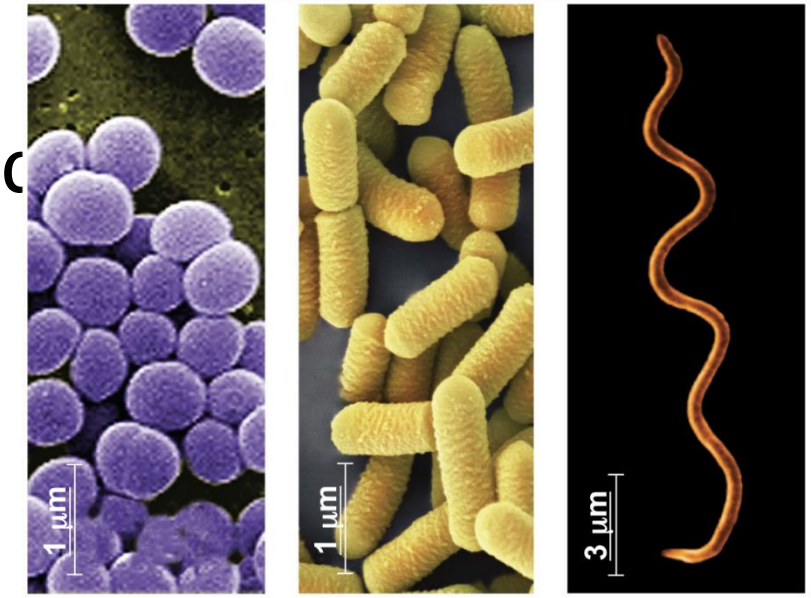
Unit Two: Biodiversity

Bacteria, Archaea, Protista & Fungi

Kingdom Bacteria

- **Bacteria** are simple, prokaryotic organisms.
- They have a cell wall made of peptidoglycan and are mostly heterotrophic. (Cyanobacteria are photosynthetic)
- They can be classified according to shape:
- **Cocci** (round-shaped);
- **Bacilli** (rod-shaped) and
- **Spirilli** (spiral-shaped).

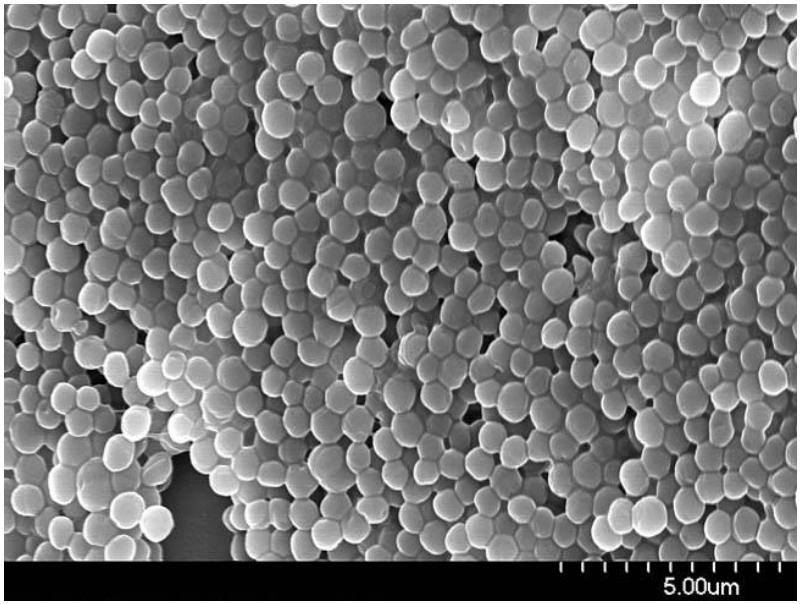
Figure 27.2



Cocci Bacteria

Ex: N. meningitidis or Neisseria meningitidis
(also called the meningococcus) => one of the most common causes of bacterial meningitis

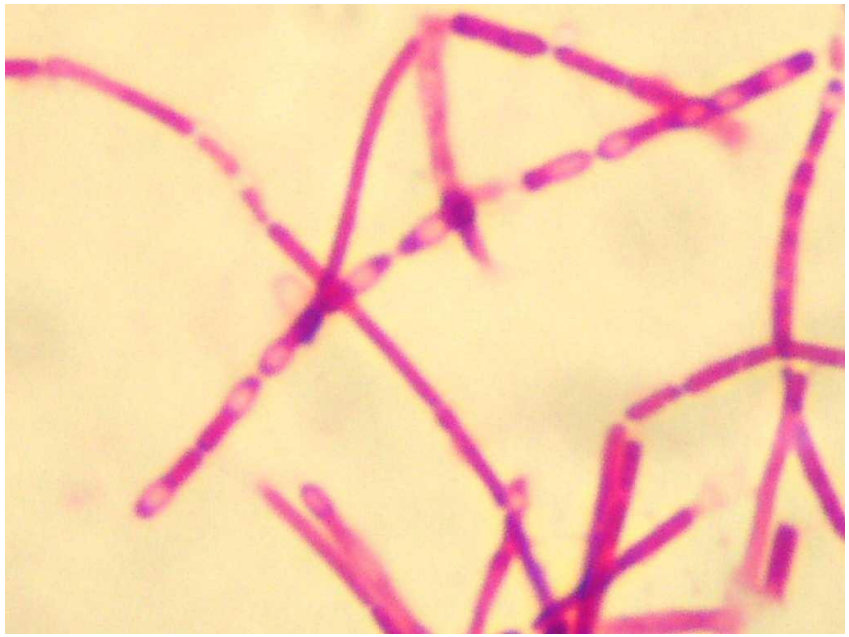
Bacterial meningitis is very serious and can be deadly. Death can occur in as little as a few hours. While most people with meningitis recover, permanent disabilities such as brain damage, hearing loss, and learning disabilities can result from the infection.



