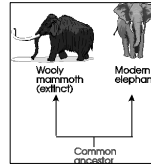


The Theory of Evolution



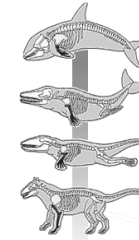
EVOLUTION IS:

1. Change with time
2. Descent with modifications
3. Plants and animals of today are **modified** forms of plants and animals of the past
4. Organisms vary and new forms appear, while old forms decline or become extinct



** Evolution is theologically neutral- it interprets a natural process

- it describes **how** -- not why
- it is based on recognition of order - not purpose



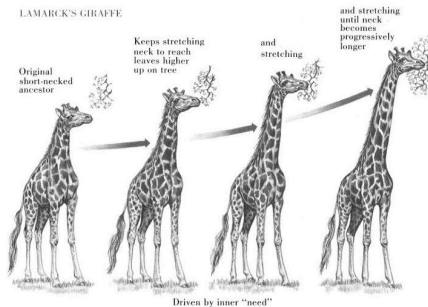
2 Theories of Evolution

1. Lamarck (1801):

- Observed a relationship between the organism and its environment
- Recognized change in living things over long periods of time



LAMARCK'S GIRAFFE



Lamarck:

- Part of Lamarck's mechanism for evolution involved the inheritance of acquired traits. He believed that **traits changed or acquired over an individual's lifetime** could be passed down to its offspring.



2. Charles Darwin:

- In 1831, sailed on the **HMS Beagle**, to South America and the South Pacific for a collecting and mapping expedition.
- Job: collect, study, and store specimens

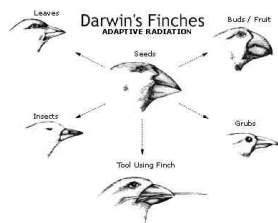


Darwin:

- Developed a hypothesis based on observations, specifically in **The Galapagos Islands**
 - Studied and compared the anatomy of many species of reptiles, insects, birds, and flowering plants
 - Noticed that these species were unique to the islands, yet similar to species seen in other parts of the world



Darwin observed finches with different beaks on the different islands



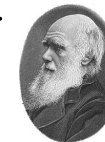
Darwin's Finches



- Darwin's observations - all the finches on the Galapagos island looked about the same except for the **shape** of their beak.
- Conclusion - all the finches were descendents of the **same** original population.
- The shape of the beaks were **adaptations** for eating a particular type of food (Ex. long beaks were used for eating insects, short for seeds)

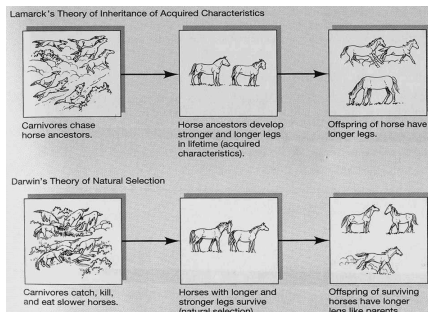
Darwin:

- **Evolution** = change in the gene pool of a population in response to various stimuli exhibited by a species **OVER TIME**.



What is Darwin's Explanation for Evolution?

- **Natural Selection** = a mechanism for change in populations that occurs when organisms with favorable variations for a particular environment survive, reproduce, and pass these variations on to the next generations.



Natural Selection:

- **Adaptation** = any trait that aids the chances of survival and reproduction of an organism.



