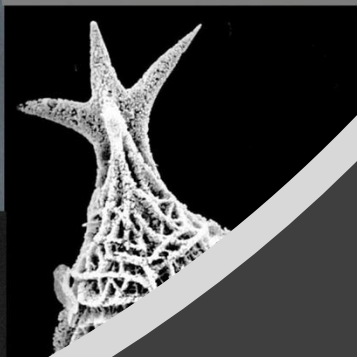
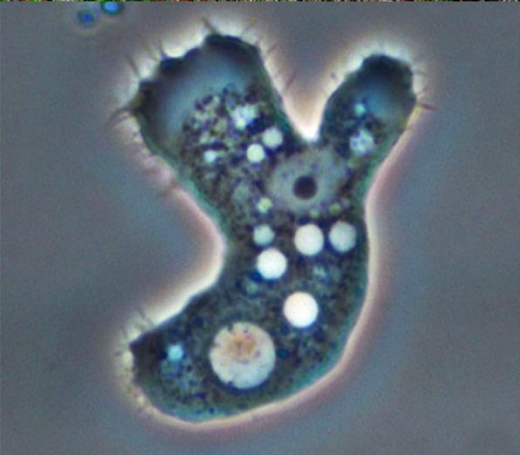
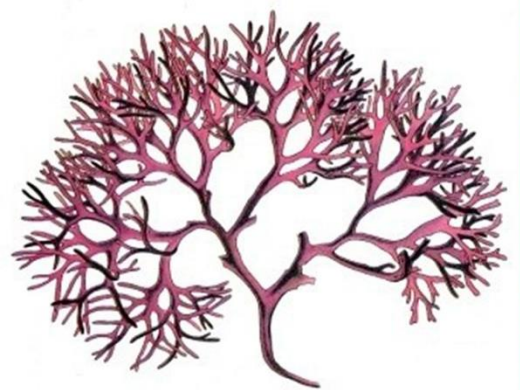


Virtual Laboratory 6 - The Perplexing World of That Which Was Formerly Known as 'Protist'

BIO 80

Supergroup Excavata

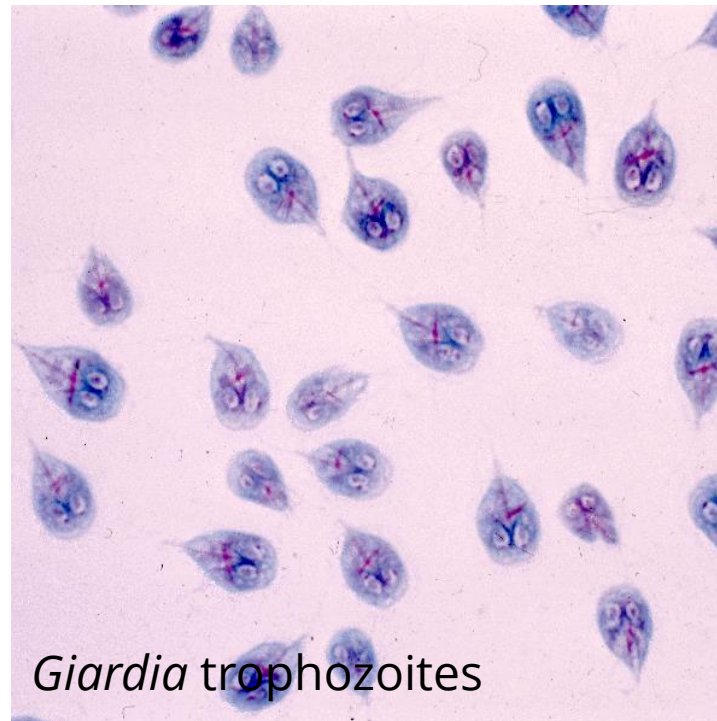
This supergroup is unique in their lack of conventional mitochondria. In fact, the mitochondria they do possess are so unusual and therefore unrecognizable that biologists first believed they lack mitochondria all together. They were referred to as 'amitochondriates'. The flagella of excavates is also unlike that found in other groups. Generally, three groups are recognized: **diplomonads**, **parabasalids**, and **euglenozoans**. Many possess a slot-like feeding groove that runs along the side of the cell.



