                     |
| Name                      | Vegetarian tree finch | Large insectivorous tree finch | Woodpecker finch   | Cactus ground finch | Sharp-beaked ground finch | Large ground finch  |
| Main Food                 | Fruit                 | Insects                        | Insects            | Cactus              | Seeds                     | Seeds               |
| Feeding Adaptation        | Parrotlike beak       | Grasping beak                  | Uses cactus spines | Large crushing beak | Pointed crushing beak     | Large crushing beak |
| Habitat                   | Trees                 | Trees                          | Trees              | Ground              | Ground                    | Ground              |

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- Common descent with modification
  - All organisms are related through descent from some unknown ancestor that lived in the distant past.

- Check the video:

<https://www.youtube.com/watch?v=yGV82kE4IEc>

- Population of individual species become better adapted to their environment through natural selection.

## 1. The Struggle for Existence

- Members of each species have to compete for food, shelter, other life necessities to reproduce in a specific environment.

## 2. Survival of the Fittest

- Some individuals better suited for the environment and more likely to survive and reproduce.

## 3. Natural Selection

- The unequal ability of individuals to survive and reproduce leads to a gradual change in a population, with favorable characteristics accumulating over generations new species evolve.

1. Organisms produce more offspring that can survive
2. Variations are found among individuals of a species
3. Variations are passed on to offspring.
4. Some variations allow members of a population to survive and reproduce better than others.

## □ Variations

- an inherited trait (change in the DNA) that makes an individual different from other members of the same species
- Could be color, shape, behavior or chemical makeup

# NATURAL SELECTION VS ARTIFICIAL SELECTION



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## Natural Selection

- Results in changes in inherited characteristics of a population.
- These changes increase a species fitness in its environment.

## Artificial Selection

- Nature provides the variation among different organisms, and humans select those variations they find useful.

# HOW DOES EVOLUTION HAPPEN?

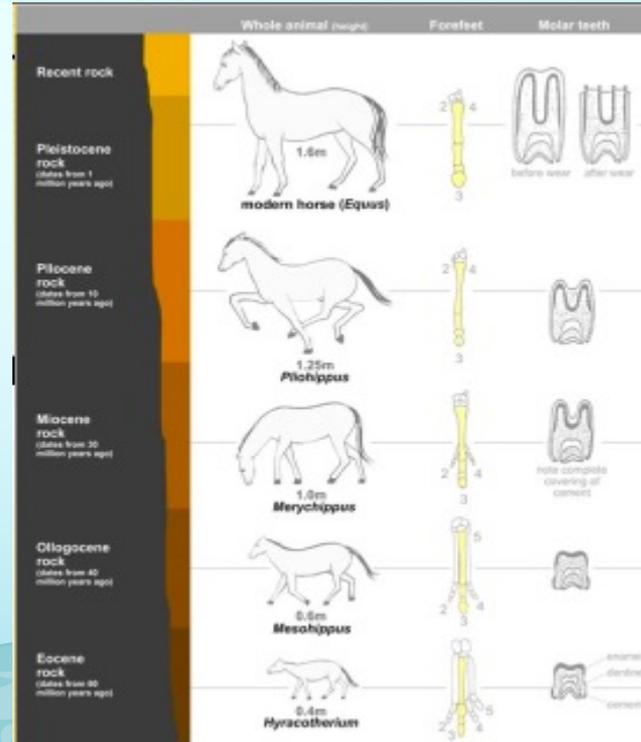


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## 1. Gradualism

- a slow steady process where you can see different forms of the new species.
- Minor changes happen



