

Classification



"The incredible diversity of life on this planet, most of which is microbial, can only be understood in an evolutionary framework" -- Carl Woese, 2000

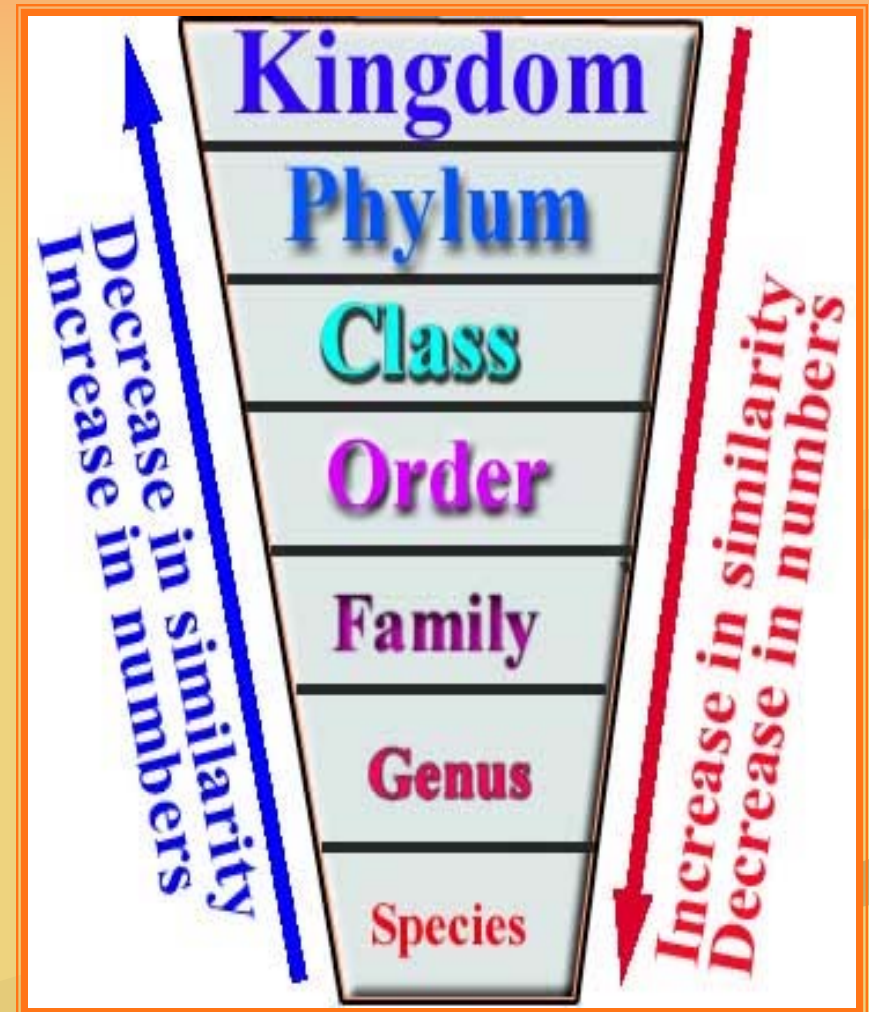
What is Taxonomy?

- ❑ How do we keep track of the some 1.7 million species of living organisms have been discovered?
- ❑ **Taxonomy** is the science dealing with the description, identification, naming, and classification of organisms



Carolus Linnaeus

- ❑ The classification system used today was developed by Swedish botanist Linnaeus in the 1700s.
- ❑ Linnaeus used structural similarities as the basis of his classification system.