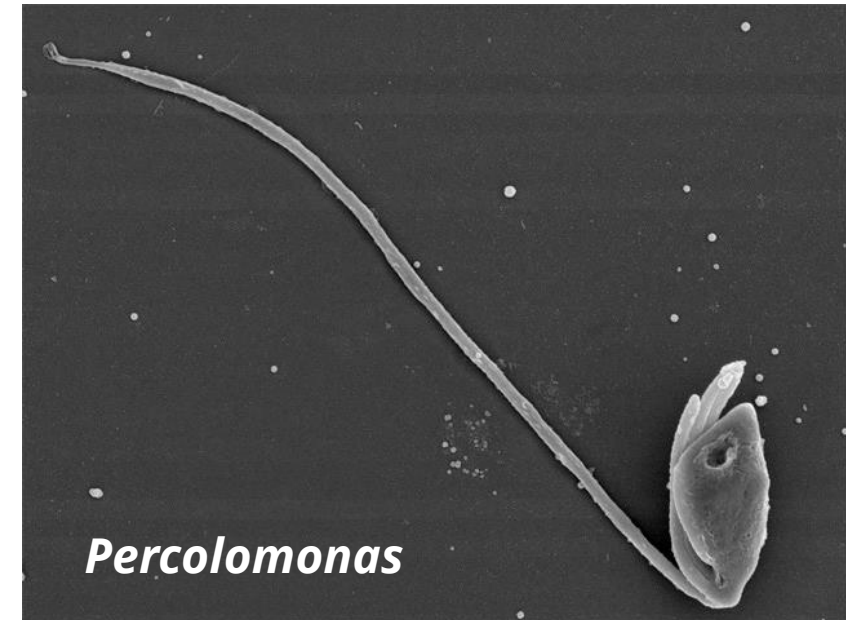
Trypanosoma brucei



Trichomonas



Giardia trophozoites



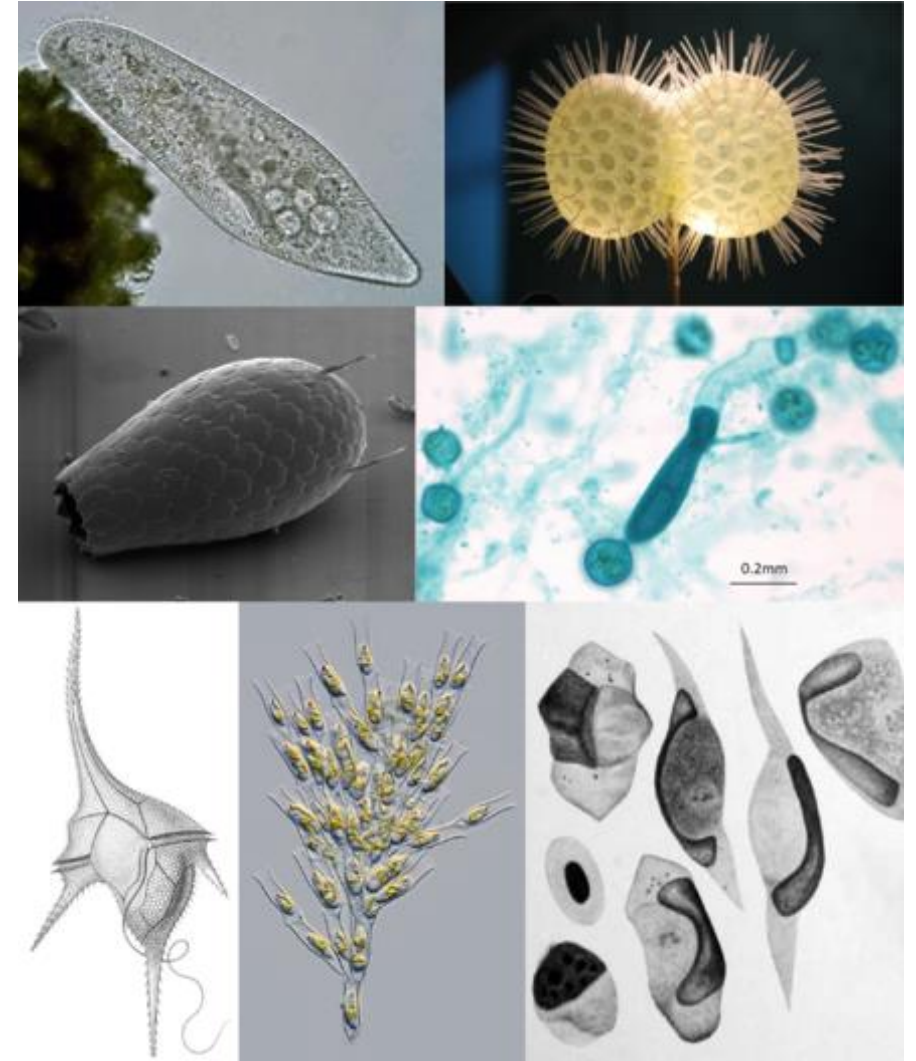
Percolomonas

The “SAR” Clade

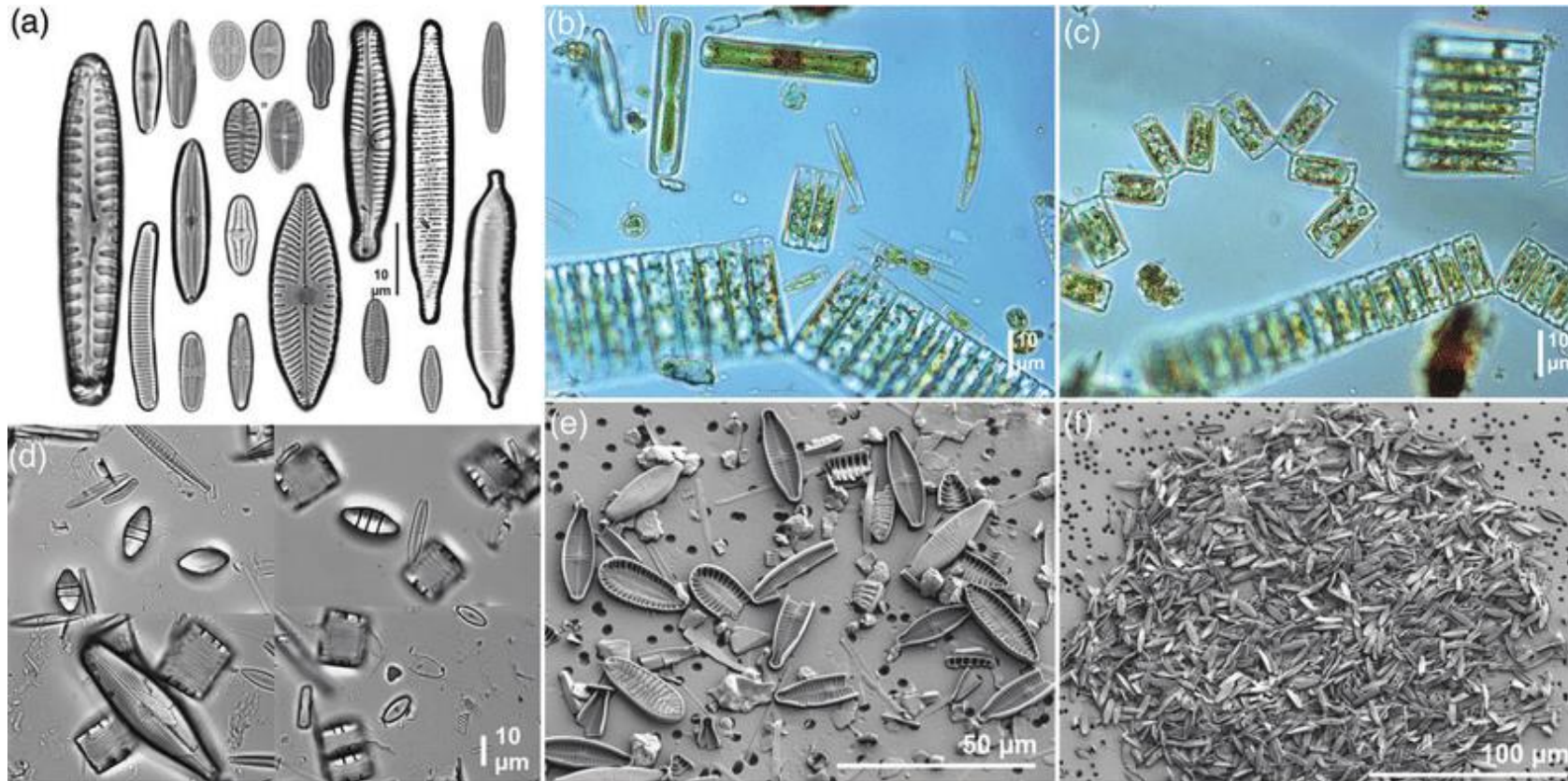
The so-called “SAR” clade was recently proposed based on whole-genome sequence analysis.

These studies have revealed that three major clades – the **stramenopiles**, **alveolates**, and **rhizarians** form a monophyletic supergroup.

This is the most controversial of the four supergroups presented here. But, for most scientists, this represents the best current hypothesis for the phylogeny of these three large protist clades that we will now consider.



