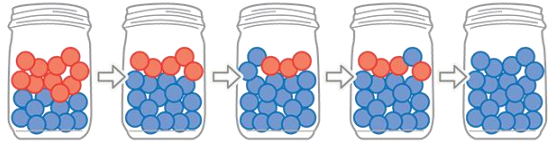
Evolution

Intro to Mechanisms and Evidence

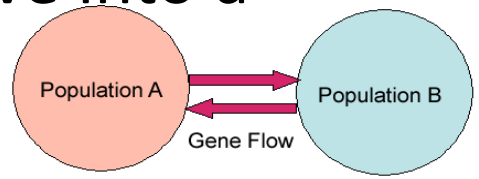
- Discuss these questions with a partner and be able to answer them when called on:
  - Is Natural Selection a random event? Why or why not?
  - What is fitness?
  - Define Genetic Variation in your own words (think back to genetics).

Genetic Drift vs Gene Flow

- **Genetic drift** – random change in allele frequency of a population. Purely by chance – not fitness!



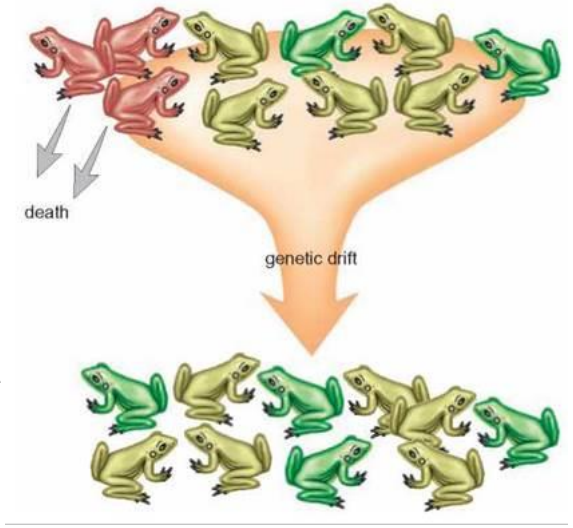
- **Gene flow** – (gene migration) new genes/alleles move into a population increasing genetic variation.



- THINK: **Drift (drifting to one side** in a lake or pool)
  Flow (flowing from one group down **to another** group)

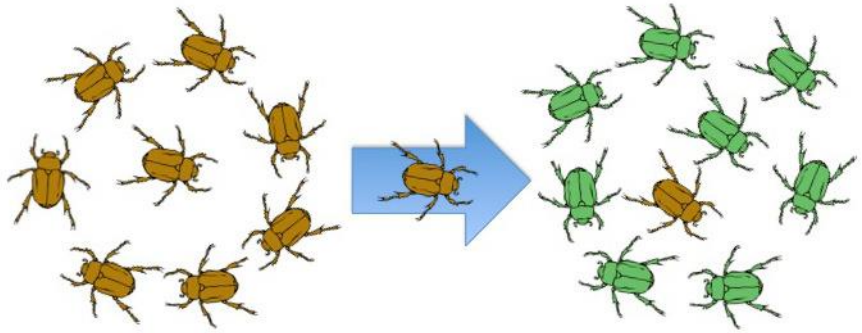
Population A

Drift



Population A

Flow

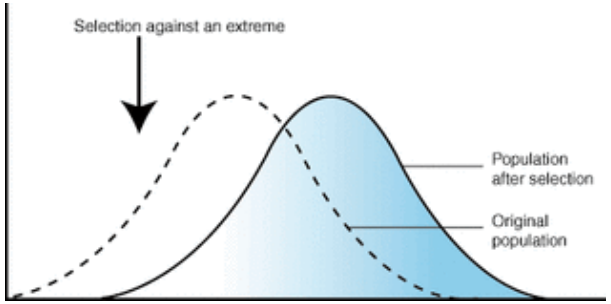


Population A

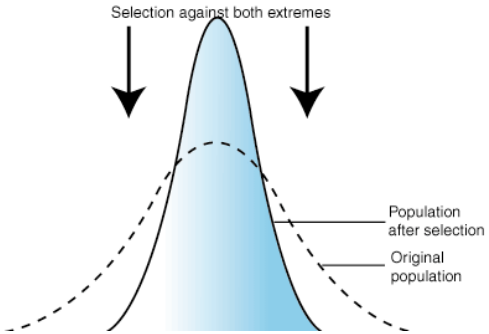
Population B

Patterns of Evolution – types of selection (PreAP Only)

