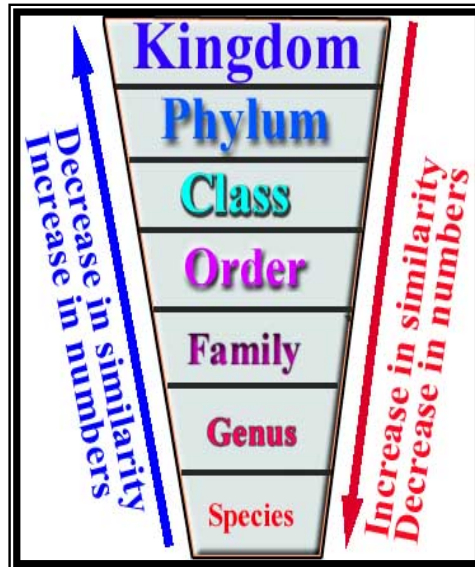


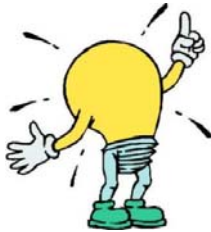
How are Organisms Classified?

History of Classification

- ◆ In order to understand organisms and their interrelationships, biologists class living things according to their common characteristics.
- ◆ The science of classifying living organisms is called **TAXONOMY**.
- ◆ Father of modern system of classification: **Carolus Linnaeus**.
--organized living things into groups, starting kingdoms (organisms with a few common characteristics) to species) organisms with the most common characteristics).



--As you move from kingdom to species, the organisms in each group have more traits in common.



Species: group of organisms that share the most common number of characteristics and are able to mate and produce fertile offspring!

--In order to identify organisms by a universal name, Linnaeus devised a naming system called **binomial nomenclature**, a two named system where every species is named by its **genus and species**.

Example: Homo sapiens: this is our scientific name. Note that the genus, ***Homo***, is capitalized and the species, ***sapiens***, is lower case. The scientific name of any organisms is either italicized or underlined.

-- Linnaeus originally separated organisms into 2 kingdoms, **Plants and Animals**, which scientists continued to use until 1969.

- ◆ The five kingdom classification system was introduced in the 1960s and was the most common way to classify living things until the 1990s.
--Criteria for classifying organisms into 5 distinct kingdoms included:

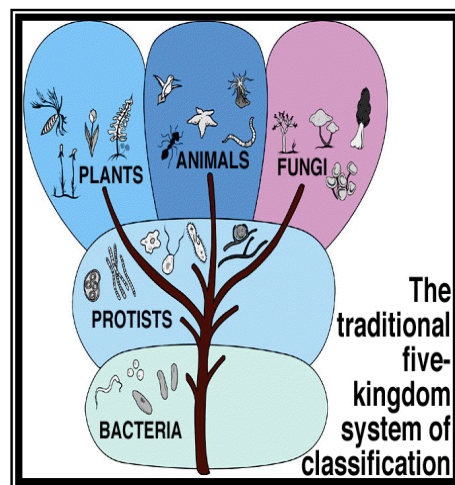
Characteristics used to Classify into Kingdoms?

- ✓ Does the organism have an organized nucleus?
- ✓ Is the organism unicellular or multicellular?
- ✓ Is the organism autotrophic or heterotrophic?

Common Characteristics used for Further Classification:

- ✓ Comparative Embrology
- ✓ Homologous structures
- ✓ Comparative Cytology
- ✓ Comparative Biochemsitry
- ✓ Fossil Record

Five Kingdom Classification System



Terminology:



Prokaryote: cells that:

- do not have an organized nucleus
- genetic material is dispersed in the cytoplasm
- lacks most other organelles
- includes Monerans &, Achaeans (most primitive bacteria)

