INTRODUCTION TO EVOLUTION

Evolution is change of life through time. It means that one species descends with modification to become a new species. The original species is the ancestor. The new species is the descendant.

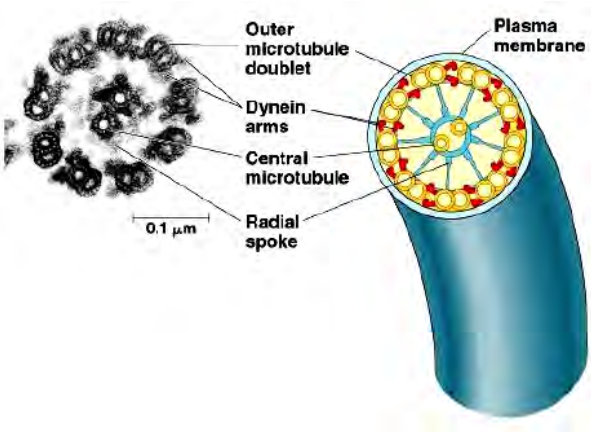
The result is that all species of life on Earth are related, from the most lowly to the most lofty. Some species are more closely related than others, but nevertheless, all species are related. The implication is that life on Earth has but a single origin.

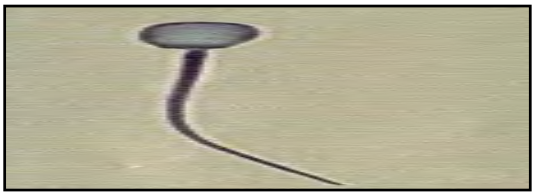
How do we know all species are related? Because, despite individual differences and variation among species, all life is unified in having genetic, molecular, structural, and physiological features in common.

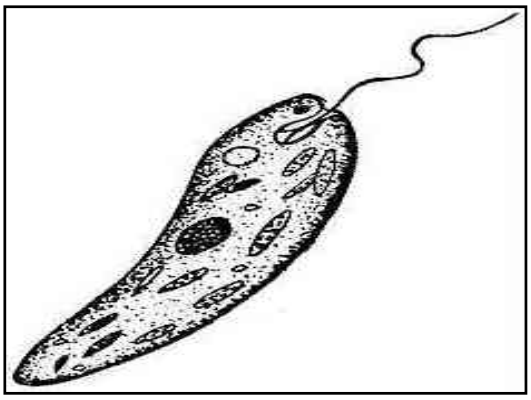
Therefore, because all species are related as demonstrated by their similarities, but all species are different from every other species, the process of evolution (through the origin of a new species from an ancestral species) involves both change and continuity. Change leads to new species. Continuity is reflected in the basic similarities of living organisms.

Examples of continuity:

- uniformity of energy utilization in cells (ATP)
- genetic code (DNA)
- structural continuity (cilia, flagella, and sperm tails of eukaryotes)

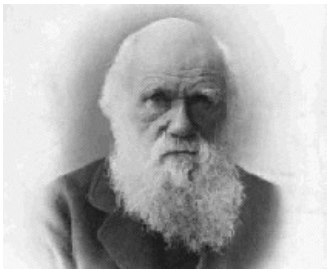






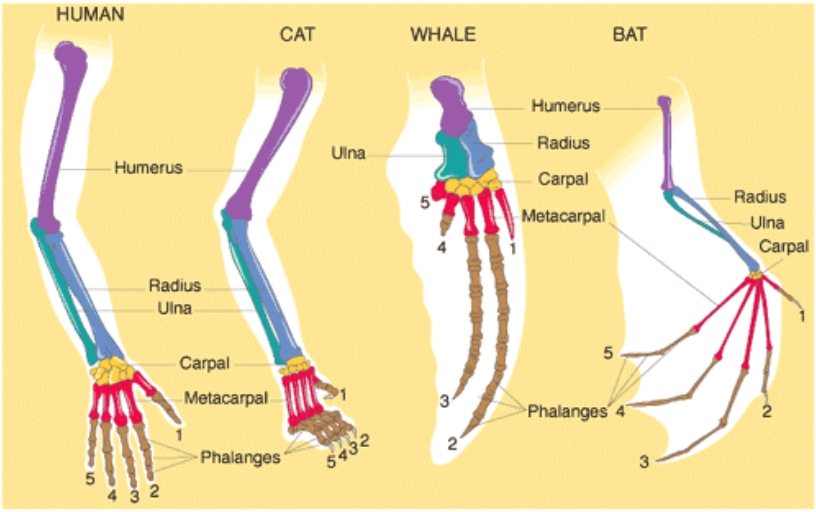
WHAT CHARLES DARWIN DID

In 1859, Charles Darwin published *On the Origin of Species by means of Natural Selection, or the Preservation of Favoured Races in the Struggle for Life*.

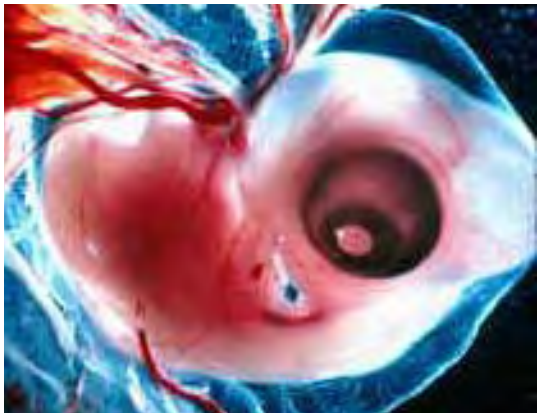


In his book, Darwin documented the fact that evolution occurs using various lines of evidence:

- comparative anatomy



- embryology



- fossil record

- distribution and diversity of living species

- variation and selection in domestic plants and animals

He included humans in his account of evolution.

He proposed natural selection as a mechanism:

1. Individual variation
2. More offspring produced than can survive
3. Only those that survive can reproduce
4. Those that reproduce pass on their characters to the next generation
5. Nature selects for appropriate (adaptive) characters

(Adaptation – a feature or character of an organism shaped by natural selection to play a particular role or fulfill a particular function.)

Charles Darwin's work was hindered because the science of genetics was not advanced enough at the time to explain how characteristic traits and adaptations could be passed on from generation to generation.

Since Darwin's time we have learned:

- Genetic information is carried by DNA contained in cells
- DNA is duplicated in cell division allowing genetic information to be passed from generation to generation
- DNA is organized into chromosomes
- Traits are coded by genes
- Genes are segments of DNA that control specific aspects of molecular biology and are an integral part of the program of heredity
- In sexual reproducing species, the chromosomes of parents are mixed to comprise the genetic composition of the offspring

- Genetically inheritable variation is produced is produced by changes in DNA structure perpetuated when DNA replicates, and from the mixing of chromosomes in sexual reproduction

Natural selection operates on the morphological, physiological, and behavioral variation in individuals that is an expression of their varying genetic make-up.