The “SAR” Clade – Stramenopiles - Diatoms



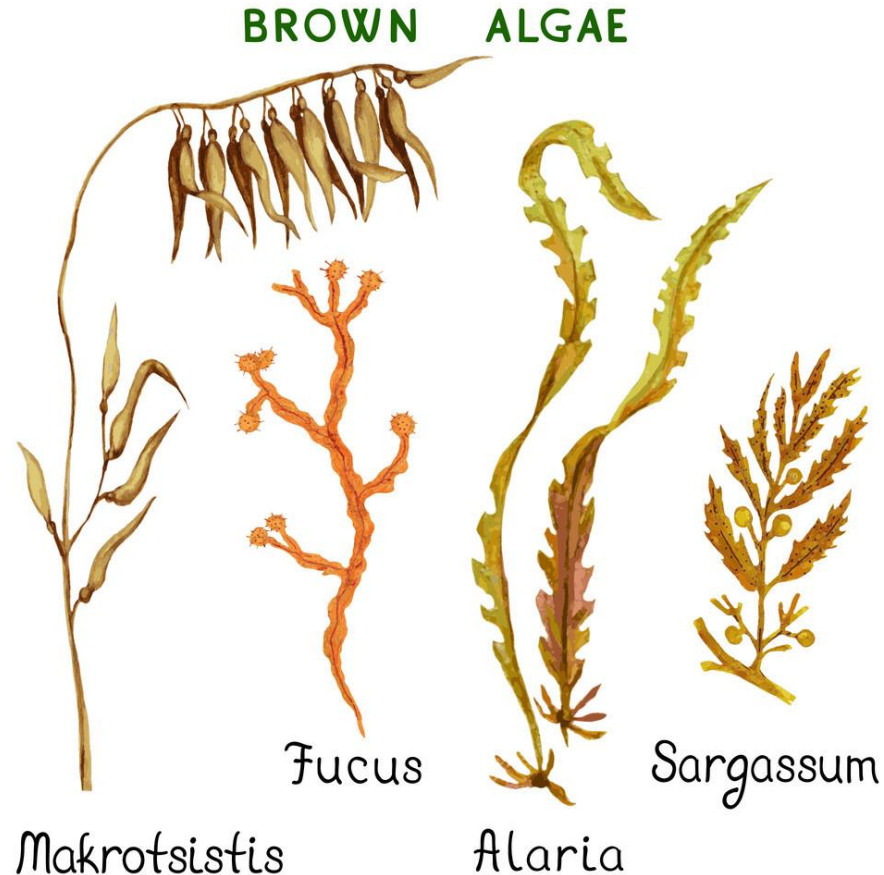
Examples of diatom cells observed with different instruments: (a) light microscope images; (b, c) show raw live material following a rainfall event. Alive specimens (with chloroplasts) showing solitary and colonial habits; (d) water sample after digestion of organic matter showing 'cleaned' frustules in a permanent slide ready for observation and counting with a light microscope; (e, f) scanning electron microscope (SEM) images showing valves under high magnification for accurate identification of species.

The “SAR” Clade – Stramenopiles – Golden and Brown Algae

Golden algae are named for their color, which results from their accessory pigments: xanthophylls and carotenoids. The cells are typically biflagellated, with both flagella near one end. All are autotrophs, but some are mixotrophs. Most are unicellular, but some are colonial.

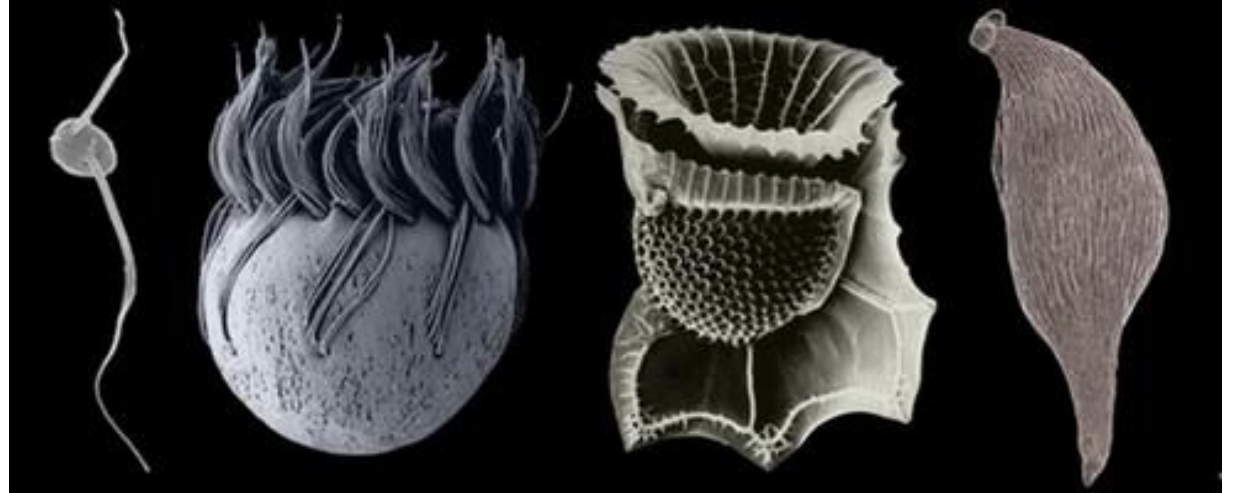


Brown algae are the largest and most complex algae. All are multicellular, and most are marine. Commonly called “seaweeds.” Accessory photosynthetic pigments called fucoxanthin.