Bacilli Bacteria

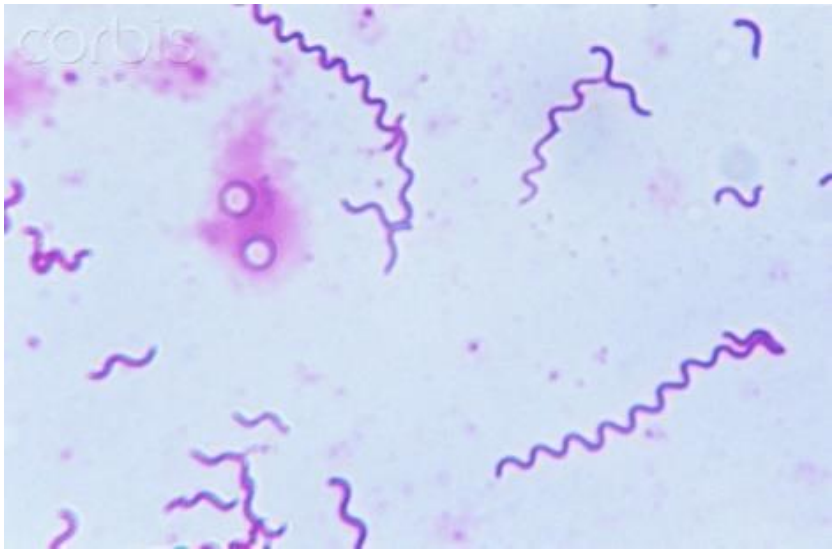
- Ex: Bacillus anthracis (The cause of Anthrax).

Anthrax can occur in four forms: skin, inhalation, intestinal, and injection.



Spirilli Bacteria

- *Spirillum minus* is associated with rat-bite fever, and *Borrelia burgdorferi* with Lyme disease.[4]



Bacteria Arrangements

1. Strepto = Chains of bacteria
2. Staphylo = Clusters
3. Diplo = Pairs

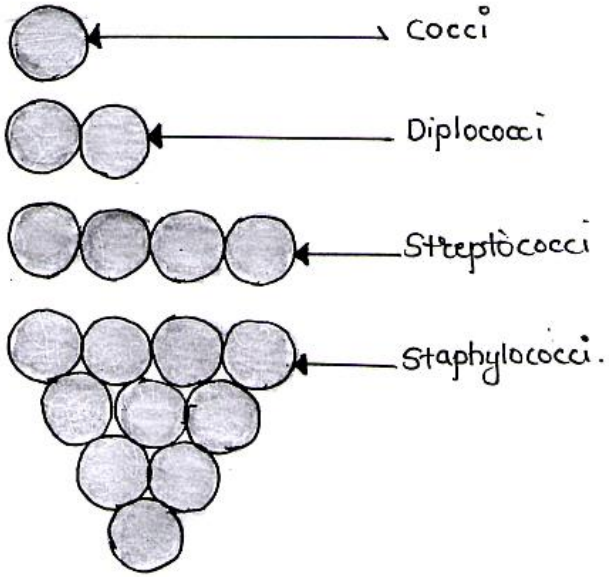


Figure:- Arrangement of Cocci Shape bacteria.

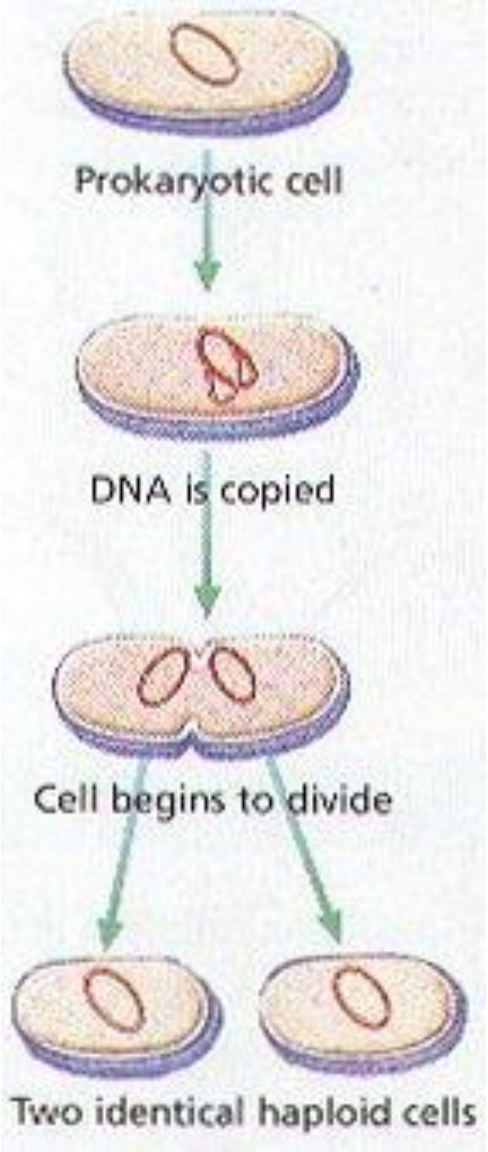
Bacterial Reproduction:

- Bacterial cells reproduce by means of **asexual reproduction** (one parental cell gives rise to 2 or more identical offspring). It is the process of ***binary fission*** in bacterial cells. (p. 134 – 135).

Example of Life Cycle of Eubacteria and Archaebacteria

The bacterial cell, (*E. coli*), reproduces by binary fission. (See Figure 5.4, p. 134).

1. As the bacterial cell grows, it makes a copy of its original, single chromosome.
2. The cell elongates and and the copies of DNA move to the ends of the cell.
3. Cell partition or septum forms between the two chromosomes.
4. The septum completes itself and distinct walls form.
5. The cells separate and two new cells are produced.



https://www.youtube.com/watch?v=3cD3U2pgb5w

https://www.youtube.com/watch?v=DY9DNWcqxI4

Kingdom Archaebacteria

Bacteria that live in very severe conditions.
These organisms have developed unique structures and mechanisms that allow them to survive there.

1. **Methanogens (meth-an-oh-jins)** — archaeans that produce methane gas as a waste product of their "digestion," or process of making energy. Methanogens live in swamps and marshes where the oxygen has been consumed by other microorganisms.