Binomial Nomenclature

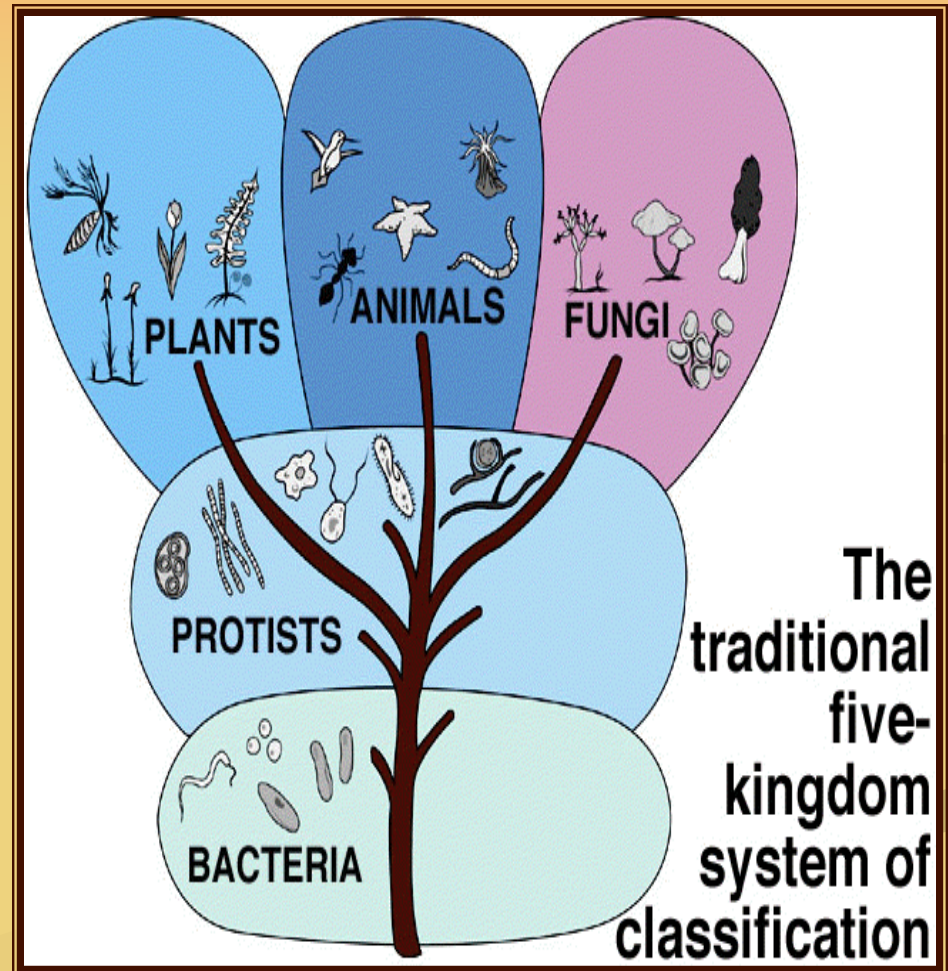
- ❑ In order to identify organisms by a universal name, Linnaeus devised a two name system in which an organism is identified by its **genus** and **species**.
- ❑ For example, *Homo sapiens* is the scientific name for man. The genus is capitalized and the species, sapiens, is lower case.
- ❑ The scientific name of an organism is always italicized or underlined.



Five Kingdom Classification System

□ The five kingdoms, from simplest to most complex are:

- Monera (bacteria)
- Protista
- Fungi
- Plantae
- Animalia



Criteria for Classification

Kingdom Classification:

- ❑ Does the organism have an organized nucleus?
- ❑ Is the organism unicellular or multicellular?
- ❑ How does the organism obtain its food (autotroph or heterotroph)?

Further Classification:

- ❑ Common ancestry
- ❑ Homologous structures
- ❑ Comparative biochemistry
- ❑ Fossil record
- ❑ Comparative embryology

Terminology

□ Prokaryote

- does not have an organized nucleus
- genetic material is dispersed in the cytoplasm
- lacks most other organelles