The “SAR” Clade – Alveolates

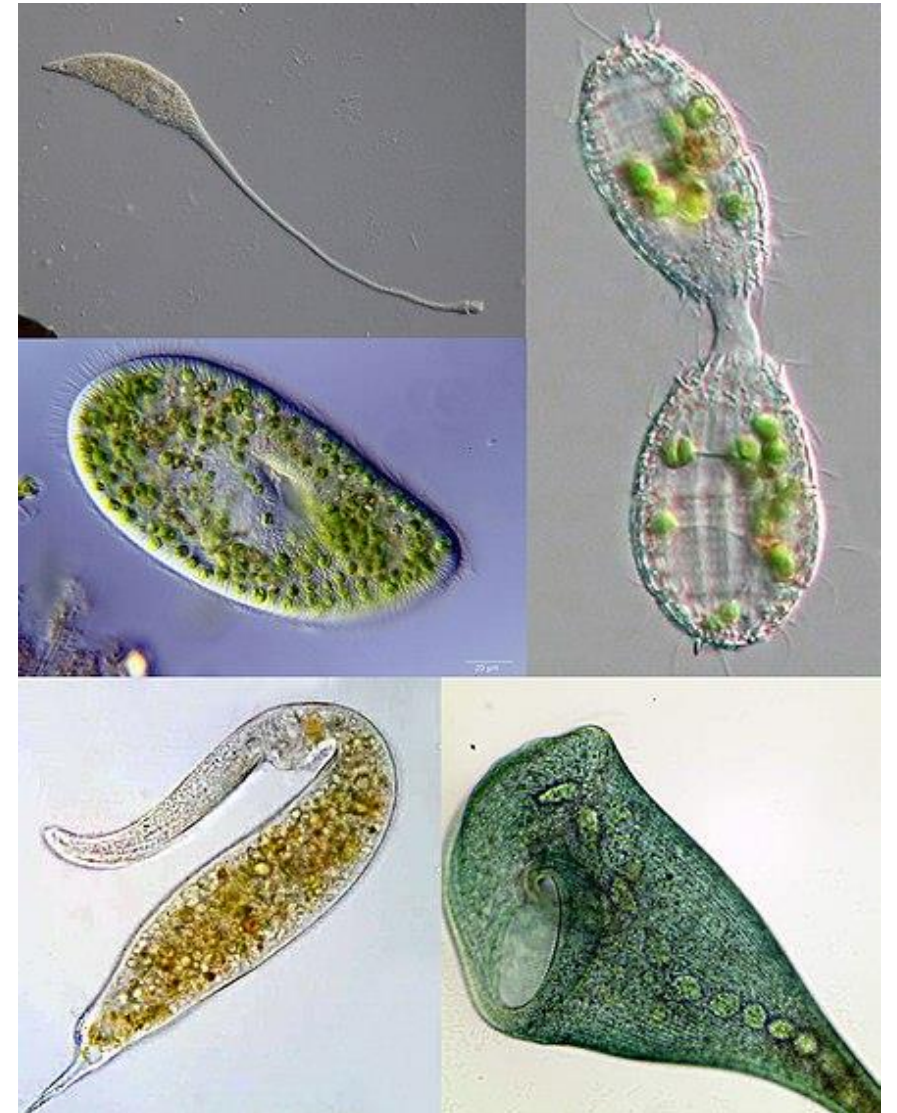
The one distinct feature of the alveolates are these somewhat mysterious membrane-bound sacs (called alveoli) that lie just under the plasma membrane. The function of these sacs is unclear, but they may have some role in osmoregulation. The group includes three distinct subgroups that are briefly discussed below. This clade also includes the most recognizable of all single-celled pondwater inhabitants and favorite of classical biology studies in the laboratory: *Paramecium*.



The “SAR” Clade – Alveolates - Ciliates

The **ciliates** comprise a large and varied group of protists. Most ciliates are predators, typically of bacteria or small protists. This taxon also includes some of the better-known microorganisms, *Paramecium*. There are around 7000 species of ciliates, all possessing cilia that either cover the entire cell surface, or as bands around the cell.

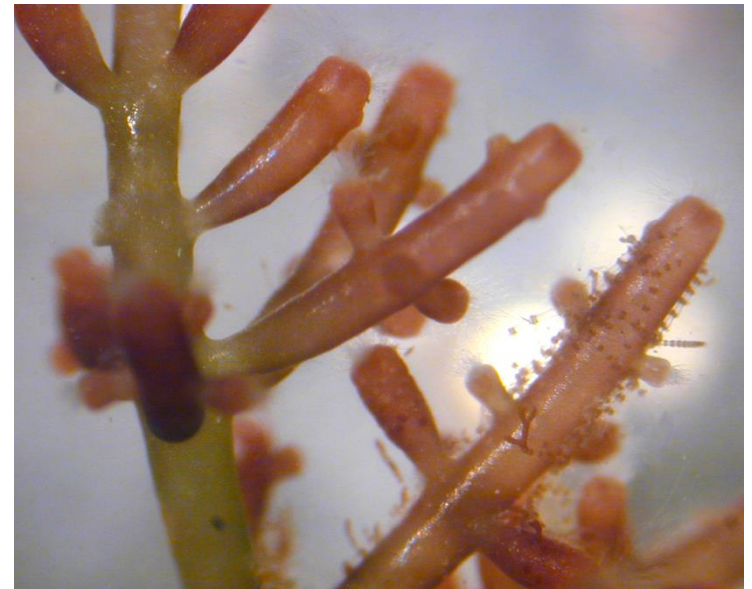
All are heterotrophic, and many are active predators, feeding on bacteria, algal cells, or other protozoans.



Supergroup Archaeplastida

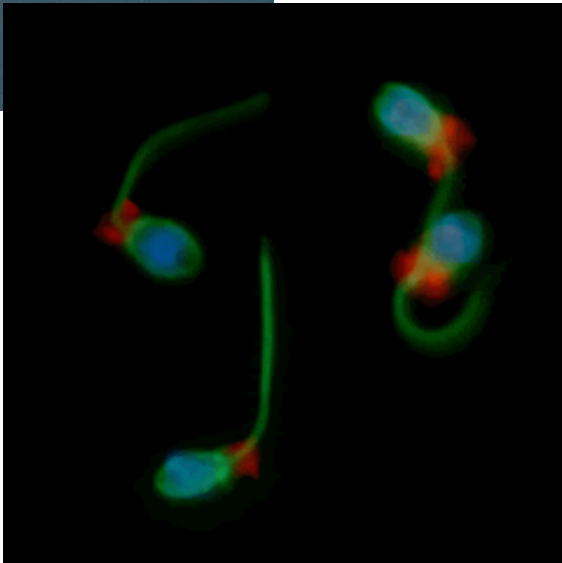
The archaeoplastids are a monophyletic super group of closely related species consisting of red and green algae, and land plant (land plants will be extensively discussed later). They likely share a common ancestor of a species of ancient protist that engulfed a cyanobacterium, an example of secondary endosymbiosis. The cyanobacterium evolved into the archaeoplastid chloroplast.

Refer to the images on the following slides for examples of **Rhodophyta**, **Chlorophyta**, and **Charophyta**