2. Halophiles (hal-oh-files) — those archaeans that live in salty environments.

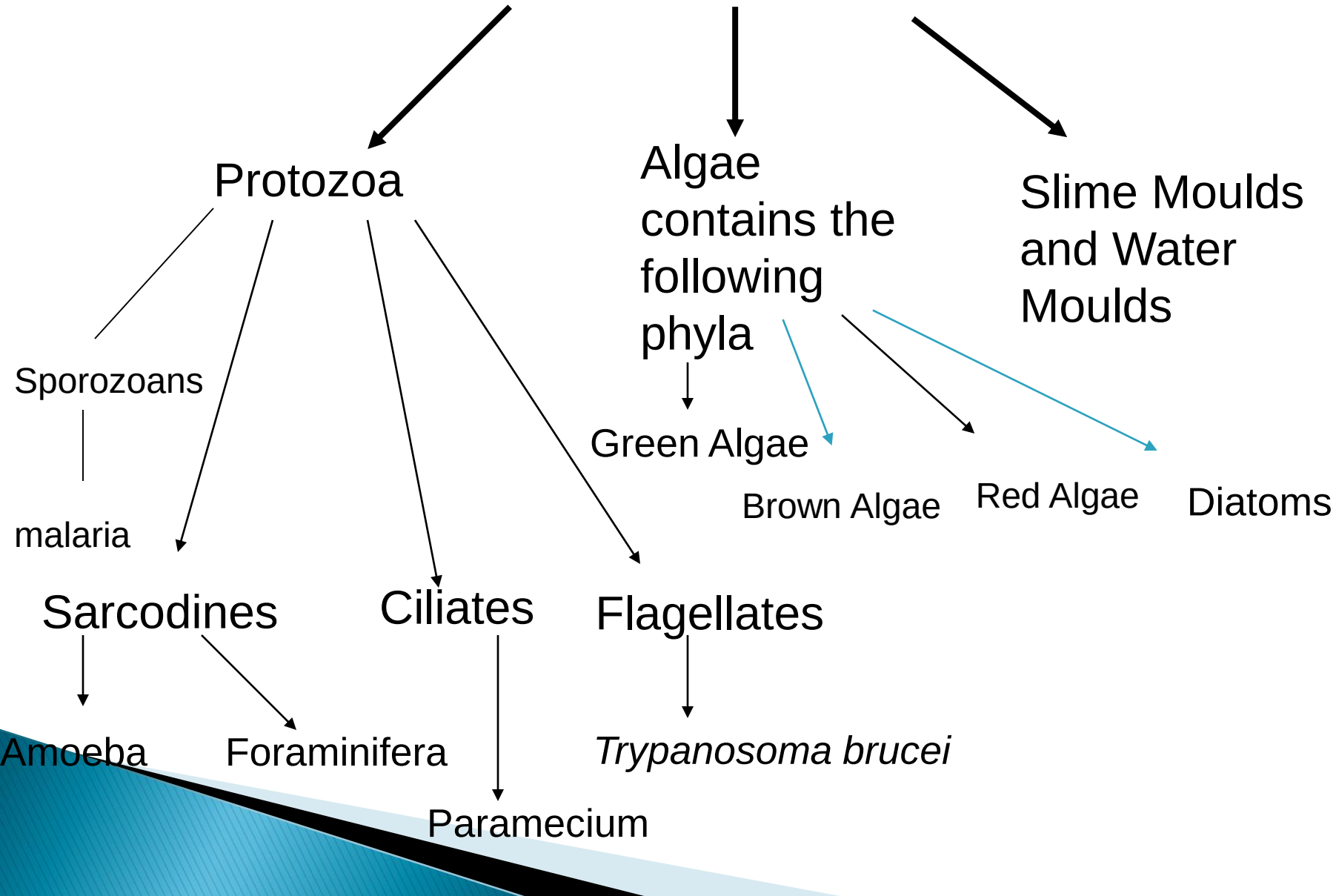
3. Thermophiles (ther-mo-files) — the archaeans that live at extremely hot temperatures.

4. **Psychrophiles (sigh-crow-files)** — those that live at unusually cold temperatures. are present in alpine and arctic soils, high-latitude and deep ocean waters, polar ice, glaciers, and snowfields.

Kingdom Protista

- **Protists** are eukaryotic organisms.
- They are classified into three major groups according to their type of nutrition.
- The groups are:
- 1) **Protozoa** (animal-like protists) : heterotrophs that ingest or absorb food.
- 2) **Algae** (plant-like protists) : autotrophs that carry out photosynthesis.
- 3) **Slime moulds and Water moulds** (fungus-like) : heterotrophic.

Major Protista Groups

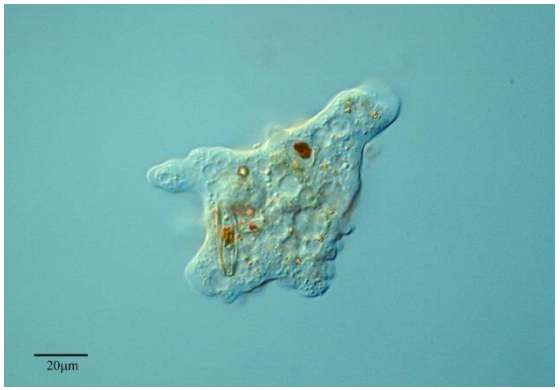


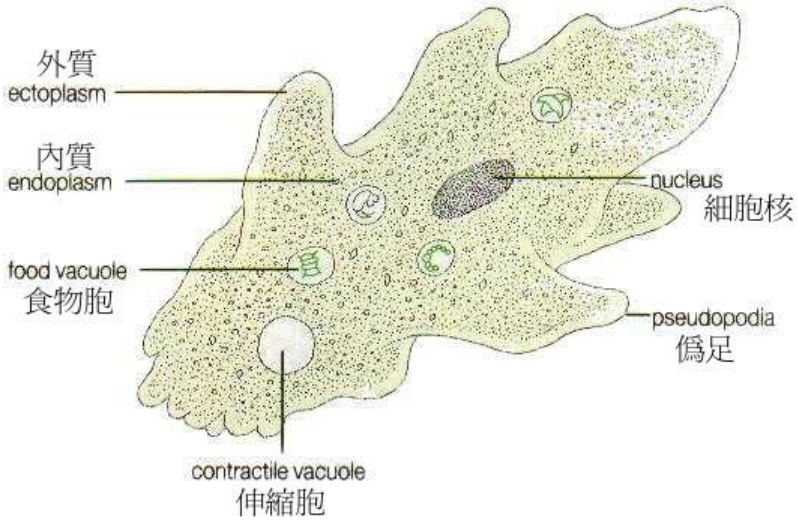
Protozoans (The animal-like protists)

- Single-celled
- heterotrophic eukaryotes
- They are restricted to moist or aquatic habitats
- Many protozoan species are symbionts, some are parasites, and some are predators of faeces bacteria and algae.

