

Linnaeus' system based only on structural similarities

Today we consider much more

Modern Taxonomy

1-start w/**structural similarities**

2-consider **evolutionary relationships**

analogous structures: structures that have the same function but not evolutionarily related, there are differences in embryological development

ex.- insect wings & bird wings

homologous structures: structures that indicate evolutionary relationship, they are similar in embryological development

ex.- vertebrate forelimbs p. 172

some structures are homologous only:

some structures are analogous only:

some structures both homologous & analogous:

Modern Taxonomy

3-comparative biochemistry

study of proteins, blood, hormones,
enzymes to see how similar they are
chemically

ex.- horseshoe crab

once grouped among other crabs, but
blood showed closer relationship to
spiders, so we changed taxonomy

4-comparative embryology

study of cell division & development from 1
cell----> embryo

certain changes occur at certain stages

ex.- starfish (invertebrate) more closely
related to vertebrates in development
than other invertebrates, so we changed
taxonomy

5-genetics

and kinds of chromosomes

6- molecular analysis of DNA

comparison of DNA of different species

ex.- African vulture vs. American vulture

these have very close structural similarities but there is a behavior difference, when American vulture gets overheated, it urinates on legs to cool off, African vultures don't do this, but storks do

after analysis of DNA, there is closer similarity btw American vulture & stork, so moved taxonomy

same situation w/Giant & red pandas

Taxonomy is Dynamic

History of Taxonomy

1700's Linnaeus 2 kingdoms: Plants & Animals

1800's 3 kingdoms: Microscopic Organisms, Plants, & Animals
what did we develop that allowed us to include microscopic organisms?

1900's 4 kingdoms: Microscopic Organisms, Fungi, Plants & Animals
where were the fungi before? why did we separate them?

1960's 5 kingdoms: Monera, Protista, Fungi, Plantae & Animalia
Now, 2 kingdoms of microscopic organisms
Why?

Kingdom Monera: all bacteria

Kingdom Protista: mostly microscopic life

both kingdoms have microscopic organisms, both are mostly unicellular
so why separate into 2?
fundamental difference between them:
Monerans have no nucleus in cells,
protistans have a nucleus

1990's biochemical analysis showed 2 different bacterial groups

so now, we have 6 kingdoms:
Eubacteria, Archaeobacteria, Protista, Fungi, Plantae, & Animalia

taxonomists also established a category above kingdoms: **Domains**

3 Domains: Bacteria, includes Kingdom **Eubacteria**

Archaea, includes Kingdom **Archeobacteria**

Eukarya, includes K. **Protista, Fungi, Plantae, & Animalia**

Cladistics & Cladograms

a classification scheme that links groups of organisms by showing how they branch off from common ancestors

this type of scheme shows evolutionary relatedness

many scientists today think this is more useful than the Linnaean hierarchical system

clades work by grouping species into larger categories that show lines of descent instead of overall similarities & differences