# HOW DOES EVOLUTION HAPPEN?

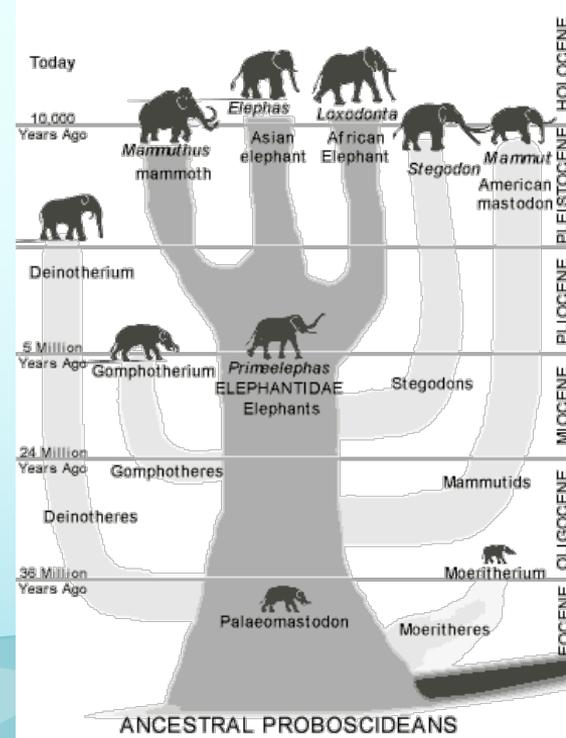


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## 2. Punctuated equilibrium

- Happens quickly
- Sometimes intermediate species are not there.
- Species branch off and evolve simultaneously.



## Gradualism

- states that evolution occurred slowly, over a long period of time

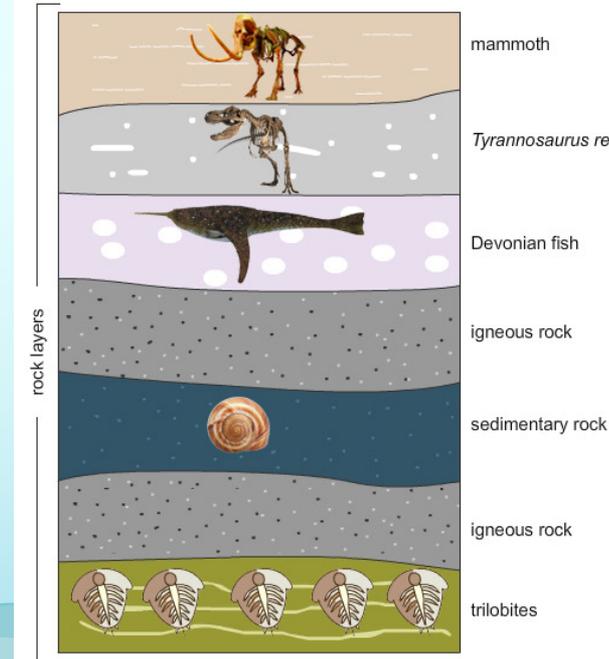
## Punctuated Equilibrium

- occurs when there are periods of apparent stasis interrupted by sudden change.

**BOTH REFER TO THE EVOLUTION OF SPECIES OVER TIME**

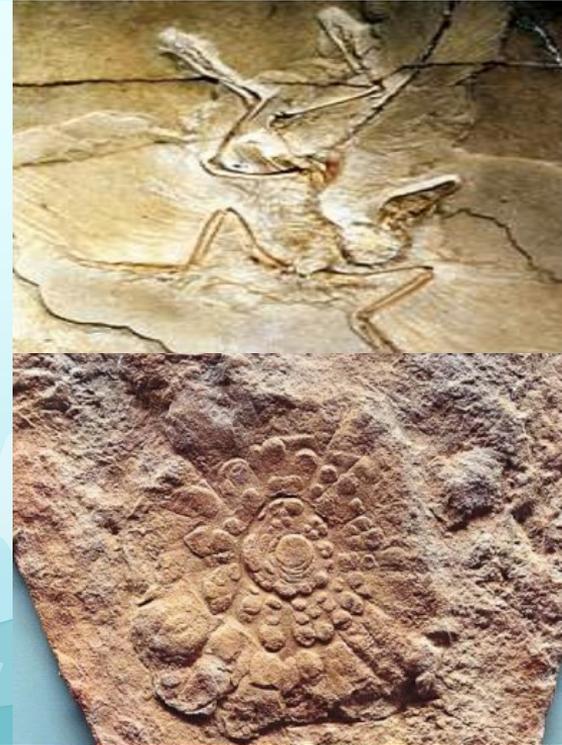
## 1. Fossils Record

- Remains or imprints of past life preserved in sediments.
- Occur in layers (strata).
- Fossils in different layers of rock (sedimentary Rock Strata) showed evidence of gradual change over time.