□ Eukaryote

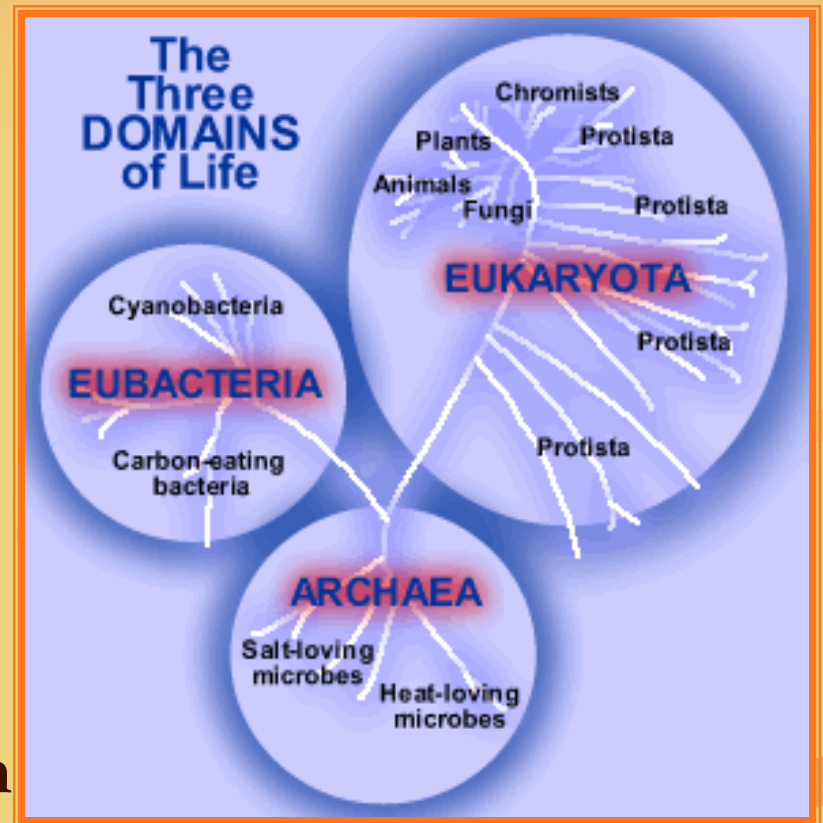
- has a membrane bound nucleus
- has membrane bound organelles

New Discoveries

- ❑ In the 1970s, scientists began to find evidence of an unknown group of microbes that existed in extreme environments.
- ❑ These organisms were found in deep sea hydrothermal vents, hot springs, acid lakes, and very salty environments.
- ❑ Because these microbes were thought to be prokaryotic, they were called archaebacteria (ancient bacteria)
- ❑ Using DNA analysis and other biochemical characteristics that these bacteria were more closely related to eukaryotes than to modern bacteria.

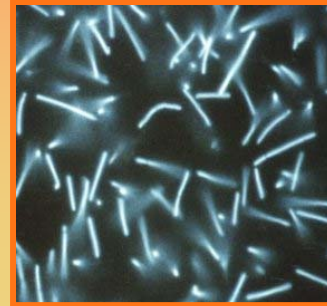
The Three Domains

- By the 1990s, scientists recognized that there were three distinctly different lineages that accurately describe the relationships among living organisms.
- The **superkingdoms** or **domains** were proposed that would encompass the 5 kingdom classification model and as well as the Archaean bacteria.



Archaea

- ❑ **Methanogens:** chemosynthetic (make their own food using inorganic molecules) releasing methane gas. Live in swamps, marshes, guts of cattle and termites.
- ❑ **Halophiles:** live in very salty environments such as the Dead Sea, the Great Salt lake or salt evaporation ponds.
- ❑ **Thermophiles:** live in hot sulfur springs, deep sea hydrothermal vents, in ocean waters around Antarctica, and under the polar ice caps.



Characteristics of Prokaryotes

Archaea

- ❑ No nucleus
- ❑ Ability to live in extreme environments
- ❑ Cell wall and cell membrane
- ❑ DNA in ringlike structure in cytoplasm
- ❑ DNA/RNA more similar to eukaryotes
- ❑ Few organelles

Bacteria (Monera)

- ❑ No nucleus
- ❑ DNA loop in cytoplasm
- ❑ Cell wall and cell membrane
- ❑ Few organelles
- ❑ Have flagella for locomotion