Supergroup Unikonta

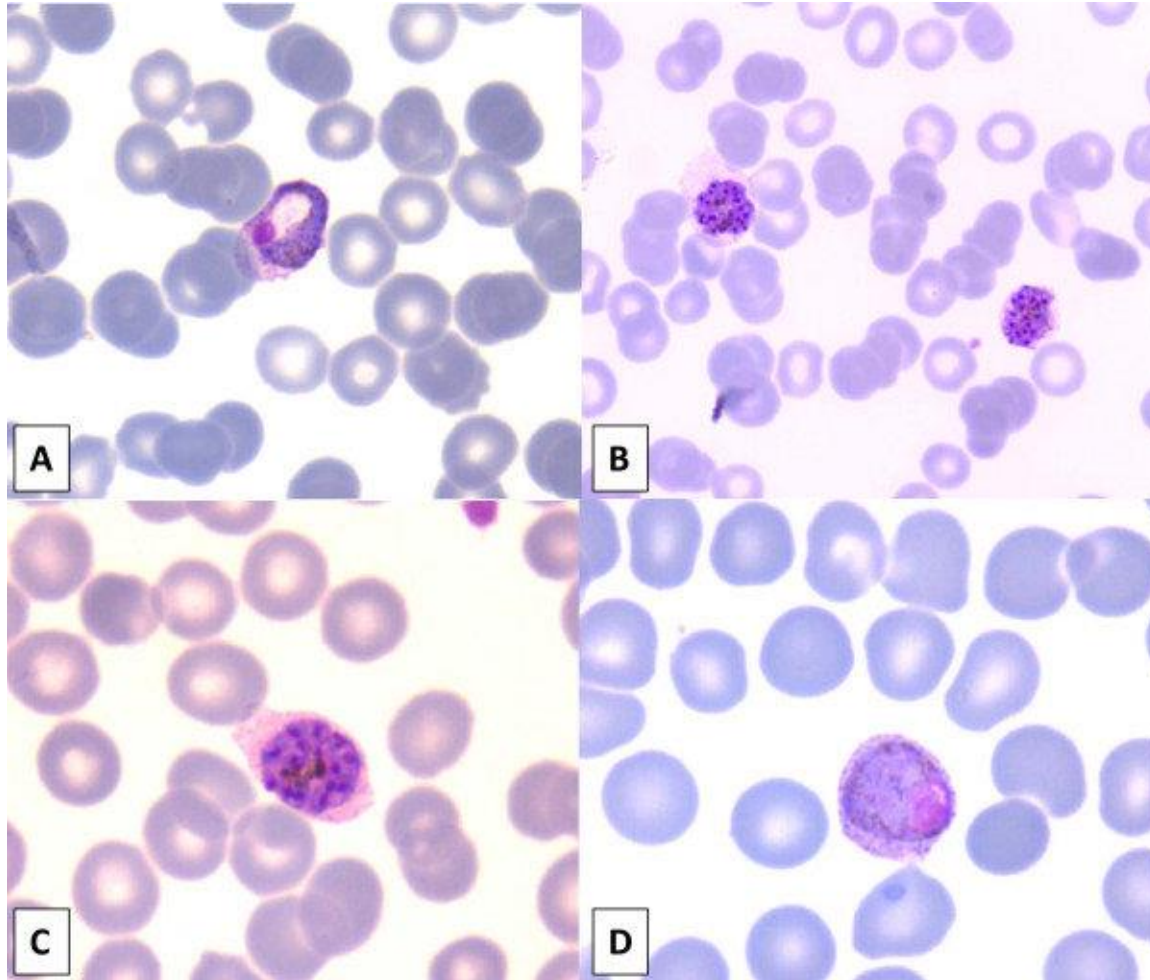
The unikonts are a diverse group of taxa that include **amoebozoans**, as well as animals and fungi (the two latter taxa collectively referred to as **opisthokonts**).



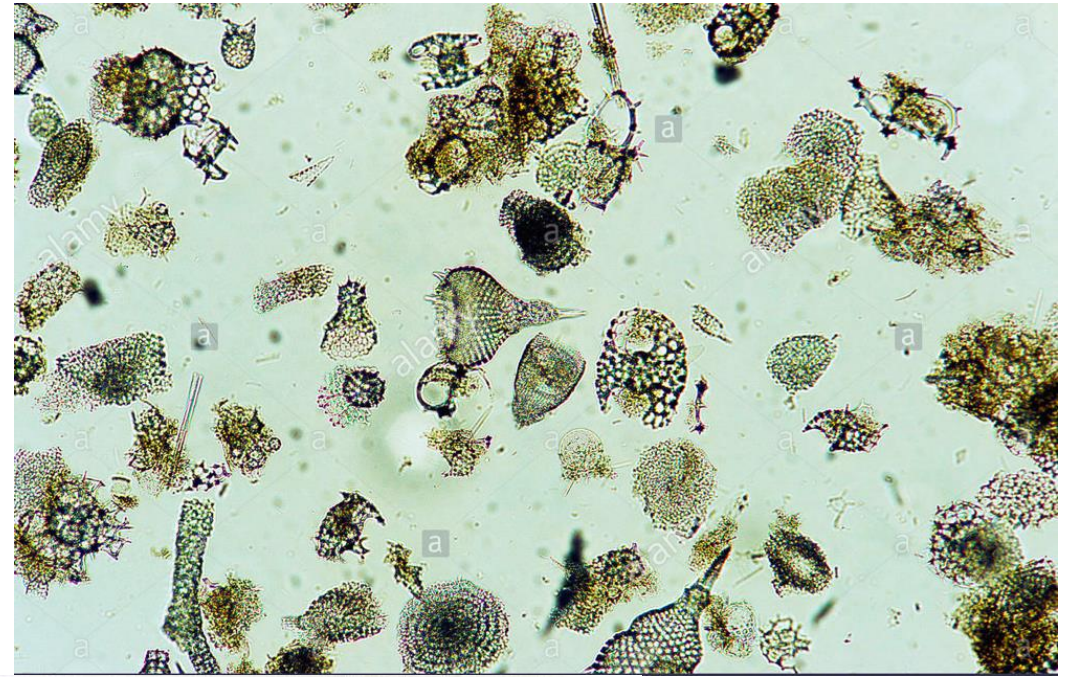
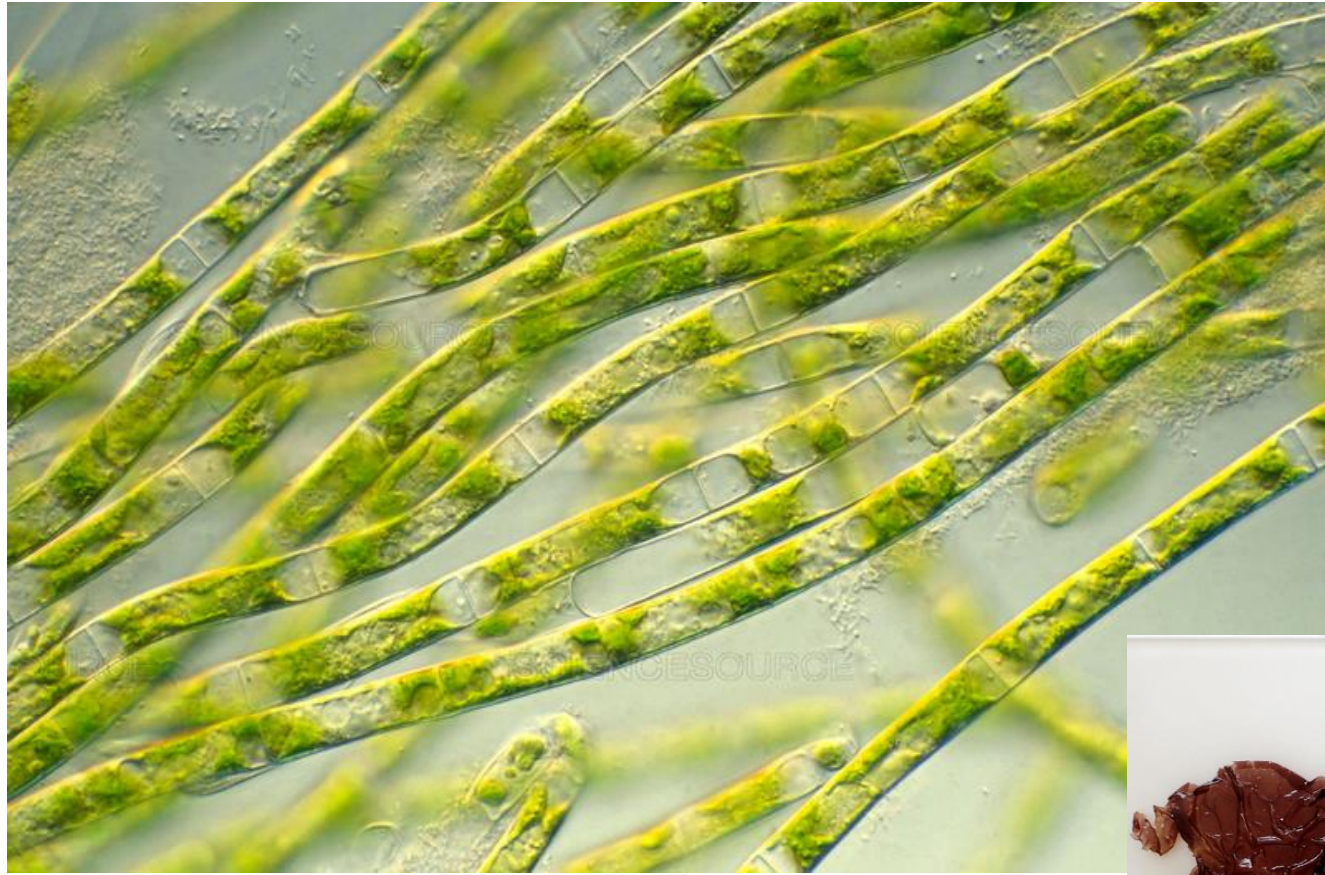
“Grab-bag” of Eukaryotes