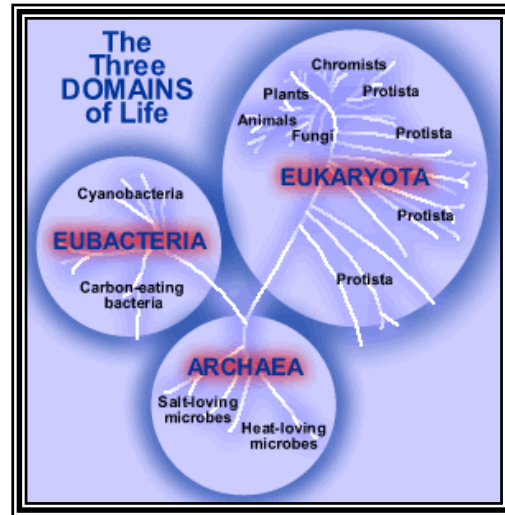
Eukaryote: cells that:

- have a membrane bound nucleus
- have membrane bound organelles
- includes protests, fungi, plants, animals

New Discoveries

- ◆ In the 1970s, began to find evidence of an unknown group of microbes that existed in extreme environments.
- ◆ These tiny single celled organisms were found in deep sea hydrothermal vents, hot springs, acid lakes, and very salty environments.

- ◆ Because these microbes were thought to have no organized nucleus, they were called **Archaeobacteria** (ancient bacteria)
- ◆ Using DNA analysis and other biochemical characteristics that these bacteria were more closely related to eukaryotes than to modern bacteria and are now officially called **Achaea**.
- ◆ 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.

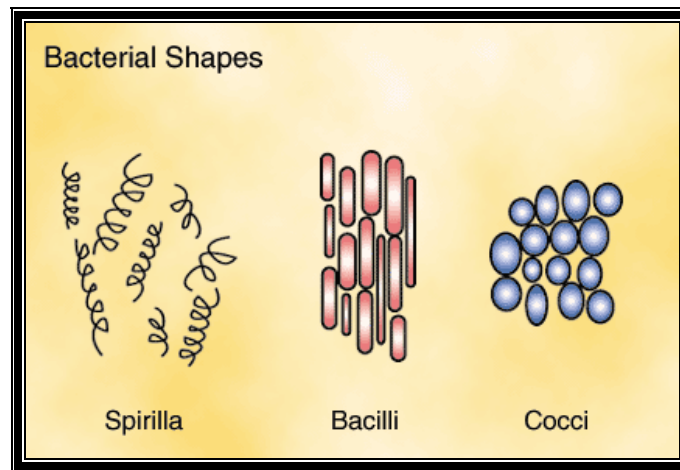


Domain: Archaea

- ◆ **Characteristics include:**
 - 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

Domain: Eubacteria

- ◆ **Characteristics include:**
 - prokaryotic
 - DNA arranged in a ring in the cytoplasm of cell
 - few organelles, enzymes for life functions found in the cytoplasm of the cell
- ◆ **Phylum: *Bacteria***
 - classified by shape: spirella, cocci, rod-like
 - Examples include: *Salmonella*, *Streptococcus*, and *E. coli*



◆ **Phylum: *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.

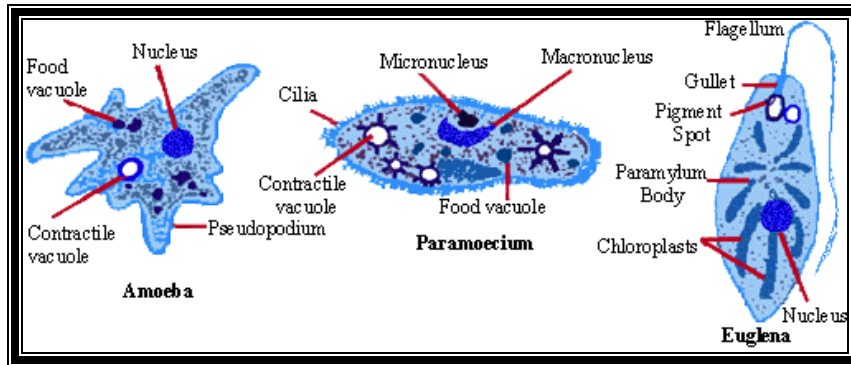
Domain: *Eukaryota*

- ◆ Eukaryotic
- ◆ Possess most organelles
- ◆ DNA packaged into chromosomes and found in nucleus
- ◆ Contains the kingdoms Protists, Fungi, Plants, and Animals

