Your goal during this lab is to observe and identify the taxa on display in lab. You will observe organisms from three of the eight major eukaryotic clades: Plantae, Ophistokonta, and Amoebozoa (Figure 1).

**Figure 1 (29.8, 2E 28.7 from text).** The Eukaryotic phylogenetic tree, illustrating the eight major clades. Groups included in this lab are indicated with a star.

**Unikonta (single flagellum)**
- Amoebozoa
  - Plasmodial slime molds*
  - Lobose amoebae*
  - Opishokonta (rear flagellum)
  - Fungi*
    - Zygomycota
    - Ascomycota
    - Basidiomycota
  - Animals*

**Plantae**
- Red algae*
- Green algae*
- Land plants*
  - Bryophytes
  - Ferns
  - Gymnosperms
  - Angiosperms

---

**Goals**
- Identify specific representatives of the Unikonta and Plantae.
- Relate these representatives to one another by organizing them into clades.
- List characteristics that define different clades.
- Create a phylogenetic tree of the clades from the lab, and map important characteristics onto it.
You are responsible for all of the lineages in the list above. Below, redraw the phylogenetic tree in Figure 1 to include only the starred lineages:

As you move around the room and learn more about these organisms, map characteristics onto the phylogenetic tree that you drew and fill in the table above. Take notes and draw pictures so that you will be able to remember the organism on the lab quiz and exam.

**Table 1.** Comparison of characteristics of different major eukaryotic clades. **Note:** you are also responsible for the different types of land plants & fungi, although they are not listed here.

<table>
<thead>
<tr>
<th>Clade</th>
<th>Carbon source (feeding?)</th>
<th>Flagella</th>
<th>Reproduction</th>
<th>Other unique features</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Unikonta</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amoebozoa</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Opisthokonta</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Fungi</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Animals</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Plantae</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Red algae</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Green algae</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Land plants</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Clade Amoebozoa includes organisms that lack cell walls. The organisms move by extending large lobes (pseudopodia) outward into their environments using their cytoskeletons. They are related to the Opisthokonts by common genetic sequences (molecular synapomorphies). You will investigate two Amoebozoans today in lab.

1. Plasmodial slime mold

   Drawing:  
   Notes:  

2. Lobose amoebae

   Drawing:  
   Notes:  

List 2 characteristics that are shared amongst all the Amoebozoa:

1. 

2. 
**Clade Opisthokonta** includes organisms with flat mitochondrial cristae (other lineages have tube- or disk-shaped cristae). Reproductive cells possess a single rear flagellum, if any.

**Fungi** can be either single-celled or composed of large, multicellular networks of hyphae. Most fungi reproduce by zygotic meiosis and feed by absorption. They share with animals many common genetic sequences, along with the ability to produce chitin (found in cell walls). Both animals and fungi use glycogen as their storage polysaccharide. Finally, some fungi (chytrids – not studied here) have rear flagella like animals. In contrast to animals, most fungi are non-motile, leading early biologists to incorrectly think them more closely related to plants.

Figure 2 illustrates the relationship between the 3 different fungal groups we will study in lab: Zygomycota, Basidiomycota, and Ascomycota. Notice that these groups are categorized based upon their different spore-producing structures.

**Figure 2.** (31.9, 2E 30.8 in text). Relationships between different fungal groups. You are only responsible for Zygomycota, Basidiomycota, and Ascomycota.

1. Zygomycota (*Rhizopus* bread mold prepared slide – locate and draw zygosporangia)

   **Drawing:**
   
   **Notes:**
2. Ascomycota (*Peziza* cup fungus prepared slide – locate and draw asci)

Drawing: 

Notes:

3. Yeast (Ascomycota – make a wet mount of live yeast)

Drawing: 

Notes:

4. Basidiomycota (*Coprinus* specimen & prepared slide – locate and draw basidia)

Drawing: 

Notes:
Animals are generally motile, multicellular organisms that feed by ingestion. Most animals have gametic meiosis, in which the only haploid cells are the unicellular gametes. Most animals have a cell with a single rear flagellum at some stage of their life cycle. Because animals will be a focus later in the course, you will only observe one example of an animal today. The hydra is a primitive lineage that has only two tissue types: **ectoderm** (outer tissue layer), and **endoderm** (the internal digestive tissue layer).

1. *Hydra* prepared slide

<table>
<thead>
<tr>
<th>Drawing:</th>
<th>Notes:</th>
</tr>
</thead>
</table>

List 2 characteristics that are shared amongst all the Opisthokonts:
1. 
2. 

Don’t forget to fill in your observations and data about the Unikonta, and subclades Amoebozoa, Opisthokonta, Animals, and Fungi into Table 1, and map the characteristics onto the phylogenetic tree that you drew.

**Supergroup Plantae**

The Plantae are all direct descendants of the primary endosymbiotic event that led to the evolution of chloroplasts. This ancestry means that their chloroplasts are bound by only two membranes (secondarily endosymbiotic lineages have more chloroplast membranes). In addition, Plantae all store their carbohydrates as **starch**.

As you go through the lab, map important evolutionary innovations onto the phylogenetic tree above. Include the following: chlorophyll b, stomata, seeds, flowers, pollen, and vascular tissue. Also label the brackets with a clade descriptor (seed plants, vascular plants, and land plants).
Red algae (*Callithamnion* wet mount and preserved specimens)

**Drawing:**

**Characteristics:**

Green algae (Mixed algae wet mount, *Volvox* wet mount without cover slip)

**Mixed algae drawing:**

**Characteristics:**

**Volvox** drawing:  

**Characteristics:**

**Land plants** are the first Plantae lineages that were able to survive on land. All land plants have a life cycle with alternation of generations. The evolution of more advanced adaptations for life on land, such as spores, stomata, vascular tissue (xylem and phloem), seeds, and flowers, are hallmarks of land plant evolution. Be sure to note when these features first evolved as you observe the different land plant groups.

Bryophytes (Liverwort *Marchantia* and unknown mosses – live specimens)

**Drawings:**

**Characteristics:**
Fill in your observations and data about the Plantae into Table 1 and map the characteristics onto both your initial, general phylogenetic tree, and the specific Plantae tree.

Table 2. Fill in this table about the land plants. Place an X when the group possesses the characteristic, and note whether it uses a seed or spore to reproduce.

<table>
<thead>
<tr>
<th></th>
<th>Stomata</th>
<th>Xylem</th>
<th>Dispersal structure (seed or spore)</th>
<th>Pollen</th>
<th>Flowers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bryophytes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ferns</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gymnosperms</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Angiosperms</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

List 2 characteristics that are shared amongst all the Plantae:
1. 
2. 

**Important vocabulary terms**

- Pseudopodia
- Plasmodium
- Cristae
- Chitin
- Glycogen
- Hyphae
- Zygosporangium
- Ascus
- Basidium
- Absorption
- Ingestion

- Endosymbiosis
- Starch
- Chlorophyll b
- Asexual
- Spore
- Seed
- Flower
- Vascular tissue
- Stomata
- Pollen
- Sexual