- The following pages contain a collection of miscellaneous Eukaryotes. Based on the descriptions in your manual and above, you should be able to correctly classify each organism. When you have identified the correct specimen, you may copy and paste it onto your worksheet.
 - There may be some duplicates of each specimen
 - Be sure to include the appropriate labels.
- **Peer-review:** Upon turning in the lab, you will be assigned a peer review. You will also be provided a key to the specimens below. Your task will be to grade and provide feedback to your classmate.
 - The purpose of this is two-fold. 1) to ensure that you have seen the correct assortment of specimens, and 2) to practice the process of peer-review before our research project.

Plasmodium smear



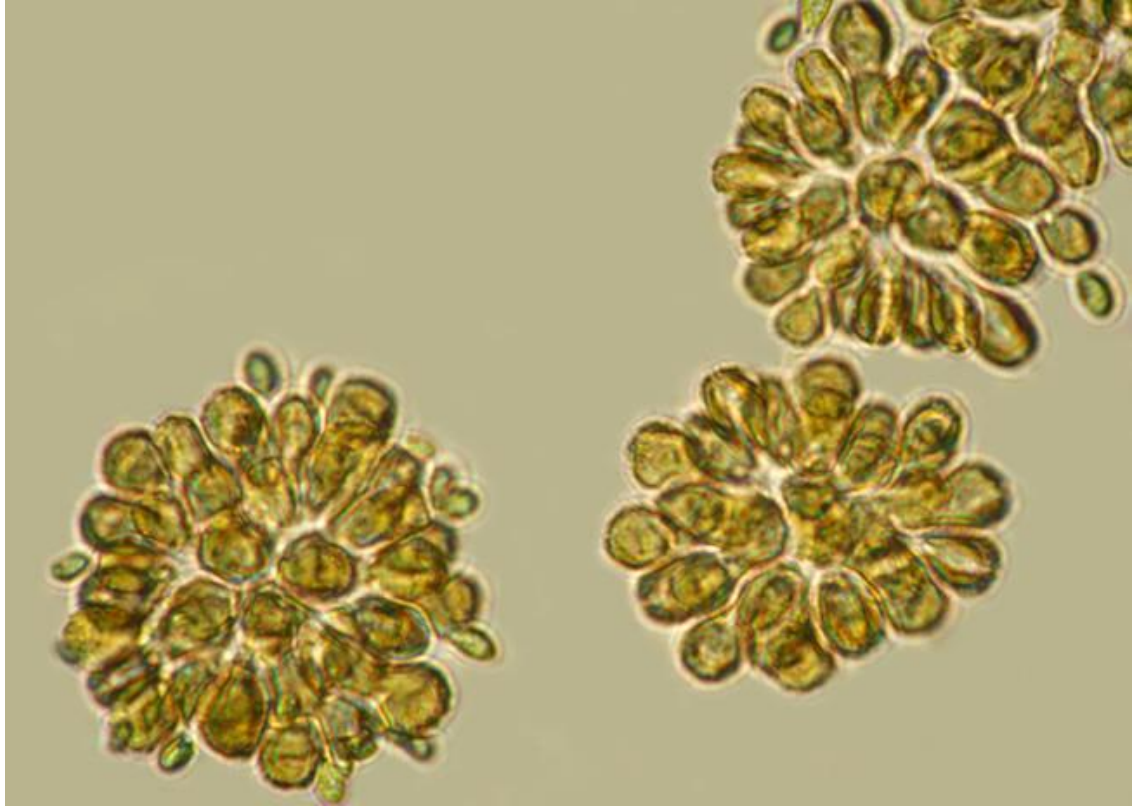
Plasmodium vivax in Giemsa-stained thin blood smear with all developmental stages present in peripheral blood. (A) Growing amoeboid trophozoite in enlarged red blood cell (RBC) (B) Immature schizonts with clumps of brown pigment almost fill the enlarged RBCs. (C) Mature schizont with merozoites (about 14) and clumped pigment. (D) Macrogametocyte with diffuse brown pigment and eccentric compact chromatin.