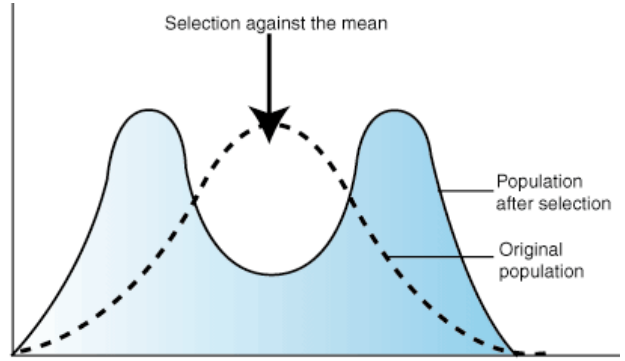
- **Directional** – one extreme train of the population survives



- **Stabilizing** – the average traits of the population survives

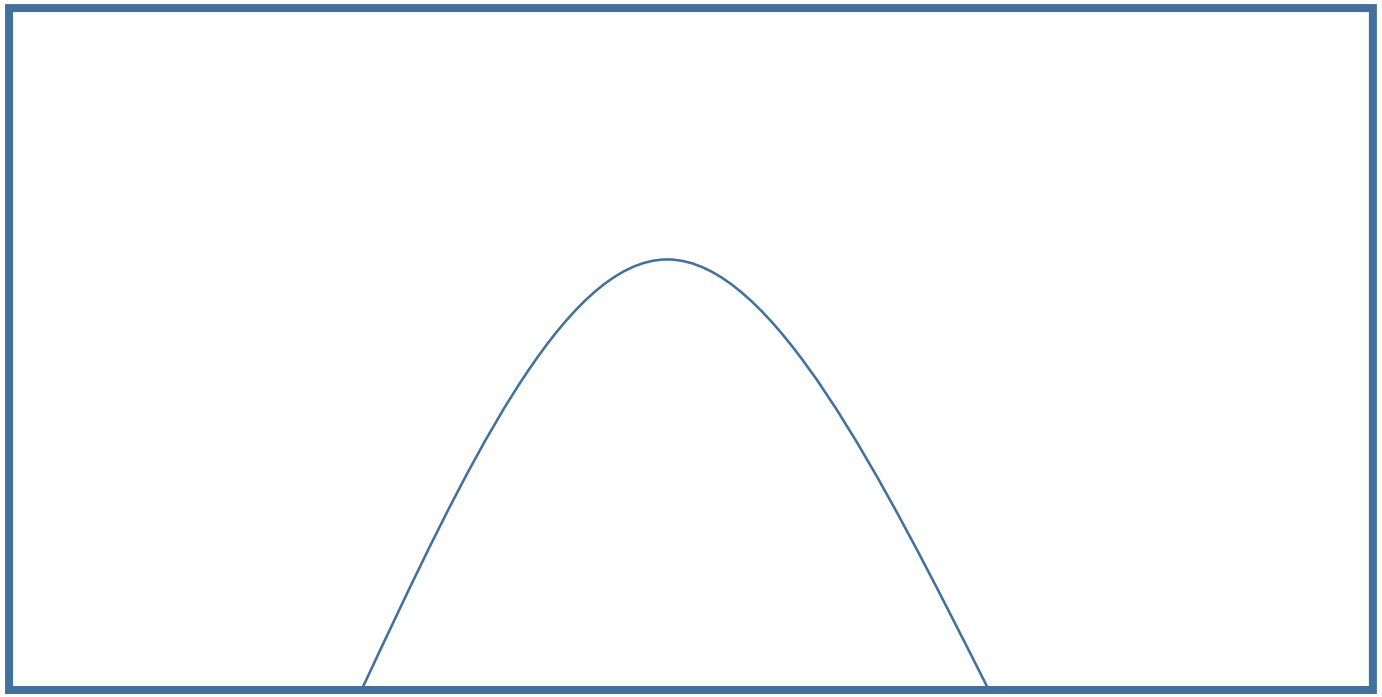


- **Disruptive** – two extremes of the population survive (leads to speciation)



What type of selection does this illustrate?