◆ **Kingdom: *Protists***

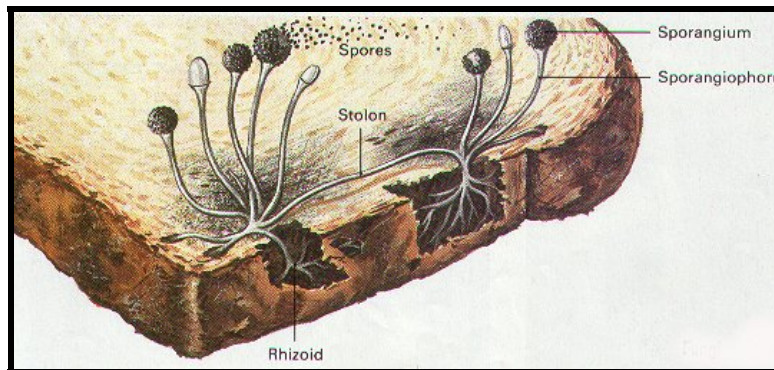
- unicellular
- eukaryotic
- heterotrophic or autotrophic
 - ✓ **Phylum: *Algae***
 - unicellular, can exist in colonies
 - autotrophic
 - cells have cell walls and chloroplasts
 - Kelp, Spirogyra, green, red, & brown algae
 - ✓ **Phylum: *Protozoa***
 - unicellular, eukaryotic, and heterotrophic
 - classified by method of locomotion
 - Ameba (pseudopods)
 - Paramecium (cilia)
 - ✓ **Phylum: *Euglena***
 - contain chlorophyll
 - are autotrophic but can be heterotrophic if there is no sunlight
 - have a pigment spot that "senses light", moving the euglena toward or away from the light

PROTISTS



Kingdom: *Fungi*

- ◆ Multicellular except for yeast (unicellular)
- ◆ Heterotrophic
- ◆ Extracellular digestion (absorb digested nutrients from the environment)
- ◆ Multinucleated structure
- ◆ Examples: mushrooms, ringworm, athlete's foot, bread mold



Please see handouts for classification summary of the Plant and Animal Kingdoms!

Classification Questions

1. What is the value of classifying organisms into categories?
2. Describe the difference between a kingdom and a species.
3. Discuss the importance of Linnaeus' work to current classification systems.
4. **King Phylo Came Over For Greek Salad** is a mnemonic that helps you to remember the categories from Kingdom to species. List all the groups that make up the current classification system.
5. What does binomial nomenclature have to do with classification?
6. The bobcat was once classified in the same genus *Felis* along with the domestic cat. Now the bobcat genus has been changed to *Lynx*. What inferences can you make about this change?
7. Distinguish between a prokaryotic and eukaryotic cell.
8. How are organisms initially classified into 5 kingdoms?
9. What other characteristics are important in classifying organisms into smaller groups?
10. Why did scientists decide to add three domains above the 5 kingdom classification system?

11. Compare bacteria and archaeans (remember: compare means similarities and differences).
12. Why is blue green algae classified in the Moneran kingdom?
13. Describe the major characteristics of Protists.
14. How do organisms in the Algae phylum differ from those in the Protozoa phylum?
15. Hypothesize why Fungi is a separate kingdom from Plants.
16. How do bryophytes differ from tracheophytes?
17. Trees are usually identified by the characteristics of their leaves. Suggest three ways deciduous trees can be identified during the wintertime when they have shed their leaves.
18. Devise a system of classifying different kinds of shoes that you have in your closet or in your home (you must include at least 10 pairs of shoes in this diagram). Using their common and differing characteristics, develop a classification tree to group and regroup shoes as shown below.