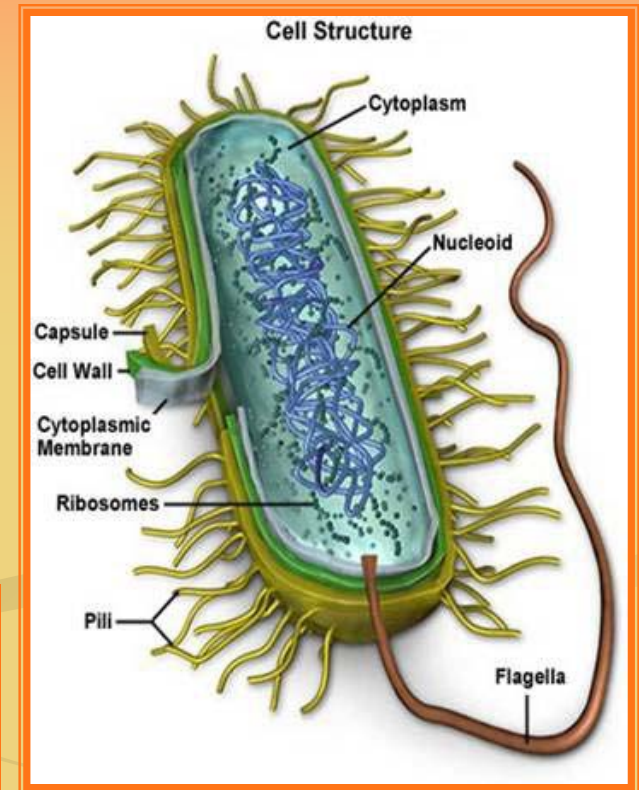
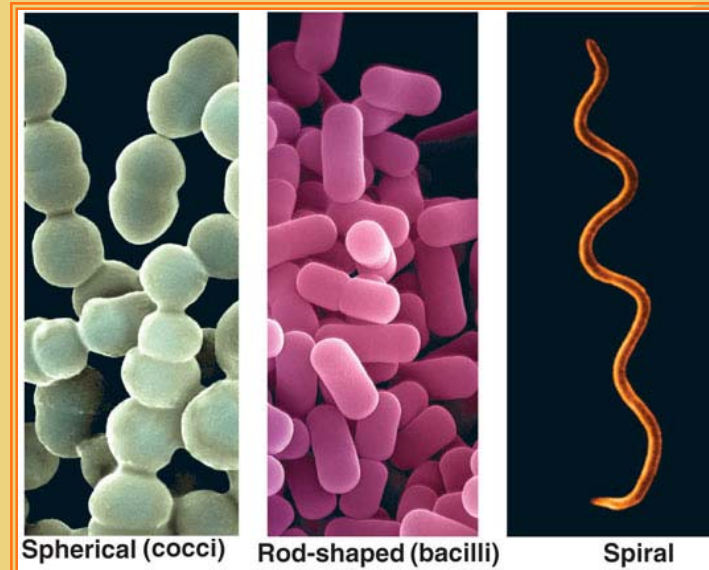
Eukarya

- ❑ Includes Protists, Fungi, Plants, and Animals
- ❑ membrane bound nucleus
- ❑ Organelles to carry on life functions
- ❑ DNA packaged into chromosomes found in nucleus
- ❑ Depending on the kingdom, can be unicellular, multicellular, heterotrophic, or autotrophic.

Monera: Bacteria

- ❑ Includes simple bacteria and blue-green algae.
- ❑ Some bacteria are chemosynthetic (make their own food with inorganic molecules); others heterotrophic