Ex 1: Amoeba

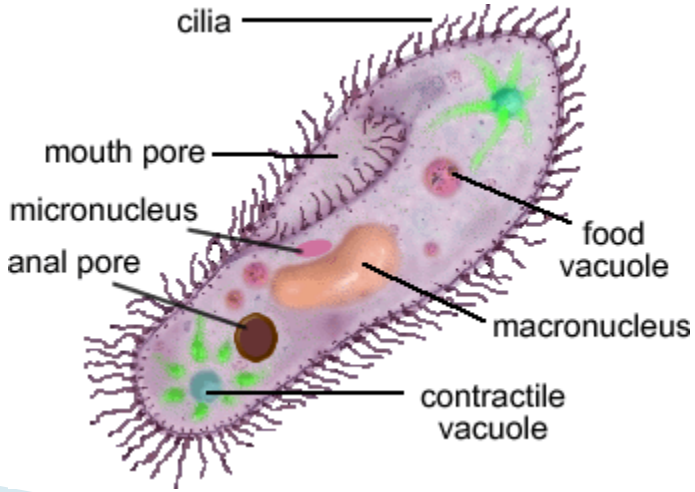
- feed on bacteria in water. Some are parasitic living in guts of humans





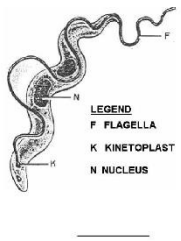
Ex 2: Paramecium

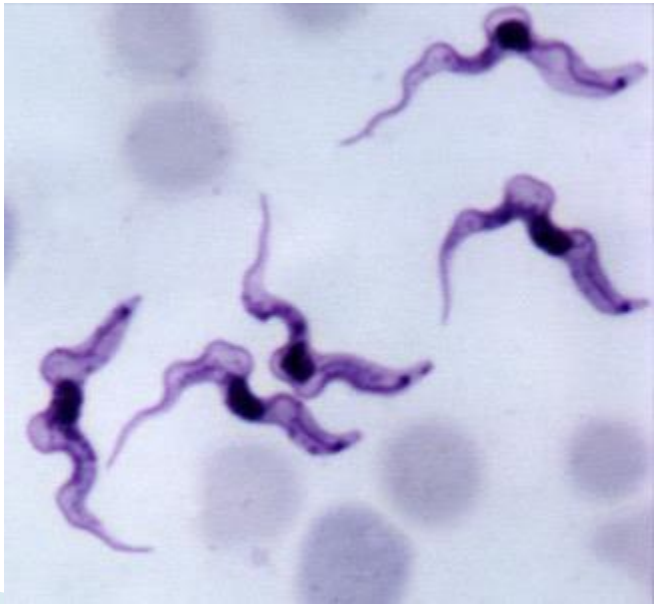
- Very common in ponds.
- Covered by cilia.
- Most are free living, but one species is parasitic to humans, living in the gut and causing diarrhea



Ex 3: *Trypanosoma brucei*

- A parasite that causes African sleeping sickness.
- They live in salivary glands of tsetse flies. They are transmitted to humans when bit by these flies.
- They spread in the blood and causes patient to become dizzy, fall into a coma and die.

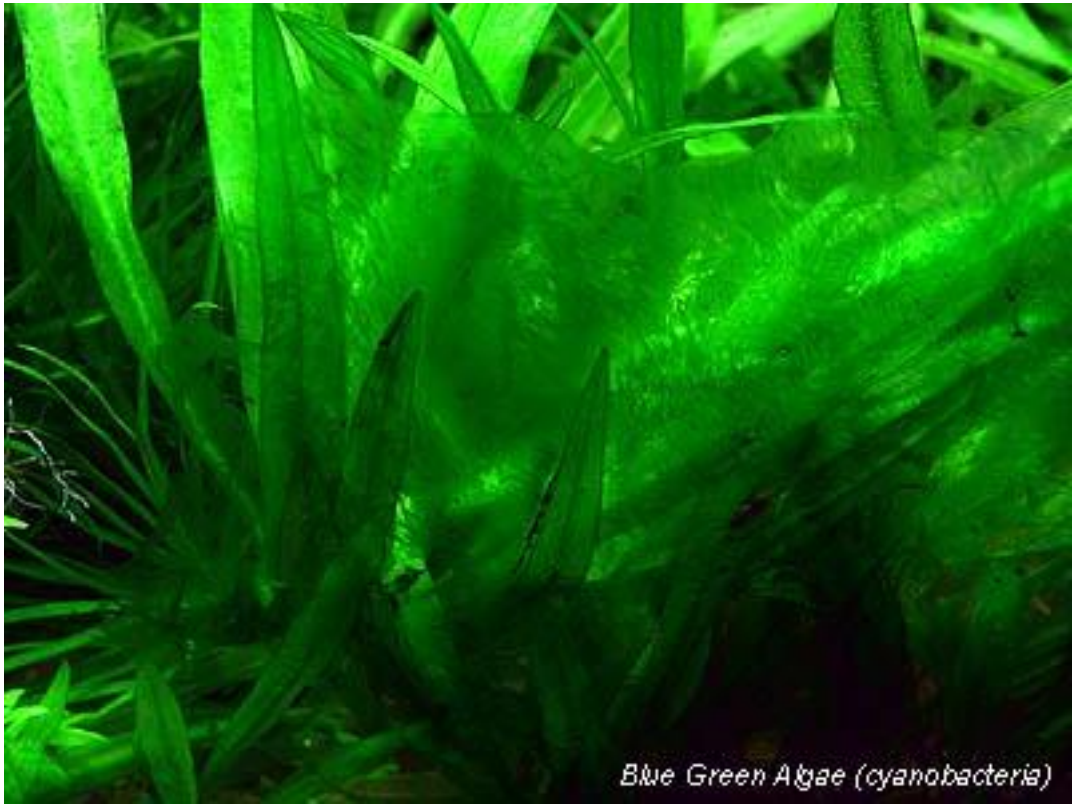




Algae (The plant-like protists)

- Simple aquatic, chlorophyll-containing organisms.
- Size range from single celled to giant seasweeds.
- Once considered plants, but because they lack true roots, stems, leaves and water conducting tissue, they were re-classified.
- Algae phyla include:

Green Algae (Chlorophyta)

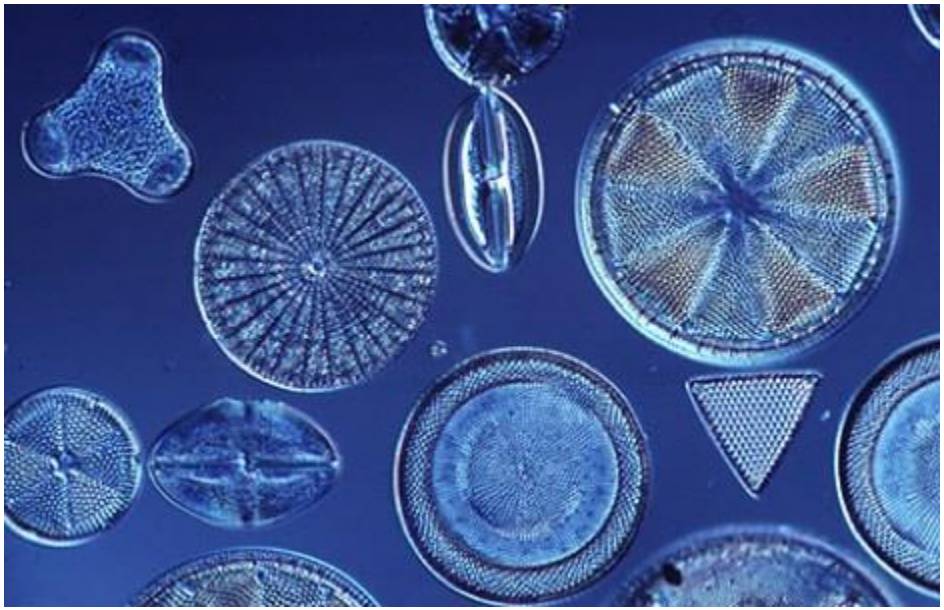


Brown Algae (Phaeophyta)

Red Algae (Rhodophyta)

Diatoms (Chrysophyta)

- Most abundant unicellular algae in the ocean!
- Rigid cell wall made of silica (makes sand and glass)



Slime and Water Moulds (The fungus-like protists)

- Similar to fungus because they produce spores.
- Most are saprotrophic, feed on dead organic matter.
- Ex: water mould, mildew, plasmodium (slime mould)

Representative Protist Life Cycle :

(See Figure 5.15, p. 146).

- *Plasmodium vivax (*a human parasite), a protozoan (Phylum Sporozoa), is responsible for one type of malaria in humans.

http://highered.mheducation.com/olcweb/cgi/pluginpop.cgi?it=swf::535::535::/sites/dl/free/0072437316/120090/bio44.swf::Malaria%20-%20Life%20Cycle%20of%20Plasmodium

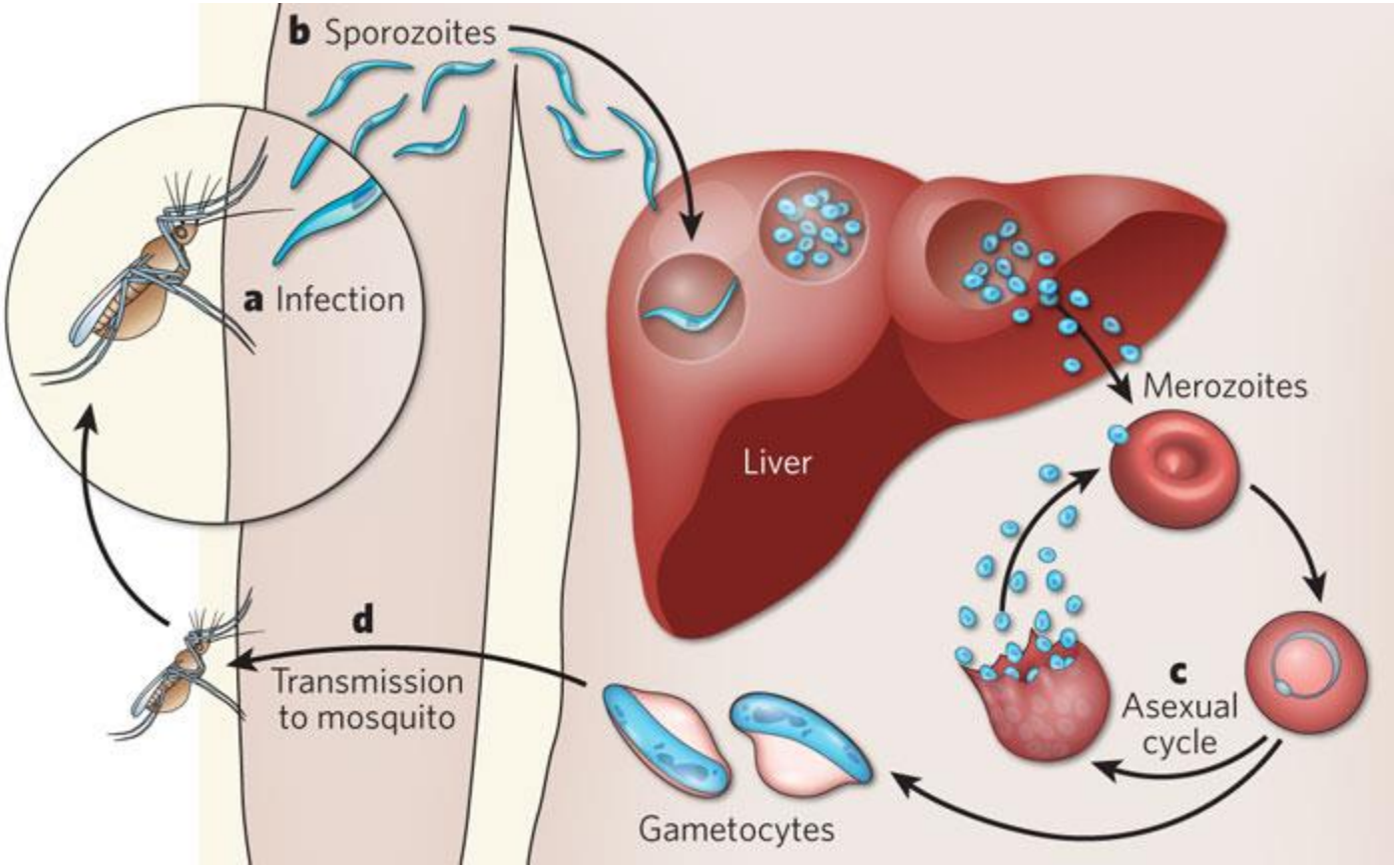
- 1. A mosquito bites an infected person and ingests the reproductive cells of the Plasmodium (gametes) present in red blood cells.