algae



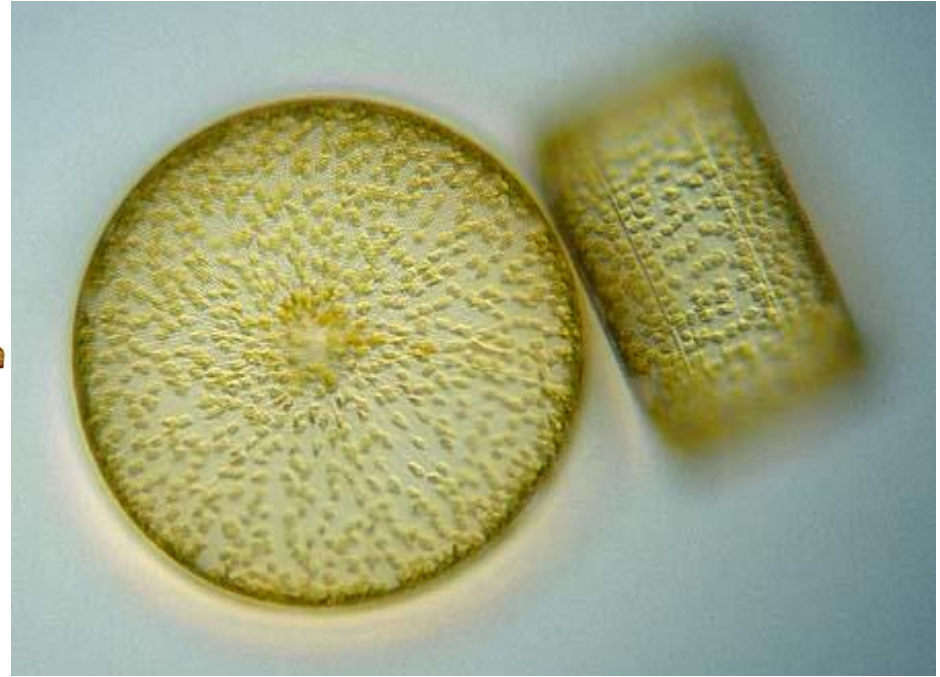
Poryphyra



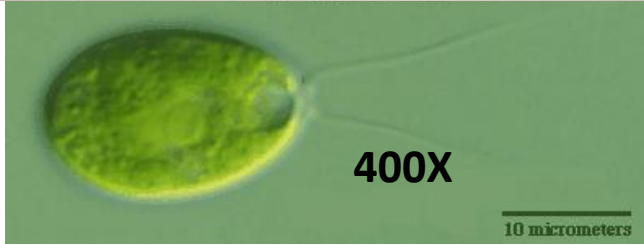
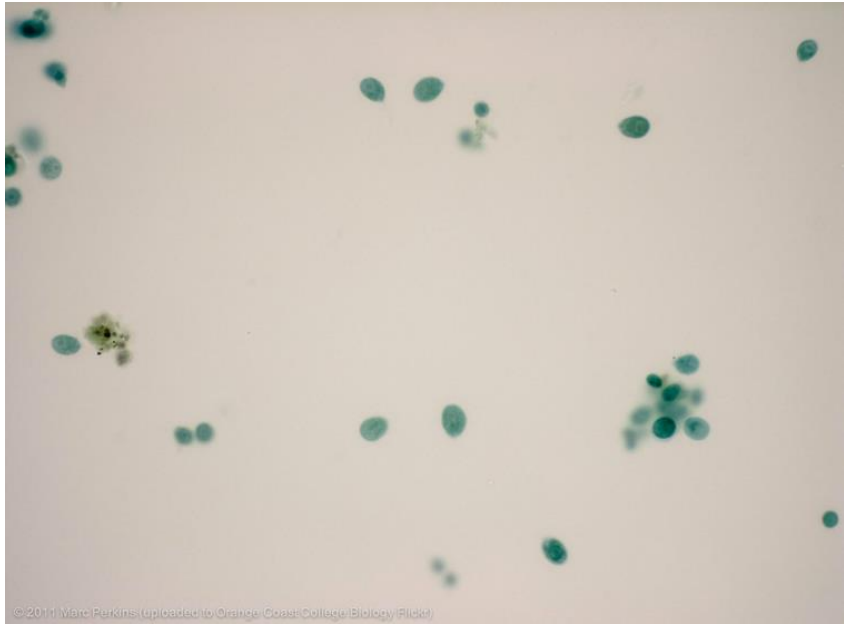