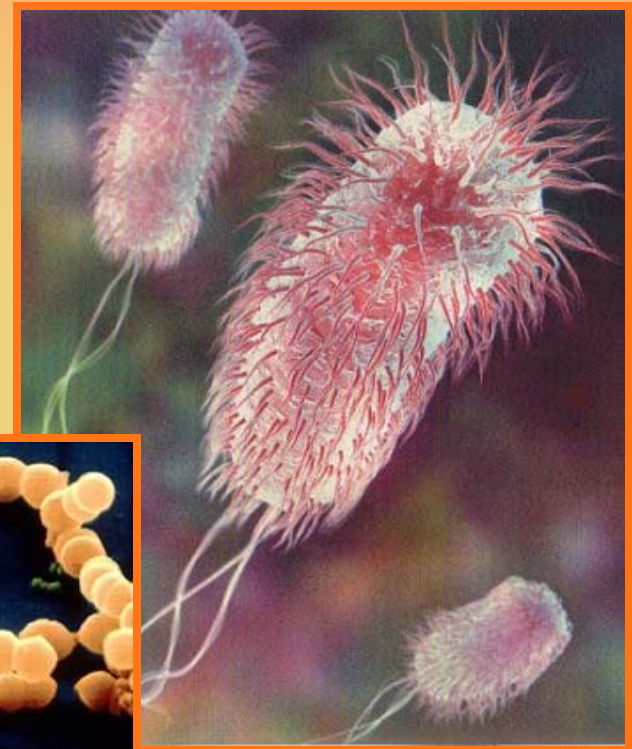
- ❑ Bacteria classified by shape.



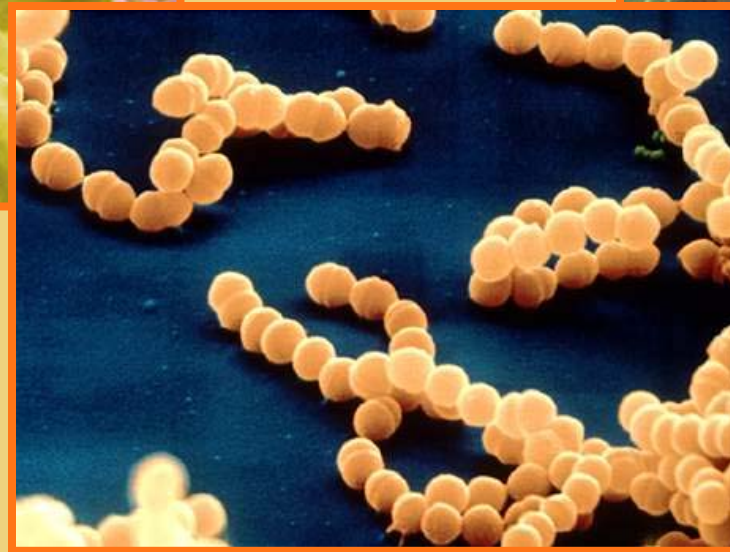
Examples of Bacteria



Samonella



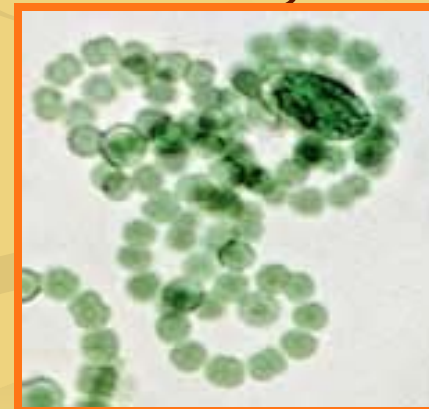
E.coli



Streptococcus

Blue-Green Algae

- ❑ Although called algae, they are actually a type of bacteria known as **cynobacteria**.
- ❑ They are found in rivers, lakes, damp soil, tree trunks, hot springs, and snow.
- ❑ Similar to algae, they are autotrophic and have chlorophyll.
- ❑ They exist as individual cells, in colonies, or in filaments.