	Black	Grey	Tan	White
1950	7	18	20	5
1970	15	16	19	9
1990	20	8	5	17
2010	30	2	2	27



- Discuss the questions with a partner and be able to answer them when called on:
  - How many populations are involved in genetic drift? What happens?
  - How many populations are involved in gene flow? What happens?
  - Natural Selection is NOT random. Are genetic drift or gene flow random events? Why or why not?

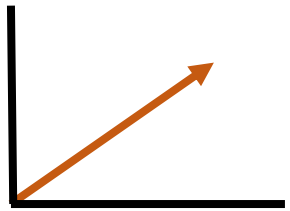
Hold up your card (True or False) for each question:

- Natural selection is a random event.
  - False – the surviving traits are due to their success in the environment
- Genetic drift and gene flow are random events.
  - True – the surviving traits are due to chance (not selection)
- Genetic drift involves two different populations of the same species.
  - False – genetic drift occurs in one population
- Genetic drift is a change in allele frequency due to a decrease in population size.
  - True – one trait (gene/allele) becomes more common than others in the original population
- Genetic variation increases when one organism joins a new population and breeds with them.
  - True – the new organism brings alleles (traits) from its original population
- The above statement describes gene flow.
  - True – that is the definition for gene flow

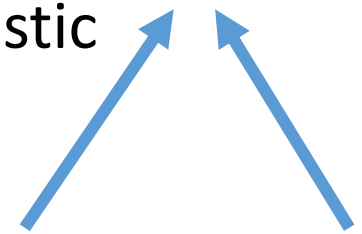
Types of Evolution:

- Punctuated Equilibrium – sudden change, long period of no change, then sudden change (horse evolution)

- Gradualism – slow and steady change over long period of time

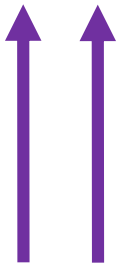


- Convergent – different species evolve to have same characteristic (bat and bird have wings)



- Divergent – same or similar species evolve to be different (early terrestrial cat developed into lions, tigers, cheetas)

- Co-evolution – two species evolve together at the same time (flower and its pollinator change together)



What are the five types of evolution? (draw them)

Which type of evolution is shown?

- Horse evolution shows long periods of very little change with periods of sudden change in between.
- The different lizard species that exist today evolved from a common ancestor 1 million years ago.
- The toxic temple ivy developed a poison to protect itself from insects over thousands of years. The rangu fly developed a defense to the toxin so it could continue to feed on the ivy.
- The bird and bat both developed the ability to fly.

Quiz today – Wednesday 1/25/17

- Clear your desk of everything except a pen or pencil.
- Put your cell phones where they are NOT visible or easy to reach.
- Turn in your quiz at the front when you finish.
- Wait quietly until everyone has finished the quiz to do today's assignment – Molecular (DNA) Evidence Supporting Evolution
- Turn the assignment in when completed.
- Have a GREAT rest of the day!

Molecular Evidence of Evolution (do this after the quiz)

- Finding the relationships in the amino acids and DNA of different species can tell you how similar (closely related) or different (further related) the different species are from each other.
  - **Look at the table below. Compare the amino acids (each letter represents an amino acid) and count the differences between each animal and the human. Circle the differences from the human (this is done for you).**
  - This is just **ONE** gene.

Human	V-H-T-A-T-A-A-S-D-L-A-T-D-K-R-C-H-E-Y-A
Chimp	V-H-T-A-T-A-A-S-D-L-A-T-D-K-R-C-H-E-Y-A
Gorilla	V-H-T-A-T-A-A-S-D-L-A-T-D-K-K-C-H-E-Y-A
Horse	V-Q-S-A-L-A-S-G-E-V-H-A-D-K-R-V-R-D-Y-A