## 1. Fossils Record

- Order of fossil appearance shows more complex forms appearing after simpler forms.
- Recent fossils (new strata) most closely resemble modern organisms.



## 2. Taxonomy

- Hierarchical classification structure developed by Linnaeus
- Implies that species can be grouped together based on their relatedness
  - Bears with bears, bees with other bees
- A family tree can be made implying descent



*Ursus maritimus*



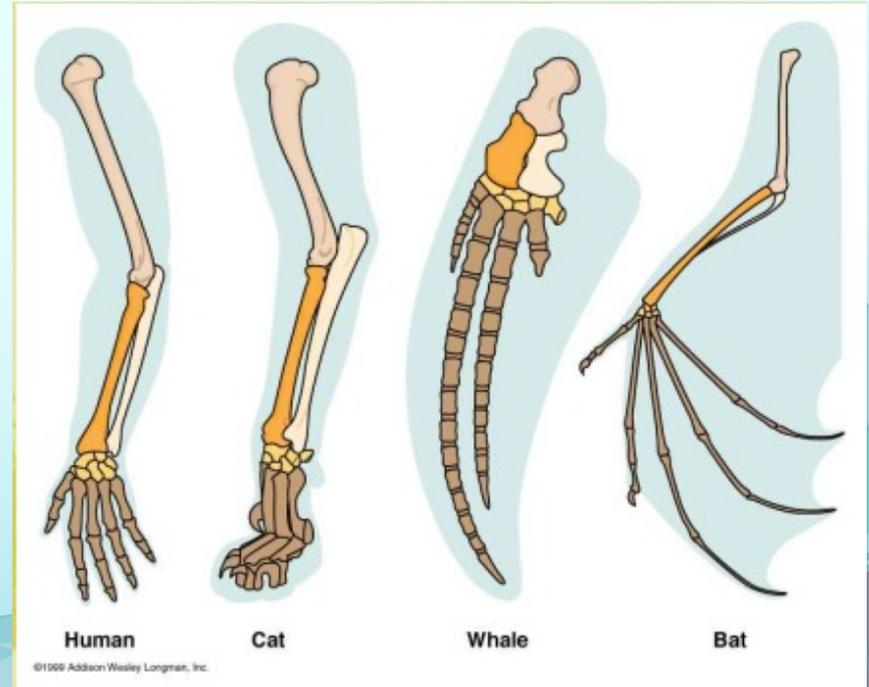
*Ursus arctos*



*Ursus americanus*

