6 Kingdoms of Life
As living things are constantly being investigated, new attributes are revealed that affect how organisms are placed in a standard classification system.
The grouping of organisms into KINGDOMS is based on 3 factors:

- 1. Cell Type (prokaryotic or eukaryotic)
- 2. Cell Number (unicellular or multicellular)
- 3. Feeding Type (autotroph or heterotroph)
1. **Cell Type** - The presence or absence of cellular structures such as the nucleus, mitochondria, or a cell wall

**Prokaryotes or Eukaryotes**
Prokaryotes – Bacteria!

• DO NOT HAVE:
  ◦ An organized nucleus
  ◦ Structured organelles
Prokaryotes – Typical Bacteria

Basic Structure

- **DNA** – strands floating in cytoplasm/small rings called plasmids
- **Ribosomes** – RNA/protein synthesis sites
- **Cytoplasm** – water based
- **Cell membrane & Wall**
A Typical Prokaryote Cell

- Cytoplasm
- Ribosomes
- DNA
- Cell Membrane
- Cell Wall
Eukaryotes

- DO HAVE:
  - Nucleus organized with a membrane
  - other organelles
A Typical Eukaryote Cell

- Nucleus
- DNA
- Cytoplasm
- Ribosomes
- Golgi Body
- Cell Membrane
- Mitochondria
- Cell Wall
2nd criteria for Kingdom Divisions:
Cell Number

◊ Unicellular—single celled organism—protozoans, bacteria, some algae

◊ Multicellular—many celled organism—cells start to specialize/differentiate
Unicellular  Multicellular
3rd Criteria for Kingdom Divisions

Feeding Type - How the organisms get their food

- Autotroph or Producer
  Make their own food

- Heterotroph or Consumer
  Must eat other organisms to survive
  Includes decomposers – those that eat dead matter!
There used to be only 5 kingdoms

1. Moneran
   This kingdom has now been divided into 2 – archaebacteria & eubacteria

2. Protista
3. Fungi
4. Plantae
5. Animalia
6 Kingdoms

- Archaebacteria
- Eubacteria
- Protista
- Fungi
- Plantae
- Animalia

Prokaryotes

Eukaryotes
<table>
<thead>
<tr>
<th>Kingdom</th>
<th>Cell Type</th>
<th>Cell #</th>
<th>Feeding Type</th>
<th>Cell Wall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Archaebacteria</td>
<td>Prokaryote</td>
<td>Unicellular</td>
<td>Autotroph</td>
<td>Yes</td>
</tr>
<tr>
<td>Eubacteria</td>
<td>Prokaryote</td>
<td>Unicellular</td>
<td>Both</td>
<td>Yes</td>
</tr>
<tr>
<td>Protista</td>
<td>Eukaryote</td>
<td>Most Unicellular</td>
<td>Both</td>
<td>Yes &amp; NO</td>
</tr>
<tr>
<td>Fungi</td>
<td>Eukaryote</td>
<td>both</td>
<td>Heterotroph</td>
<td>Yes</td>
</tr>
<tr>
<td>Plantae</td>
<td>Eukaryote</td>
<td>Multicellular</td>
<td>Autotroph</td>
<td>Yes</td>
</tr>
<tr>
<td>Animalia</td>
<td>Eukaryote</td>
<td>Multicellular</td>
<td>Heterotroph</td>
<td>NO</td>
</tr>
</tbody>
</table>
Archaebacteria

- Ancient bacteria-
  - Live in very harsh environments
  - extremophiles
Eubacteria

- It is the eubacteria that most people are talking about when they say bacteria, because they live in more neutral conditions.
Bacteria

- Bacteria are unicellular prokaryotes
Bacterial Shapes

- Bacteria come in 3 main shapes
  - Rod or Stick (bacilli)
  - Sphere (cocci)
  - Helical or spiral (borrelia)
Bacterial Locomotion

- Some bacteria have flagella or cilia for movement
- Some secrete a slime layer and ooze over surfaces like slugs
Bacterial Nutrition

- Some bacteria are autotrophs and can photosynthesize
- Some bacteria are heterotrophs
Protists

- Protists include many widely ranging microbes, including slime molds, protozoa and primitive algae.

Odds & Ends Kingdom
Protista Kingdom

- There are animal-like, fungus-like, and plant-like protists

- Some are beneficial

- Some protists can cause diseases in humans, such as:
<table>
<thead>
<tr>
<th>Disease</th>
<th>Protist</th>
<th>Vector (carrier)</th>
<th>Symptoms</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amebic dysentery</td>
<td><em>Ameba histolytica</em></td>
<td>water</td>
<td>diarrhea</td>
<td>can get from tap water in some places</td>
</tr>
<tr>
<td>Giardaisis (beaver fever)</td>
<td><em>Giardia</em></td>
<td>water</td>
<td>diarrhea, vomiting</td>
<td>don't drink water from streams</td>
</tr>
<tr>
<td>African Sleeping Sickness</td>
<td><em>Trypanosoma</em></td>
<td>Tse tse fly</td>
<td>uncontrolled sleepiness, confusion</td>
<td>Only found in isolated areas lives in blood</td>
</tr>
<tr>
<td>Malaria</td>
<td><em>Plasmodium</em></td>
<td><em>Anopheles</em> mosquito</td>
<td>fever, chills, death</td>
<td>can be treated with quinine lives in blood results in millions deaths per year</td>
</tr>
<tr>
<td>Toxoplasmosis</td>
<td><em>Toxoplasma</em></td>
<td>cats</td>
<td>fetal death or brain damage</td>
<td>pregnant women should avoid cat litter</td>
</tr>
</tbody>
</table>
Protists Disease

- Amebic dysentery

*Ameba histolytica*
Protists Disease

- Giardiasis (beaver fever)
Protists Disease

- African Sleeping Sickness

*Trypanosoma*
Protists Disease

- Malaria

Plasmodium
Protists Disease

- Toxoplasmosis

Toxoplasma
Protists Locomotion

3 types of movement:
- Pseudopod (false foot)
- Flagella/cilia
- Contractile vacuoles
Protists Nutrition

- Protists can be autotrophs or heterotrophs
The Kingdom Fungi includes some of the most important organisms. By breaking down dead organic material, they continue the cycle of nutrients through ecosystems.
All fungi are eukaryotic.