Human and chimp have 0 differences

Human and gorilla have 1 difference

Human and horse have 12 differences

The **human and the chimp** are the **closest related**

The **human and the horse** are the **furthest related**

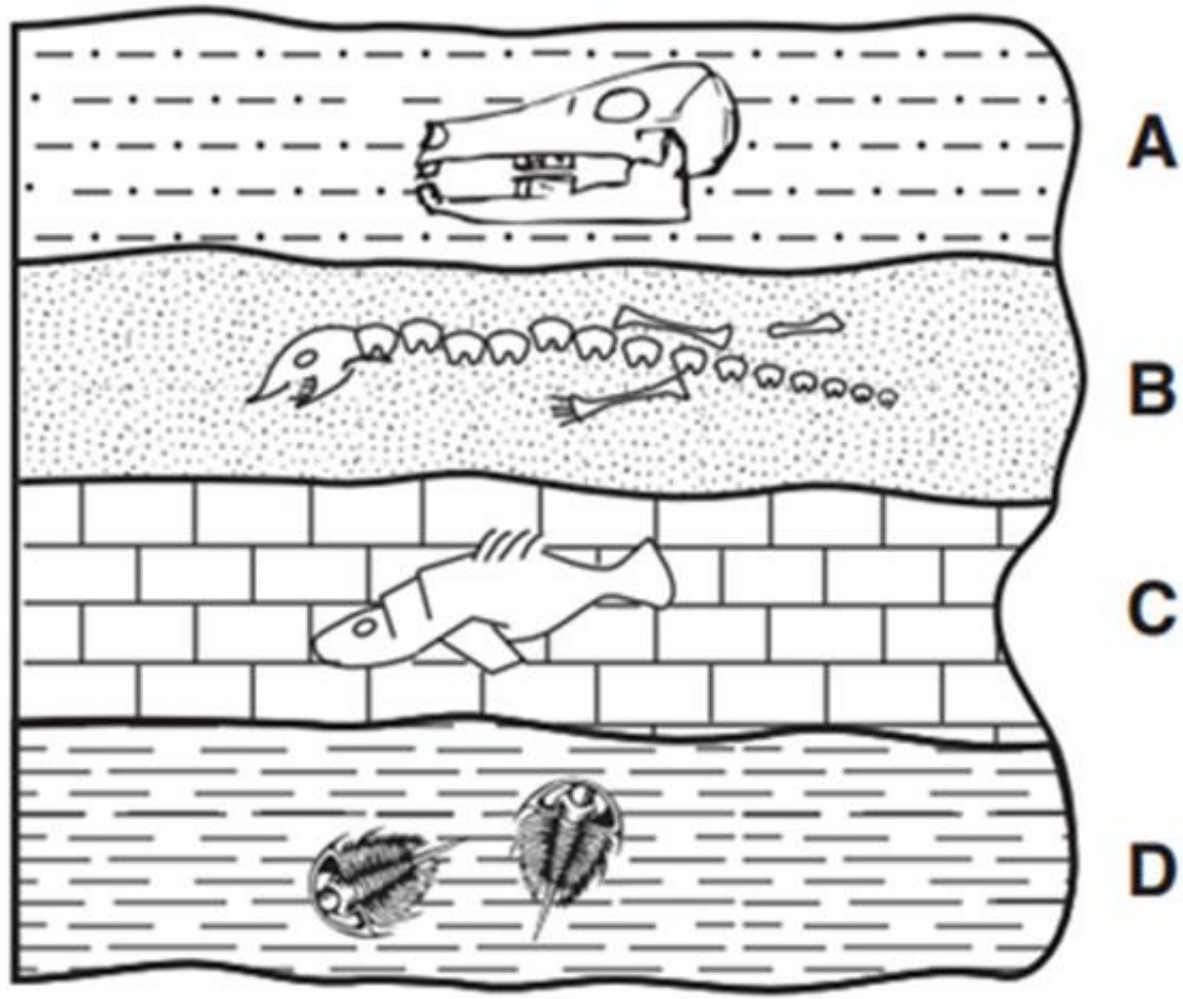
Note: DNA evidence is the number one, most reliable, undeniable evidence supporting evolution!

- **Use this same process to complete the Molecular Record worksheet. Circle the amino acids that are not the same as the human, count the number of differences and record them on the table. Fill in the bar graph and answer the questions.**

What type of information can fossils give us?

Grab an Expo and write it below:

- https://www.youtube.com/watch?v=xBbP-sgforA


A
B
C
D

2nd

- What can fossils tell us? Watch the video below. ☺

- https://www.youtube.com/watch?v=xBbP-sgforA

- Be able to answer the following questions:
  - What can fossils tell us about the environment's history?
  - What can fossils tell us about the organism?
  - What else can we look at as evidence of evolution?

Developmental Similarities - Embryology

- The study of one type of evidence of **evolution** is called **embryology**, the study of embryos. An embryo is an unborn (or unhatched) animal or human young in its earliest phases. Embryos of many different kinds of animals: mammals, birds, reptiles, fish, etc. look very similar and it is often difficult to tell them apart.
- This is evidence of a **COMMON ANCESTOR**!