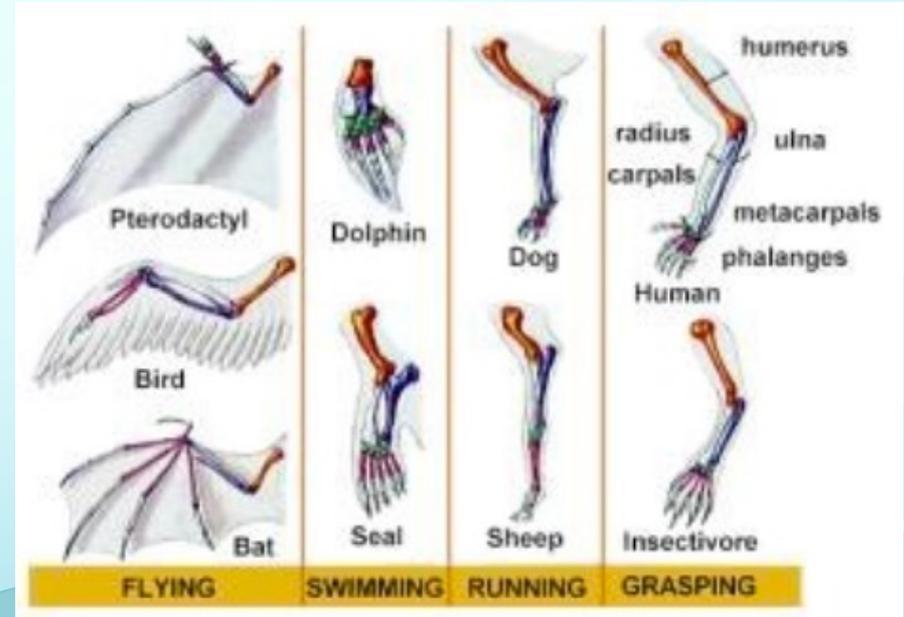
Related species of *Ursus*

- 3. Comparative Anatomy
  - Compares anatomical structures from different organisms.
  - Similar structures in two or more species are called homologous structures.



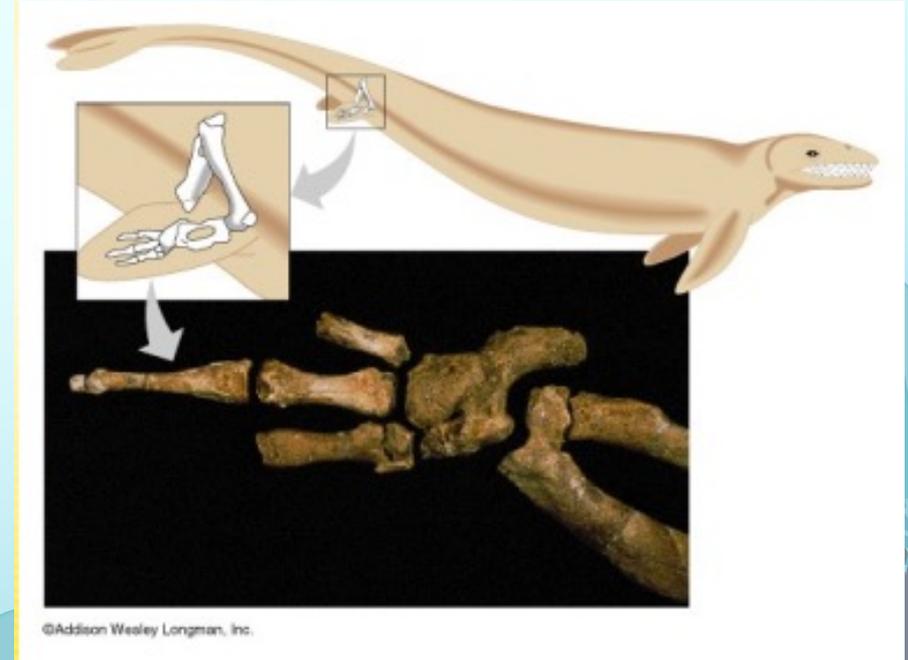
## 3. Comparative Anatomy

- Scientists noticed animals with backbones (vertebrates) had similar bone structure.
- May differ in form or function.
  - Limb bones develop in similar patterns.
  - Arms, Wings, Legs, Flippers