- 2. The gametes fuse to form a zygote inside the **gut wall of the mosquito** and divide many times to form numerous spore-like fragments or **sporozoites**. The zygote breaks open releasing the sporozoites (spore cells).

- 3. The **sporozoites migrate and invade the salivary glands of the mosquito**. From here, they will be injected into a new human host when bitten by the mosquito.

- 4. Once inside the new human host, **sporozoites will reproduce asexually in the liver** to form a second type of spore-like cell. The cells leave the liver and **enter the bloodstream** where they invade red blood cells. Once inside the red blood cells, they multiply at a very rapid rate.

- 5. Red blood cells rupture releasing toxic substances and spores. These spores infect other red blood cells. The cycle repeats itself when a mosquito bites the infected person.



VIDEO SUMMARY:

http://highered.mheducation.com/olcweb/cgi/pluginpop.cgi?it=swf::535::535::/sites/dl/free/0072437316/120090/bio44.swf::Malaria%20-%20Life%20Cycle%20of%20Plasmodium

Kingdom Fungi

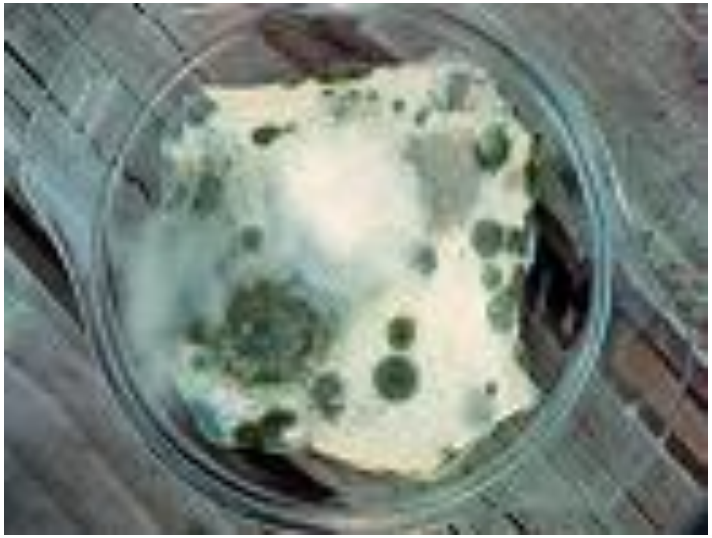
- https://www.youtube.com/watch?v=m4DUZhnNo4s
- Crash Course ☺

Kingdom Fungi

- **Fungi** are non-photosynthetic heterotrophs that grow in the ground and possess cell walls.
- They perform **extra-cellular digestion**, which means they release digesting enzymes into their surroundings, then absorb the digested nutrients.
- They have some plant-like qualities.
- The bodies of fungi are made up of a network of fine filaments called **hyphae** (singular hypha).
- A loose, branching network of hyphae that makes up the bulk of a fungus is called a **mycelium**.

Types of Fungi

- Fungi are classified according to their reproductive characteristics.
- 1) Zygomycotes — zygospores — sexual reproduction.
- 2) Basidiomycotes — basidiospores — sexual reproduction.
- 3) Ascomycotes — asci (spores spread by wind) — sexual reproduction.
- 4) Deuteromycotes — conida — asexual reproduction.