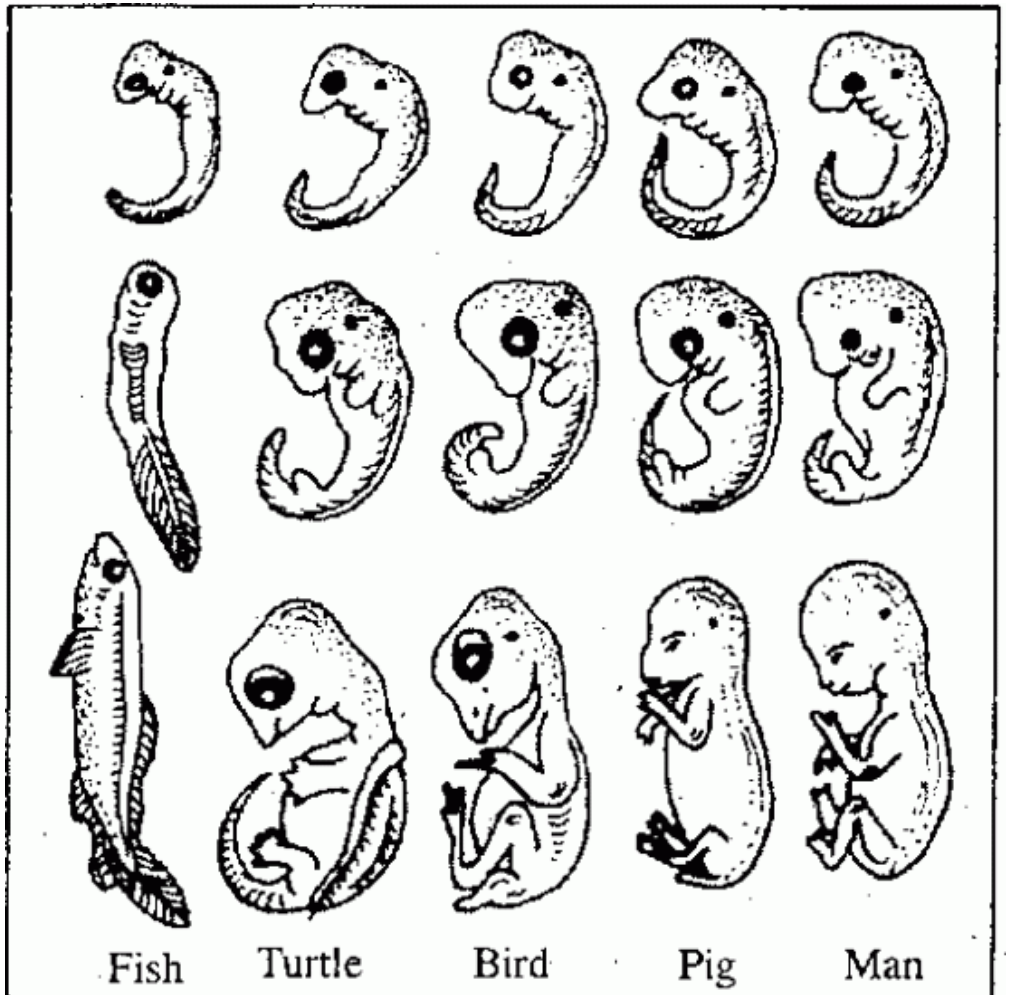
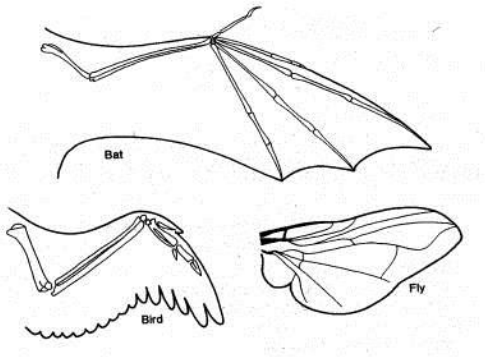
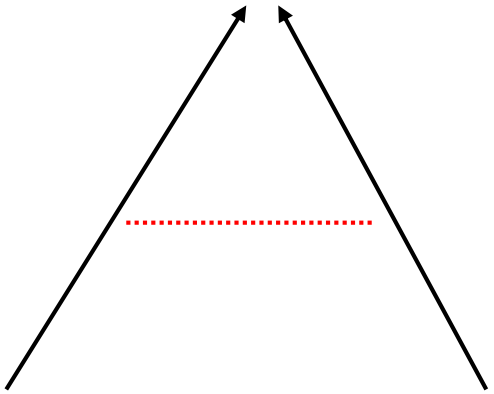