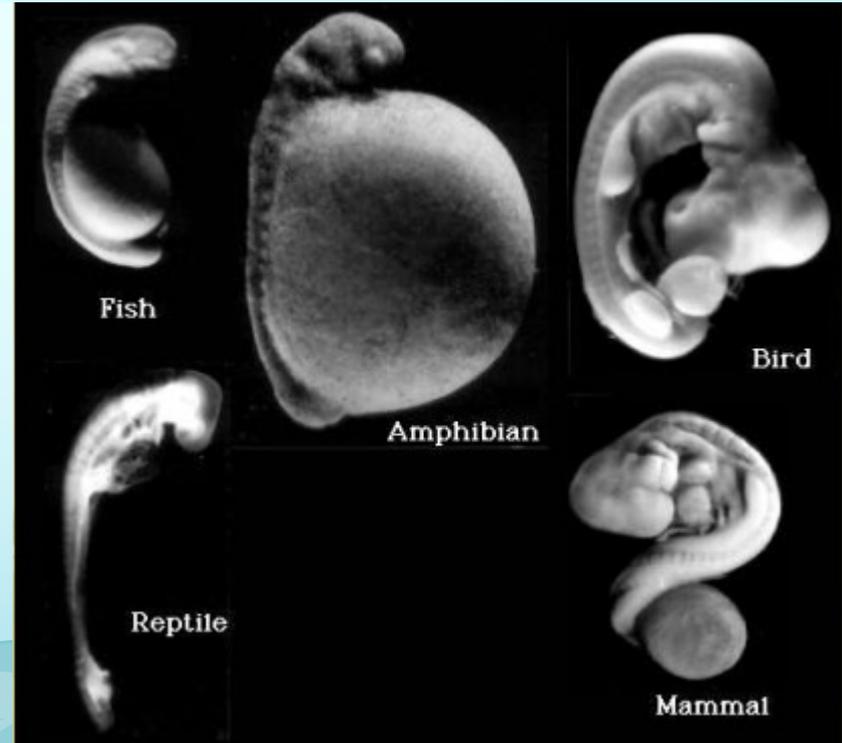
## 4. Vestigial Structures

- A body part that doesn't seem to have a function at this time.
  - E.g. pelvic bone of whale



## 4. Comparative Embryology

- Embryos (young stage of organisms are compared)
- Embryonic structures of different species show significant similarities.
- Similar features due to shared ancestry.



## 5. Biogeography

- Distribution of species
- Many related species occur across the earth
- Isolated areas (islands, Australia) often have unique species
- Biogeography explained by continental drift of plates and speciation

### KNOW YOUR MONOTREMES

EGG-LAYING MAMMALS



SHORT-BEAKED ECHIDNA



PLATYPUS



WESTERN LONG-BEAKED ECHIDNA



EASTERN LONG-BEAKED ECHIDNA



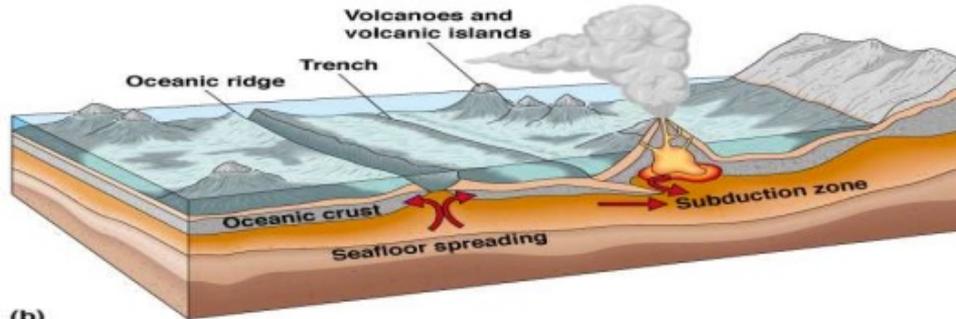
ATTENBOROUGH'S LONG-BEAKED ECHIDNA



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(a)



(b)

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## 6. Molecular Biology

- Includes comparisons of
  - protein sequences
  - DNA sequences
  - chloroplast genomes (plants only)
- • Used to developed phylogenetic trees (hypothesized relationships)

Lets Explore More

[http://www2.edc.org/weblabs/explorin  
gevolution  
/evolution.swf](http://www2.edc.org/weblabs/explorin%20evolution/evolution.swf)

# MISCONCEPTION ABOUT EVOLUTION



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1. Evolution is “just a theory” or the “best guess”, so it is not supported by scientific evidence.
2. Organisms change and evolve because they have a desire to do so.
3. We can’t see evolution happening.
4. Evolution leads to more advanced organisms that are “climbing the evolutionary ladder”.
5. Evolution occurs in individual organisms.