Rhizopus stolonifera

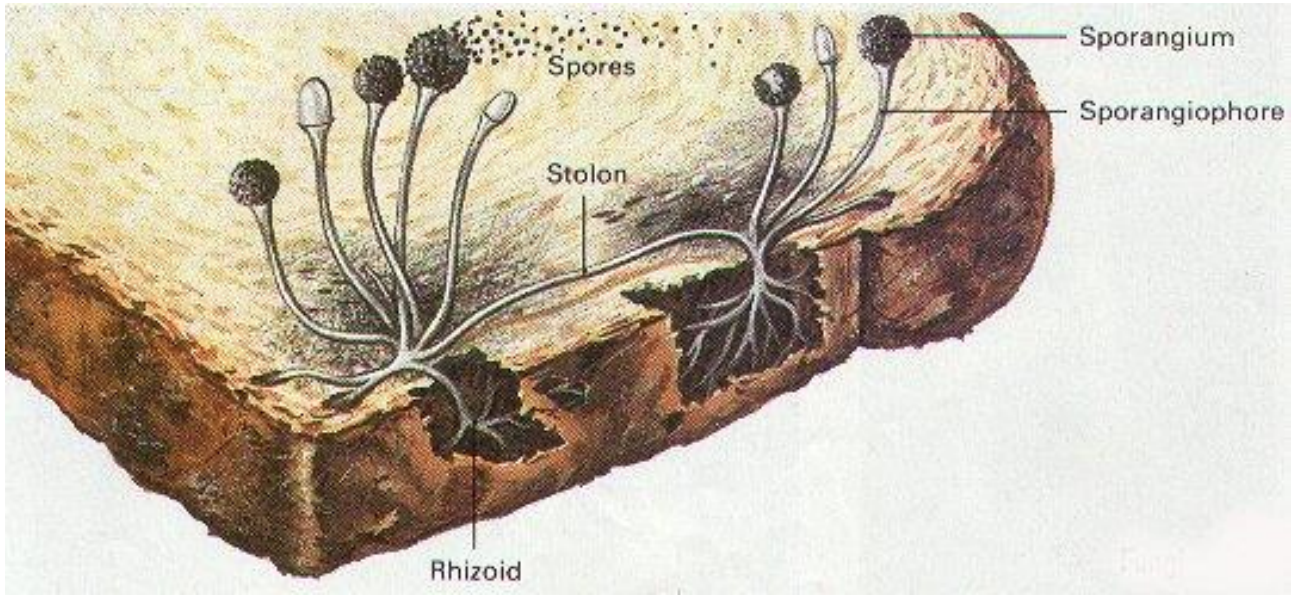
Mushroom - Basidiomycota

Ascomycota – Morels

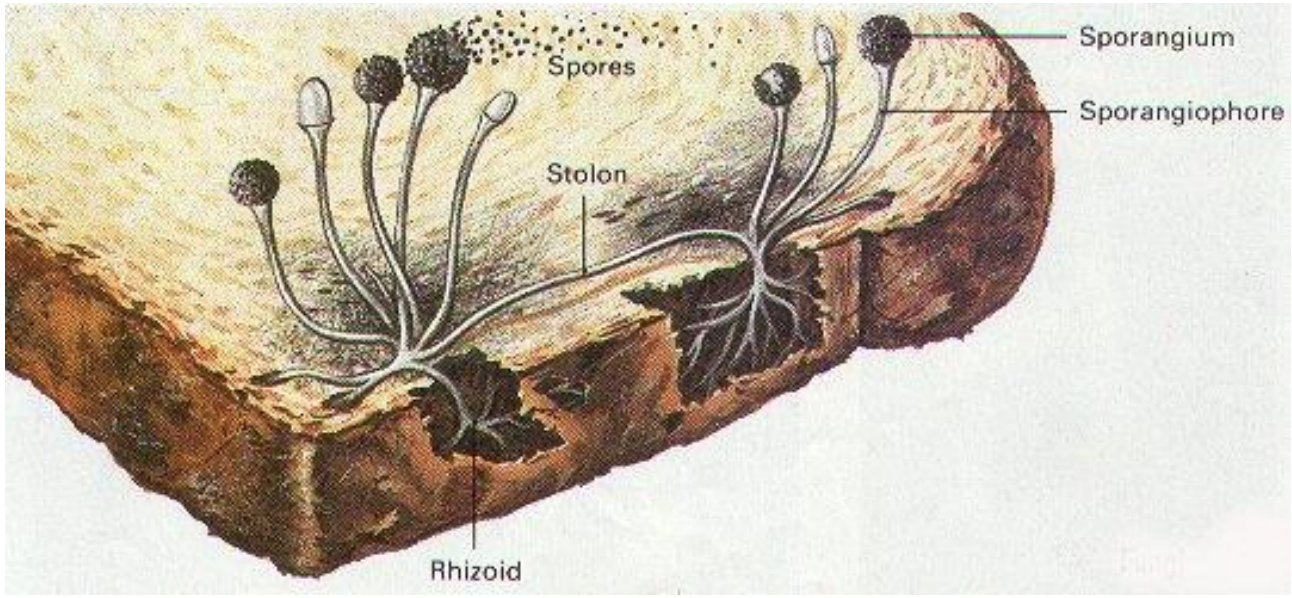
Deuteromycota – Fruit moulds - Pennicillium

Representative Fungus Life Cycle
(See Figure5.28, p. 154).

- Rhizopus stolonifera is the common black bread mould.
- The small black dots or fuzz on bread are the reproductive structures of the bread mould.



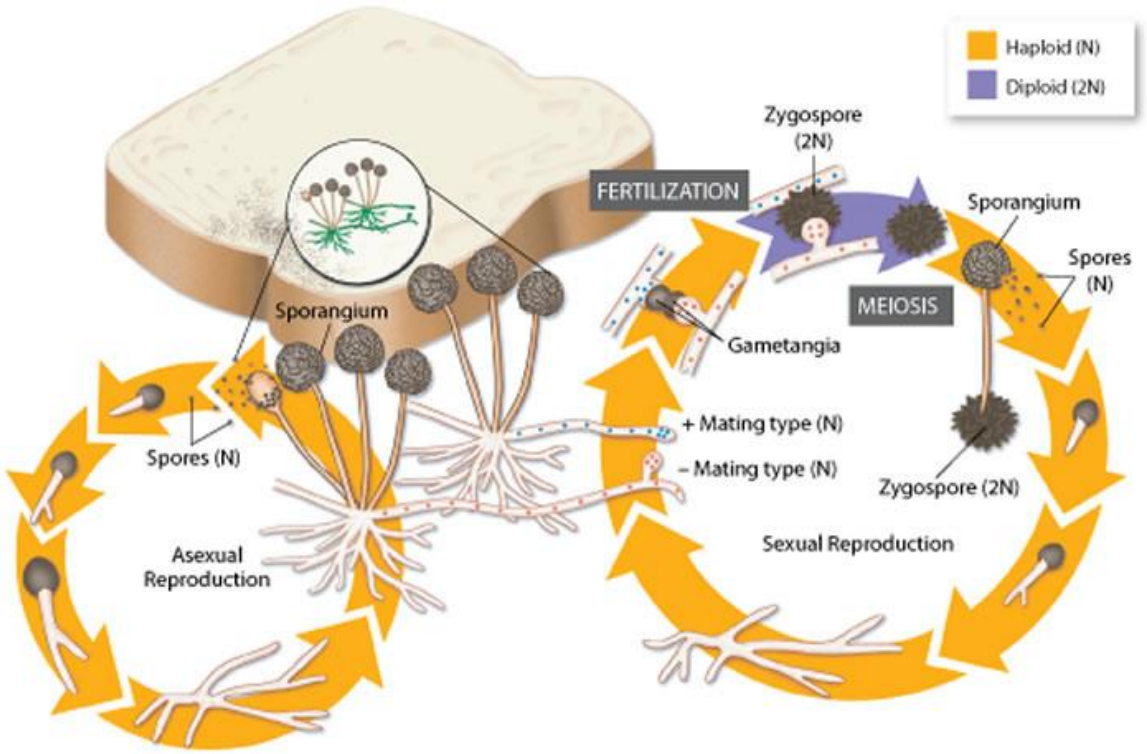
- Bread mould is made up of two forms of hyphae.
- The horizontal hyphae are the **stolons** and the downward growing hyphae are the **rhizoids.**
- The stolons spread out over the surface of the bread while the rhizoids anchor the mycelium to the bread surface.