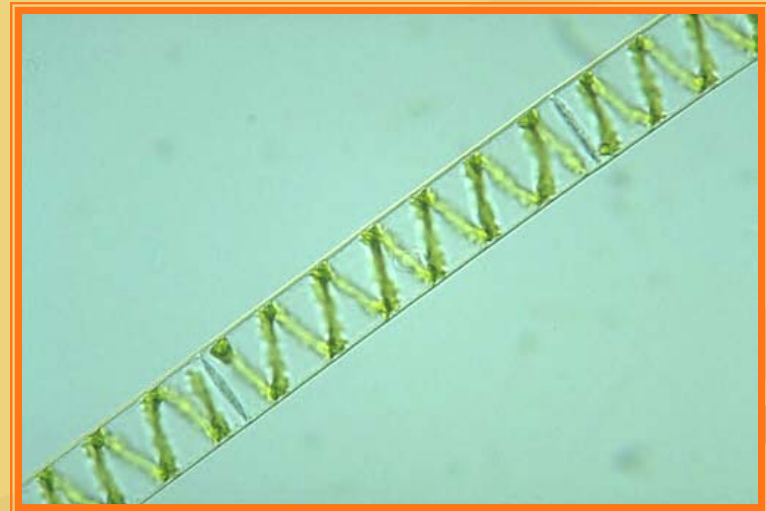


Protists

- ❑ Phyla include Algae, Protozoa, and Euglena
- ❑ Algae are photosynthetic, have cell walls, and chloroplasts



Kelp



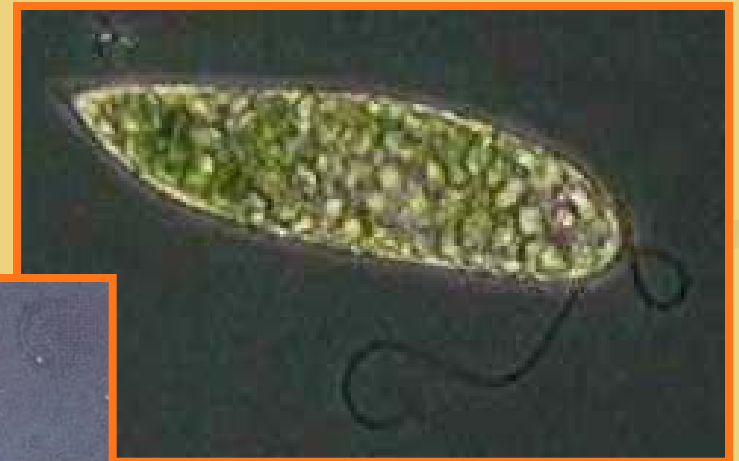
Spirogyra

Protists: Protozoa & Euglena

- ❑ Protozoa are heterotrophic and are classified by method of locomotion.
- ❑ Euglena contain chlorophyll and are photosynthetic



Ameba: pseudopods



Euglena: flagellum



Paramecia: cilia

Fungi

- ❑ Multicellular except for yeast (unicellular)
- ❑ Heterotrophic
- ❑ Extracellular digestion

Athlete's Foot



**Bread
Mold**



Plants

- ❑ **Bryophytes:** no vascular tissue (no true roots, leaves or stems)
-- mosses, liverworts
- ❑ **Tracheophytes:** vascular tissue (xylem and phloem)
-- ferns, conifers, flowering plants