Natural Selection:

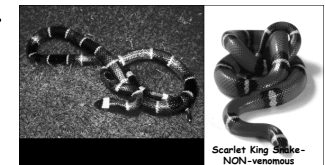
Two types: **Structural** and **Physiological**

1. **STRUCTURAL ADAPTATIONS** arise over **many generations**:

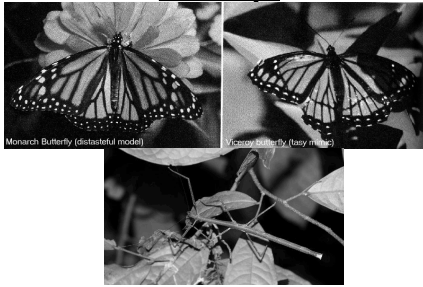


Structural adaptations

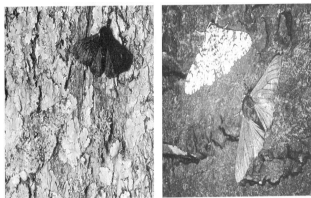
- **mimicry** = provides protection for an organism by enabling it to copy the appearance of another species.



Mimicry:



- Pollution kills lichens and uncovers darker tree trunks
- Frequency of color moths has changed over time in response to pollution



Structural adaptations

- **camouflage** = enables an organism to blend in with its surrounding
- more likely to escape predators and survive to reproduce



Natural Selection:

2. PHYSIOLOGICAL ADAPTATIONS can develop rapidly

- Changes in an organism's **metabolic processes**
- Ex: insects/ weeds have been selected for physiological resistance to chemicals used in pesticides.



Camouflage-snowshoe hare



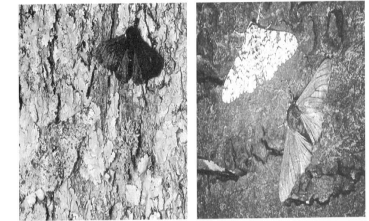
PHYSIOLOGICAL ADAPTATIONS

- Ex: Penicillin- was considered 50 years ago as a wonder drug b/c it could kill many types of disease causing bacteria
- Now penicillin is not as effective as it used to be because many species of bacteria have evolved physiological adaptations that make them resistant to penicillin



Example of Natural Selection:

- Lighter colored pepper moths less noticeable on lichen covered trees



EVIDENCE FOR EVOLUTION

- Genetic Comparison
- Fossils
- Anatomical studies
- Functionless structures
- Embryological development



Evidence for Evolution

1. GENETIC COMPARISONS

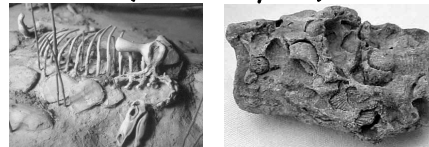
- nucleotide sequencing studies are used to indicate levels of relationships among species within major taxonomic groups



Evidence for Evolution

2. FOSSILS:

- fossil records show how organisms have changed over time (millions of years)



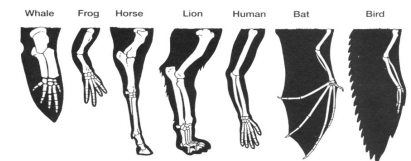
Evidence for Evolution

3. ANATOMICAL STUDIES:

- **Homologous Structures** = Similarities in structure and arrangement—likeness indicates a genetic relationship through a common ancestor.

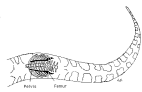


- Ex: Homology among the bones of the forelimb. : Although these structures show considerable differences in form and function, the same basic bones are present in the forelimbs of humans, cats, bats, porpoises, and horses.



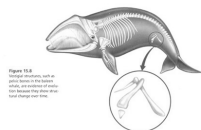
4. FUNCTIONLESS STRUCTURES:

Vestigial structure = any body structure that is reduced in function in a living organism but may have been used in an ancestor.



- Examples:

- pelvis in snakes
- external ears and pelvis in whales



Human Vestigial structures

- appendix - left behind by plant eating ancestor
- ear muscles - move ears toward sound like cats
- nictitating membrane- a third eyelid that is translucent or clear, used as an extra level of safety
- wisdom teeth - ancestor's early diet of leaves, nuts, roots, meats



Evidence for Evolution

5. EMBRYOLOGICAL DEVELOPMENT:

- Development of the phylum- in the embryonic stage it is difficult to distinguish fish, amphibians, reptiles, birds, and mammals.

