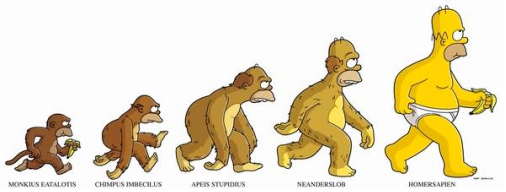
Evidences of Evolution



Directions: Complete the outline below.

I. Age of the Earth:

Approximately 4.5 billion years old

II. First signs of life: were simple bacteria and appeared around 3.5 billion years ago

III. Evidences of Evolution

a. Fossils (preserved remains or impressions, casts of organisms)

i. Media- include ice, tar, amber, shells, bones, sedimentary rock

ii. Determining relative age- fossils found in the bottom layers of undisturbed sedimentary rock are older and less complex than those found in the top layers

b. Comparative Anatomy = studying the structures of organisms such as bones and organs

i. Homologous structures = bones and organs with similar structure but possibly different function

ii. Examples- bones of a bat's wing and a human's arm, also a whale's flipper, cat's forelimb etc.

iii. What they tell us? These homologous structures indicate that the organisms share a common ancestor.

iv. Analogous structures = structures with similar function but different structure (NOT EVIDENCE OF EVOLUTION) * these organisms share parts with similar function due to the fact that they live in similar environments, but they do NOT share a recent common ancestor

v. Examples- flipper of a whale (mammal) and the fin of a shark (fish): both live in water therefore the ability to swim efficiently is an adaptation (whale's flipper contains bones in a similar layout to ours, while the fin of a shark is mainly cartilage)

vi. Vestigial structures = parts that currently serve no function, yet are not harmful so the trait continues to be passed on

vii. Examples – human appendix (possibly used to digest tough plant material), wisdom teeth (possibly used to more efficiently chew tougher foods), tail bone (coccyx) (remnants of our ancestral tail)

c. Comparative Embryology = examining similarities in the embryos (developmental stages prior to birth) between different species

i. What it tells us? The more similar the stages are between two species for the greatest amount of time, the more closely related they are (share a recent common ancestor)

ii. Examples- the embryos of mammals such as chimps, cows and pigs look very similar early on, more so than compared to organisms such as fish

d. Comparative Cytology = examining similarities in cell parts

i. What it tells us? The more cell parts two individuals share in common, the more closely related they are (share a more recent common ancestor)

ii. Examples- Two cells that contain chloroplasts (producers) are more closely related than a cell with chloroplast and a cell without.

e. Comparative Biochemistry = examining similarities of chemicals found in living things

i. What it tells us- the more similar the chemicals are between two individuals, the more closely related they are

ii. Examples- DNA sequences can be compared (the more similar the more closely related), also other chemicals such as certain enzymes and other parts of blood can be examined

*What can we conclude if two organisms share several forms of evidences of evolution?

If two organisms share several forms of evidences of evolution, they most likely share a recent common ancestor.

*Why is it important to use multiple evidences to determine the evolutionary relationship of two or more organisms?

Some evidences such as fossils may be misleading due to damage over time etc. If several evidences, especially chemical indicate a common ancestry, these can help form a more valid conclusion.

*Which type(s) of evidence do you think are most reliable? Explain. Which can be misleading? Explain.

Chemical evidences such as cytology, biochemistry and embryology are most reliable as they are based on DNA. Physical evidence such as bones and other fossils can be misleading due to damage and misinterpretation.