They may be unicellular or multicellular.

All fungi have a cell wall.
Fungi

- Fungi can be very helpful and delicious
- Many antibacterial drugs are derived from fungi
Fungi

- Fungi also causes a number of plant and animal diseases:
  - Athlete’s Foot
Fungi

- Ringworm
Fungi Locomotion

- Fungi are stationary
- They have root-like structures that they use for attachment
Fungi Nutrition

- All fungi are heterotrophs
  - Saprophytes — get their nutrients from dead organic matter
  - Mutualists — live symbiotically
  - Parasites — absorb from a host, eventually killing the host
Plant Kingdom

- All plants are multicellular, their cells having a cell wall, and...
- They are autotrophs
4 important plant groups are the:

- **Non-vascular**
  - Mosses (Bryophytes)
  - Conifers (Gymnosperms)

- **Vascular**
  - Ferns (Pteridophytes)
  - Flowering Plants (Angiosperms)
• Nonvascular Plants - Mosses

- the simplest of all land dwelling plants
- lack an internal means for water transportation
- do not produce seeds or flowers
  - fertilization depends on water medium to get the sperm to the egg.
- lack a woody tissue necessary for support around their “stems” and so are usually relatively short
Mosses
Liverworts & Hornworts
• Vascular Plants

- Internal transportation System
  - Xylem – water carrying tubes
  - Phloem – sugar carrying tissues
  - enables plants to evolve into larger specimens.

- Produce Seeds – protects and nourishes an Embryo of the new plant
Gymnosperms

- Conifers (pine cones)
- Oldest vascular plants
Angiosperms
- flowering plants
Animalia Kingdom

All animals are:

- Multicellular: cells lacking a cell wall
- Heterotrophs
- Capable of movement at some point in their lives.
1. **Asymmetrical**

Asymmetrical animals (sponges) have no general body plan or axis of symmetry that divides the body into mirror-image halves.
2. **Radial Symmetry**

   Animals (such as coral and jelly fish) have body parts organized about a central axis and tend to be cylindrical in shape.
3. **Bilateral Symmetry**

Bilaterally symmetrical animals (such as humans and fish) have only a single plane of symmetry that produces mirror halves.
2nd Criteria for Animal Classification

• Skeletal Characteristics
  – Invertebrates
    have a **hard external skeleton** made of **chitin**
    known as an exoskeleton
  – Vertebrates
    have a **hard internal skeleton** made of **bone**
    or **cartilage**
♦ Kingdom
   - Phylum  
     ♦ Subphylum
     - Class
       » Order
       » Family
       » Genus
       » species

Major phylums of animals are...
Porifera: sponges
Cnidarians: Jellyfish, corals, and other stingers. . . Their stinger is called a nematocyst
Nematocyst

Operculum

Barbs

Thread

Capsule

nematocyst coiled prior to release

nematocyst released to capture copepod

The stinging cells (nematocyst) found in coral tentacles in coiled and released positions.
Another Cnidarian – the Hydra

- Hydra can reproduce asexually by “budding”
- A “bud” is a CLONE of its parent
Mollusks
- Octopi, squid
Mollusks

- Clams, oysters
Mollusks

- Snails, slugs
Platyhelminthes (flat worms)
- Tapeworms & Liver Fluke & Planaria

Human liver fluke
Flatworms – PLANARIA

- Hermaphrodites
  - fertilize their own sex cells internally
  - zygotes are released into water to hatch

– Planaria – capable of regeneration
  being studied to understand stem cells ability to differentiate.
• **Annelids (segmented worms)**
  - Worms & leeches
Echinoderms

- Starfish, sea urchins, sea cucumbers
◊ Arthropods
   - Shell fish, arachnids & BUGS!
Phylum: Chordates

- The Chordata is the animal phylum with which everyone is most familiar

Subphylum: Vertebrates (backbone)
- Bilateral symmetry
- Endoskeletons
- Closed circulatory systems
- Nervous systems with complex brains
- Efficient respiratory systems
Phylum: Chordates
Viruses

- Viruses do not share many of the characteristics of living organisms.
Viruses can reproduce only inside a living cell, the host cell.
Viruses

The viral reproductive process includes the following steps:

1. A virus must insert its genetic material into the host cell.
2. The viral genetic material takes control of the host cell and uses it to produce viruses.
3. The newly formed viruses are released from the host cell.
Virus Vectors

Viruses are transmitted through vectors, such as:

- Airborne
  - Influenza
  - Common cold
Virus Vectors

- Contaminated food or water
  - Hepatitis
Virus Vectors

- Infected animal bite
  - West Nile
  - Rabies
  - Avian influenza (bird flu)
  - Ebola
Virus Treatment

- Viruses cannot be treated with antibiotics.

- There are some anti-viral drugs available.

- You generally have to wait for the virus to run its course and let your immune system fight it off.