Moss



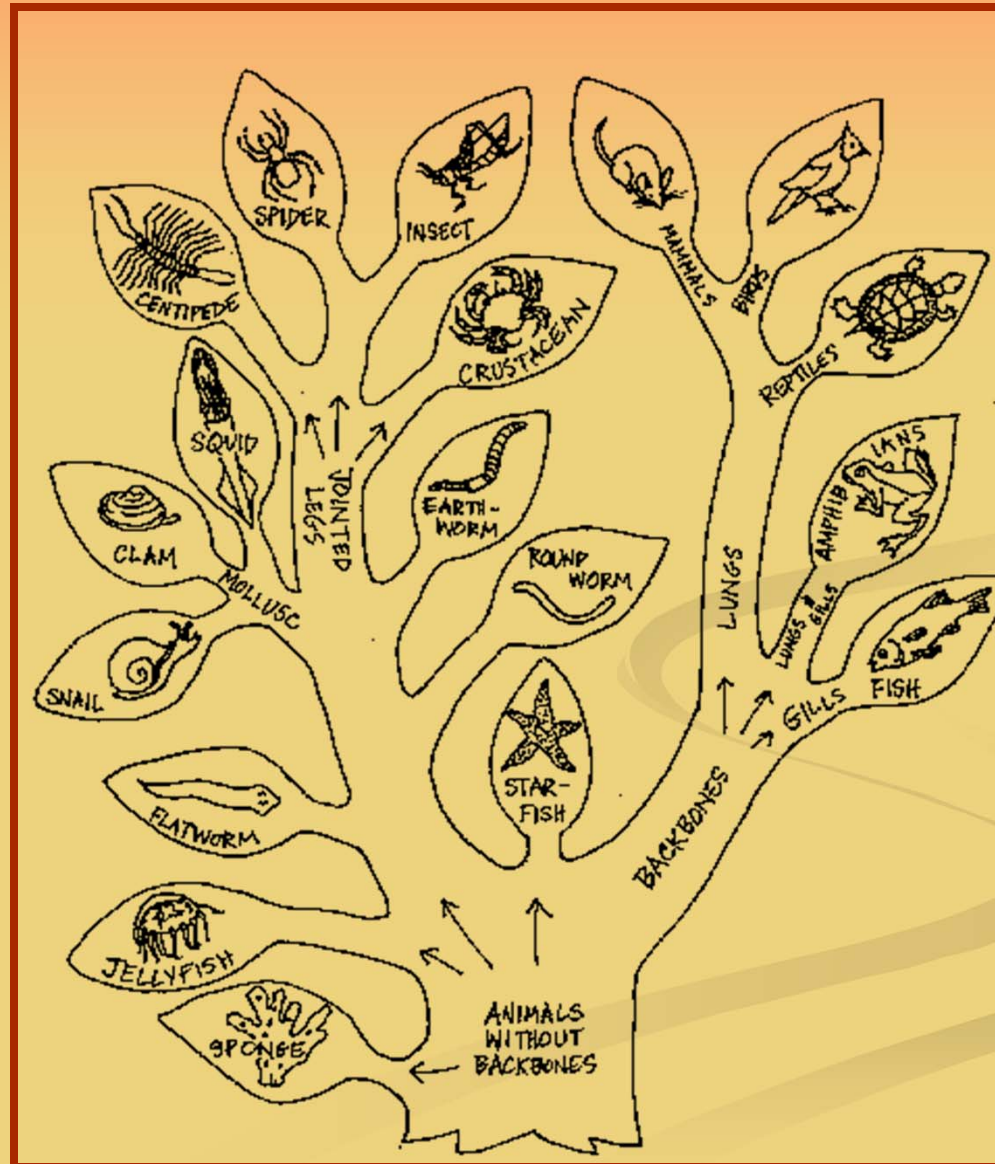
Ferns

Conifers & Flowering Plants



© Roll Hicker

Animals



Animal Phyla

- **Porifera: filter feeders (sponges)**



- **Coelenterates:**
hollow body cavity
with one opening
(hydra, jellyfish)



Hydra

Animal Phyla

- ❑ **Annelids:** worms with segmented bodies, openings at both ends, tube within tube body structure (earthworms, leeches, sandworms)



- ❑ **Arthropods:** segmented body, jointed appendages, exoskeleton (grasshopper, lobster, spider)



Animal Phyla

- **Vertebrates:** animals with true backbones (fish, frogs, snakes, and humans)

Tree Frog



Anaconda



Parrot Fish

Mammals

- ❑ Warmblooded, have hair, produce milk
- ❑ **Monotremes:**
 - have common duct (cloaca) for urination, defecation, and reproductive processes
 - lay eggs, mothers do retain eggs inside bodies for some time and provide eggs with nutrients



Duckbill Platypus

Marsupials

- ❑ Offspring born in an immature state and must make their way into the mother's pouch on the ventral side of body where development will be completed with nourishment from the mother's milk.



Placental Mammals

- ❑ Offspring develop inside female **uterus**, nourished by the **placenta**, an organ made of maternal and fetal tissue.
- ❑ Offspring are born when they are fully developed
- ❑ Infants have the most parental care of any living organisms.