- Identifying Fungi – 156 – let's spoil some bread! ☺

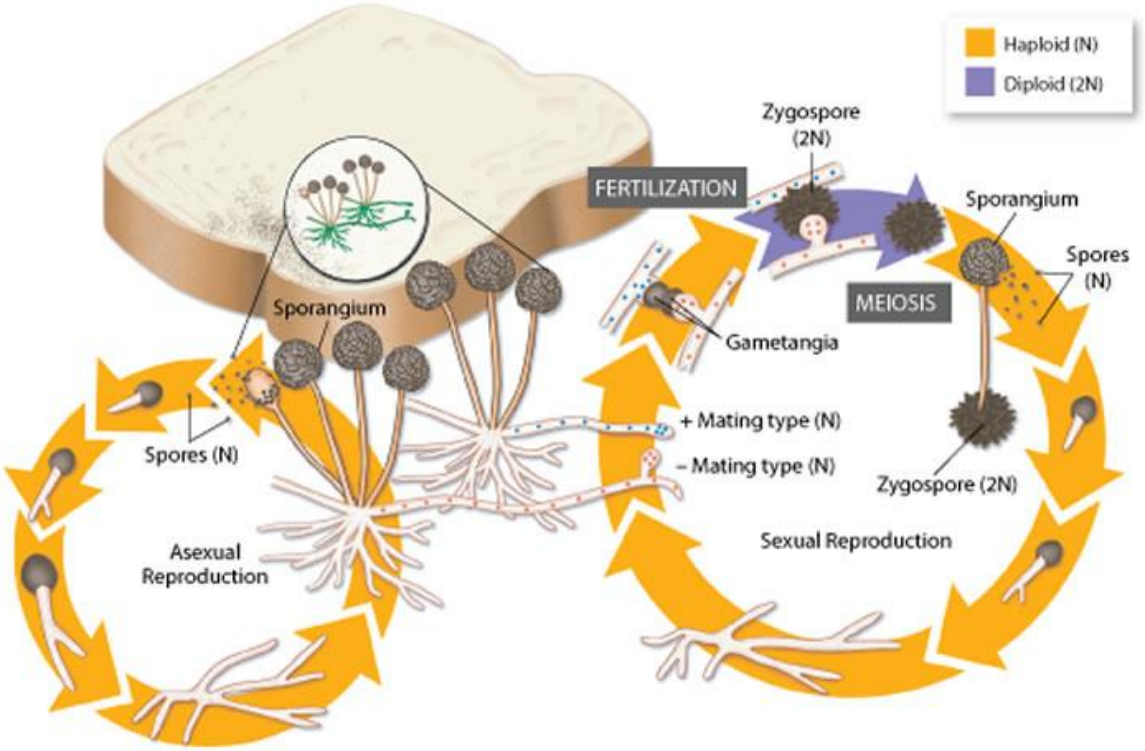
Representative Fungus Life Cycle (See Figure5.28, p. 154).

- The bread mould reproduces by asexual reproduction, but can also reproduce by sexual reproduction when times are unfavorable (producing zygospores).
- These are **diploid cells** that contain two copies of every chromosome.
- Rhizopus belongs to the Phylum Zygomycota or the zygospore fungi.



Asexual Reproduction:

1. The bread mould will develop **sporangiophores**, a third form of hyphae.
2. The **sporangia** or **spore-bearing capsules** are located at the ends of the sporangiophores.
3. The asexual spores develop inside the sporangia and are released when the capsules split open.
4. These spores develop into new hyphae



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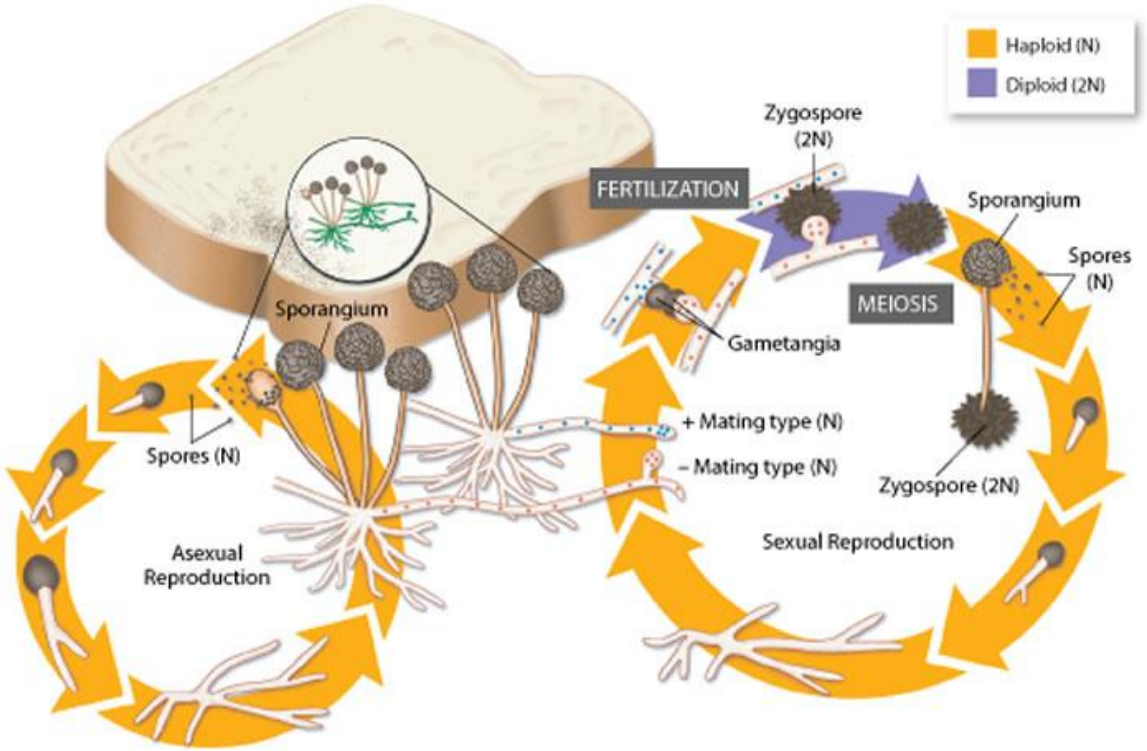

Sexual Reproduction:

1. + and – mating strands fuse to form a DIPLOID zygospore.
2. It remains dormant until conditions are favorable, then it will undergo meiosis to produce a sporangium that contains haploid spores.
3. Upon release these spores grow into new hyphae.