Fig. 9.7. Developmental stages of five vertebrates

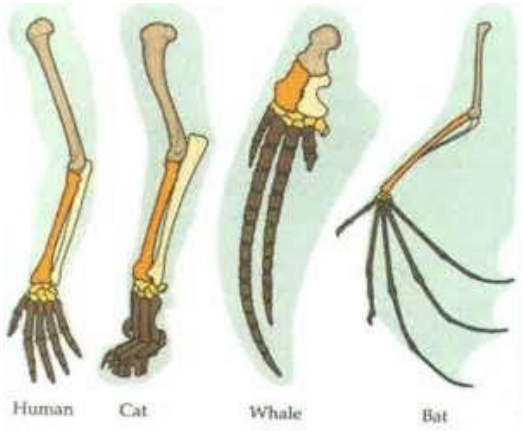
Anatomical structures are used to show evolutionary relationships. There are 3 types.

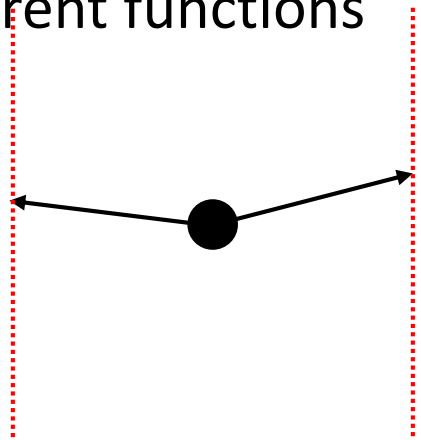
- ANALOGOUS STRUCTURES
- Same function, different structures (developed very differently)
- Example:
  - Due to convergent evolution, different organisms need to function the same (like flying)





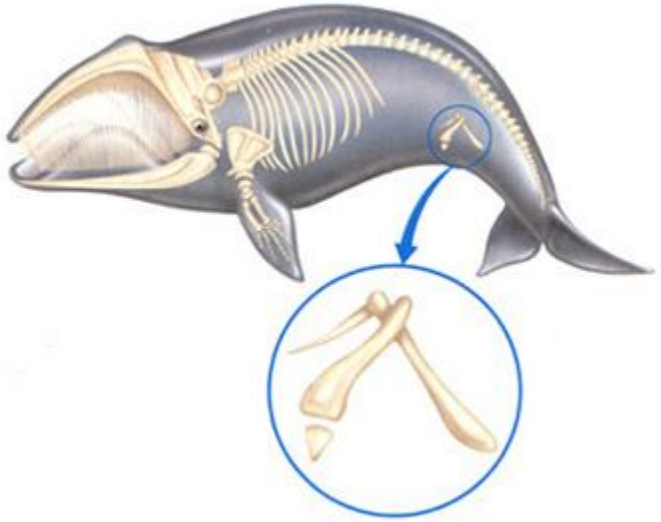
- HOMOLOGOUS STRUCTURES
- Same structure, different function (same bones but different purpose)
  - Why? Due to a ***common ancestor***
- Example:
  - Due to divergent evolution, like organisms develop different structures for different functions



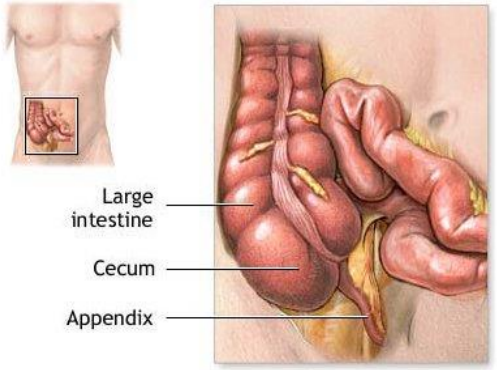


Vestigial Structures

These are structures present in modern organisms that no longer function, but functioned in ancestral organisms



- Whale ancestors had a pelvis due to hind limbs, whales lost the hind limbs through natural selection but the inner pelvic bones remain.



- Human ancestors had a working appendix used to help digest roughage. Modern day humans do not eat the same material. As a result the appendix quit working and is no longer useful.