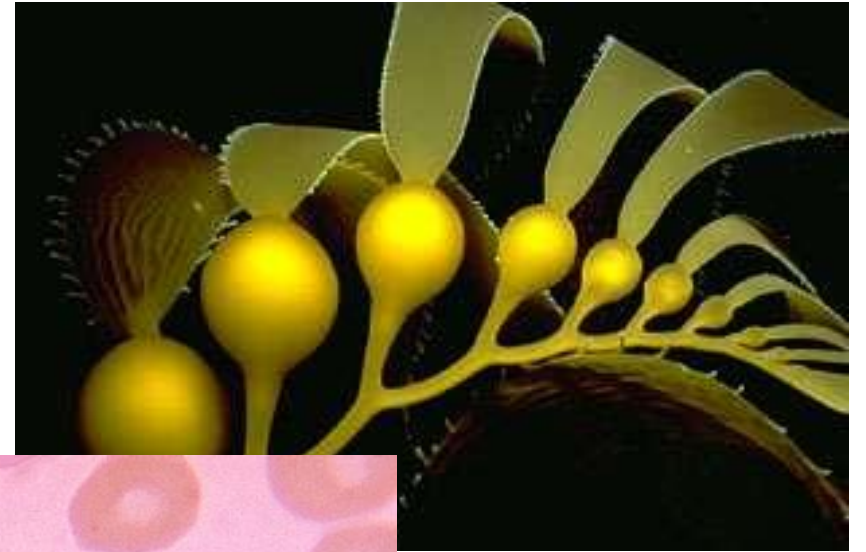
D. Munaretto 2009

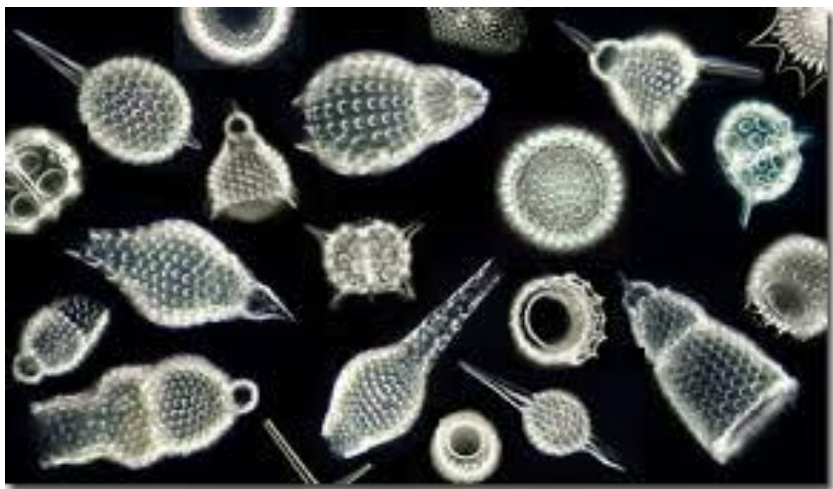






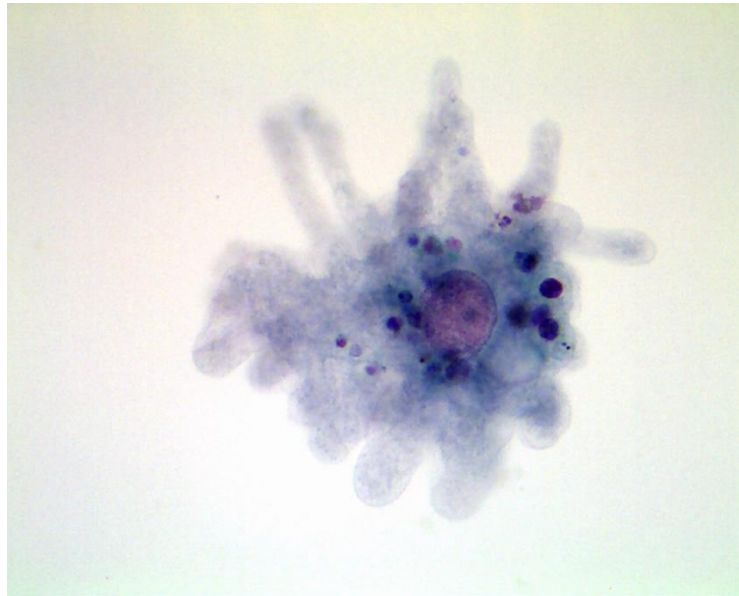




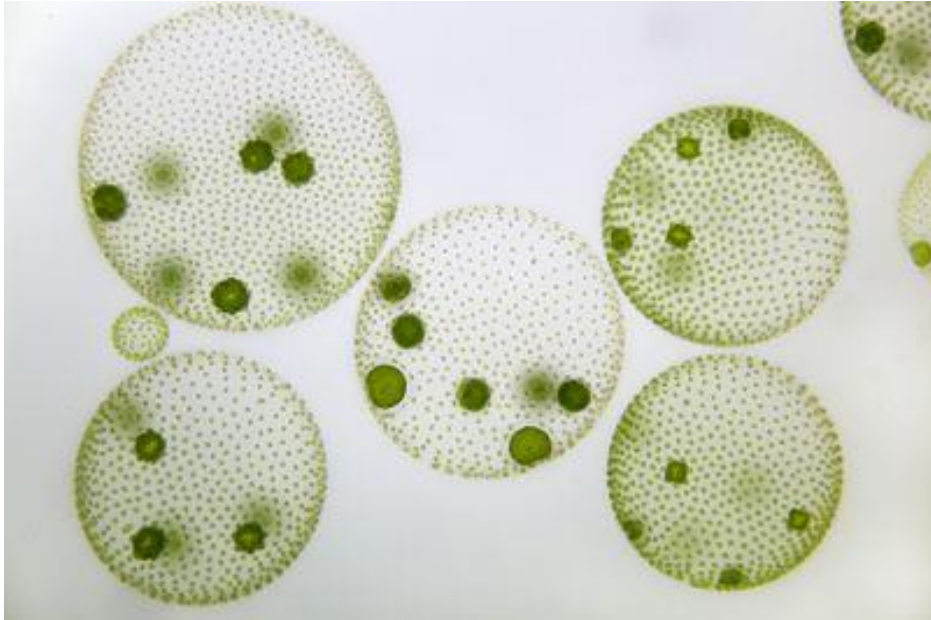
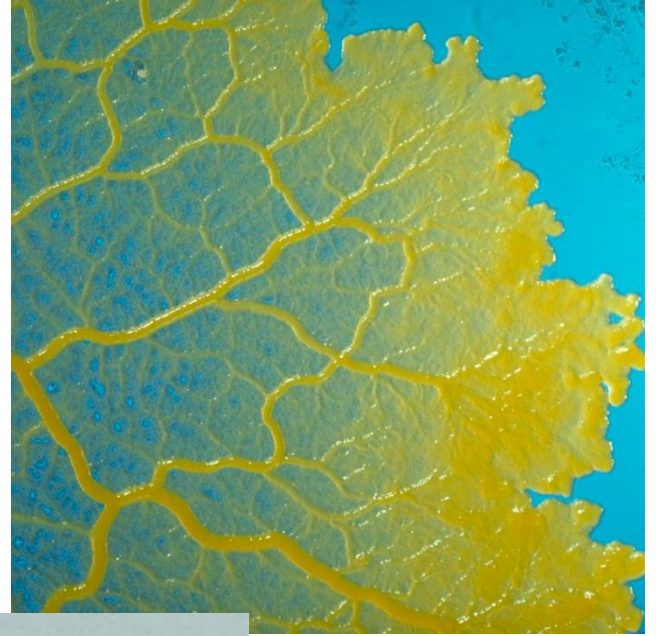


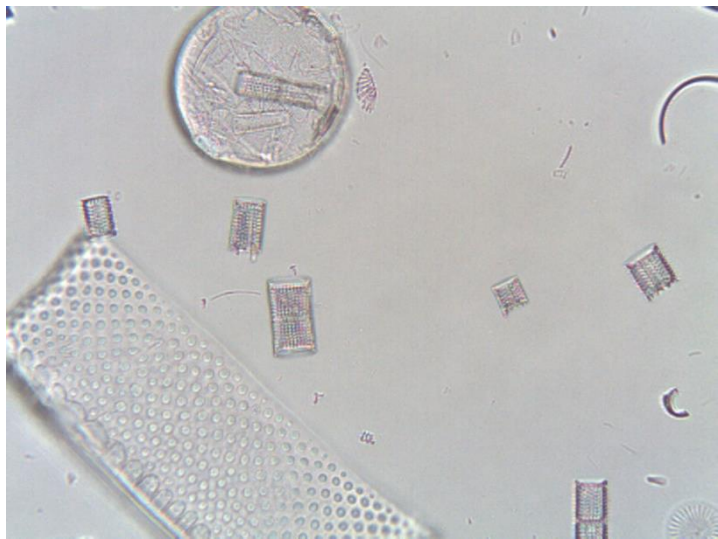
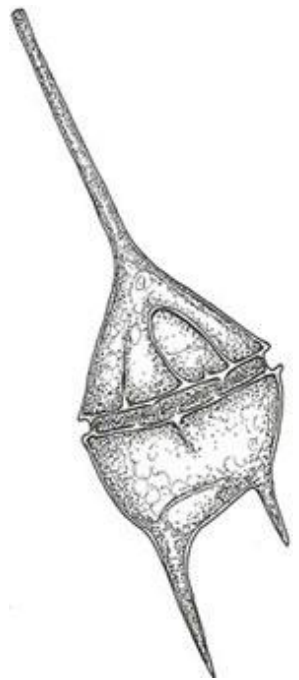


Corallina



Batrachospermum







After completing
the End-of-lab
Questions, you
are done with
Lab 6!
