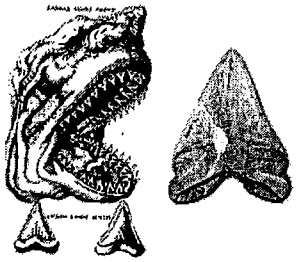
Evidence for Evolution Notes

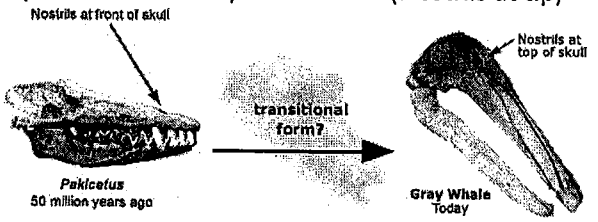
4 Lines of Evidence:



1. **Fossil Evidence**: What can we learn from fossils?
   - -They are a record of past life
   - -They show interactions between organisms
   - -They tell us about growth patterns in ancient organisms

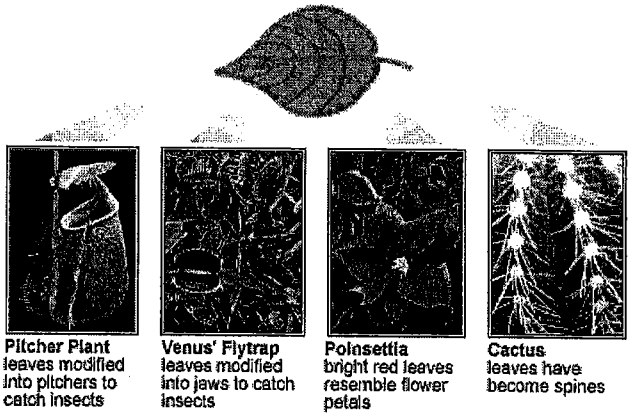
Transitional Forms (Evidence of change over time)
-They show us the intermediate state between an ancestral form and its descendants

eg. Gray Whale (nostrils on top) > Aetiocetus (nostrils in middle) > Pakecetus (Nostrils at tip)
eg. Horses feet > 4 toes to 1 toe

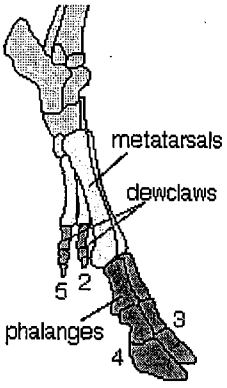


2. **Homologies:** Similar characteristics due to relatedness; can be anatomical, cellular, or embryological

Eg. "Leaves"- different plants have a different shape/function yet all are derived from a common ancestral form and are thus termed homologous structures



Eg. Forelimb of Tetrapods (frog, lizards, rabbit)
–Same bone structure despite differing external appearance and function



A. Anatomical Homologies

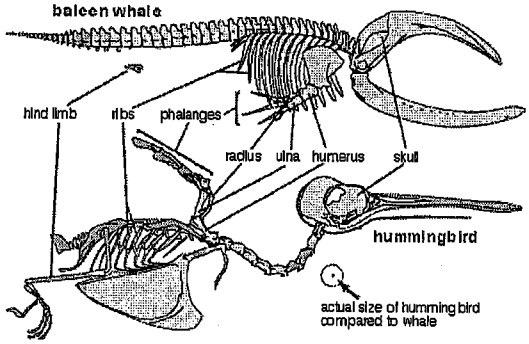
i.) Vestigial Features: a feature an organism inherited but is now less elaborate and functional than in the ancestor, "a remnant of evolution"

eg. –Dew claws of pigs, dogs and deer
-Chest shape-shoulder blade position of humans and apes
- Clawed wings of some birds including chickens and ostriches

Such structures provide evidence that organisms descended from ancestors with those features.

ii.) Comparative Anatomy: Organisms that are closely related share many anatomical similarities.

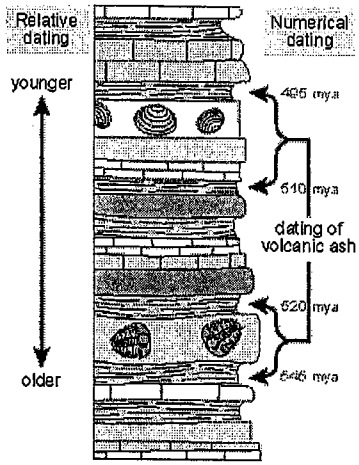
eg. Hummingbird and baleen whale, nearly every bone in each corresponds to an equivalent bone in the other.



B. Developmental Homologies
-Studying embryological development
-During some stages of development organisms can exhibit ancestral features
eg. Snake embryos have "limb-buds"; supports the hypothesis that snakes evolved from a limbed ancestor

C. Cellular and Molecular Homologies
i) Cellular: similarities between animal and plant cell structures and organelles supports the hypothesis that they share a common ancestor
ii) Molecular similarities: All living things contain DNA and vastly different species share similar DNA sequences
eg. Roundworms and humans share 25% of their genes

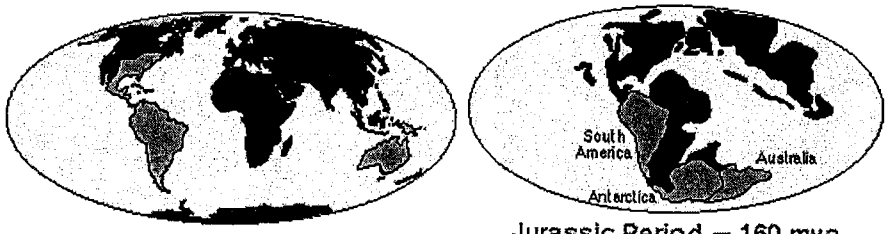
3. **Distribution in Time and Space** (Understanding the age of the Earth and the geological change that has occurred on Earth)



A. Chronology (Age of the Earth and/or Fossils)
Two Methods:
i) Relative dating: placing fossils in chronological order based upon their position in layers of rock, "lower is older"
ii) Radiometric Dating: using the half-life of radioactive elements to determine the exact age of fossils and rocks

B. Geography: The distribution of living things on the globe provides information about their ancestry (as well as information about the history of the Earth)

eg. Marsupials (Kangaroos etc.) are found in Australia, the Americas and New Guinea, this provides clues about where they originated and that those land masses were once connected

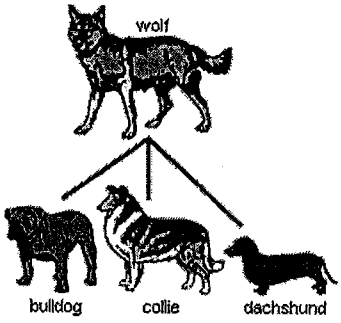


Distribution of marsupials today

Jurassic Period – 160 mya

4. **Evidence by Example**

i) Artificial Selection: Human domestication of species by means of selecting for desired traits, provides a model to help us understand natural selection



ii) Ecology: Observation of populations evolving in response to their environment
eg. Formation of two different species of house sparrow in North America in response to different environmental conditions from a single ancestral species

iii) Experimental Evidence: Conducting experiments to see evolution in action
eg. Presence of predators influences how colorful populations of guppies are

iv) Nested Hierarchies –groups of related organisms share groups of similar characteristic and the number of shared similarities increases with relatedness.