

222 MBIO

Microbial Fine Structure

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2026

Algal Cell Structures

- Lab 8 -

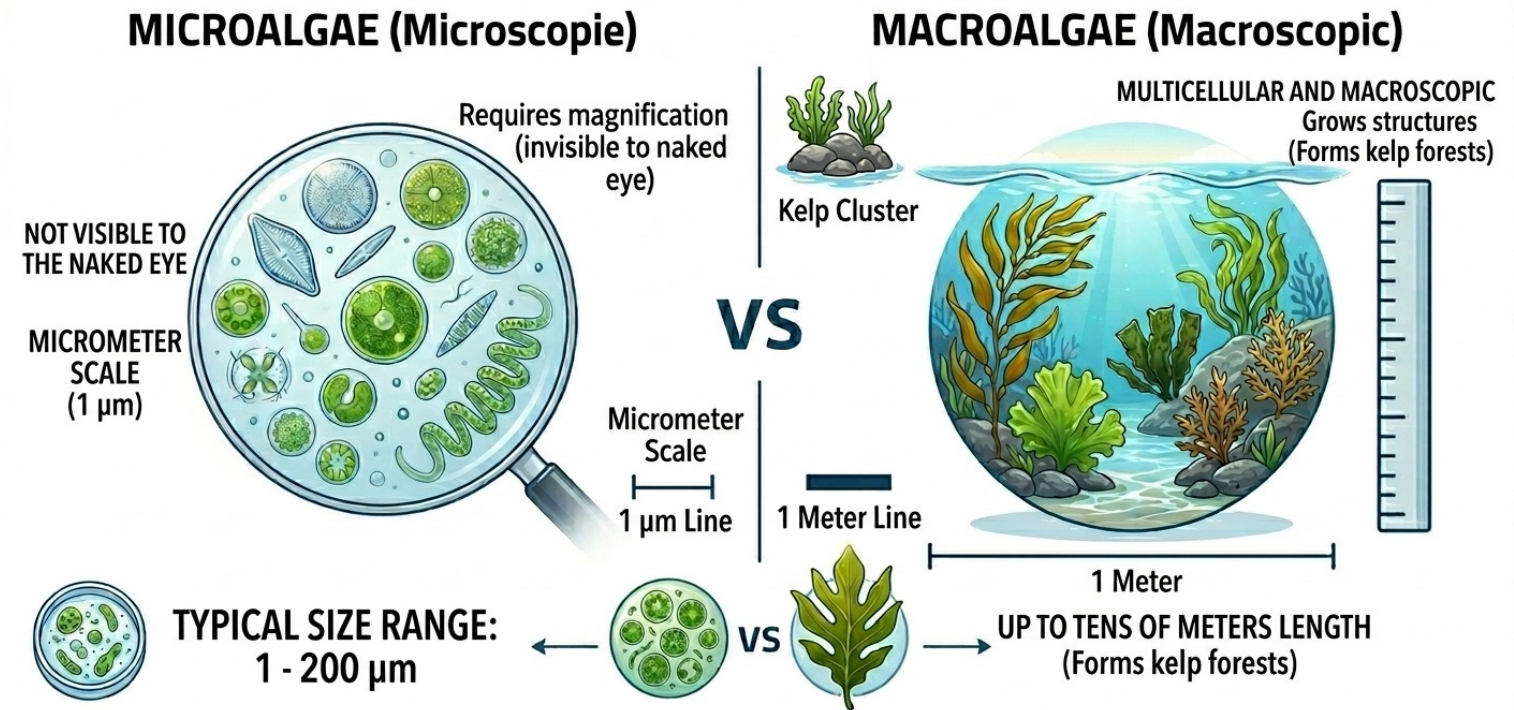
Introduction to Algae

- **Algae** are **photoautotrophs** that **produce oxygen** and **form the base** of many food chains.
- **Cell Type:** All algae are **Eukaryotic**, except for **Cyanobacteria (Blue-green algae)**, which are Prokaryotic.
- **Habitat:** Found in fresh water, marine environments, and moist soil.
- **Pigmentation:** They contain **chloroplasts**. Depending on the **pigments used** for **photosynthesis**, they appear in different colours: Green, Red, or Brown.

- Algae can be divided into **microalgae**, which are microscopic, and **macroalgae**, which are visible to the naked eye.

❖ Why do microbiologists study algae?

- Oxygen production
- Aquatic ecosystems
- Bioindicators
- Biotechnology applications.



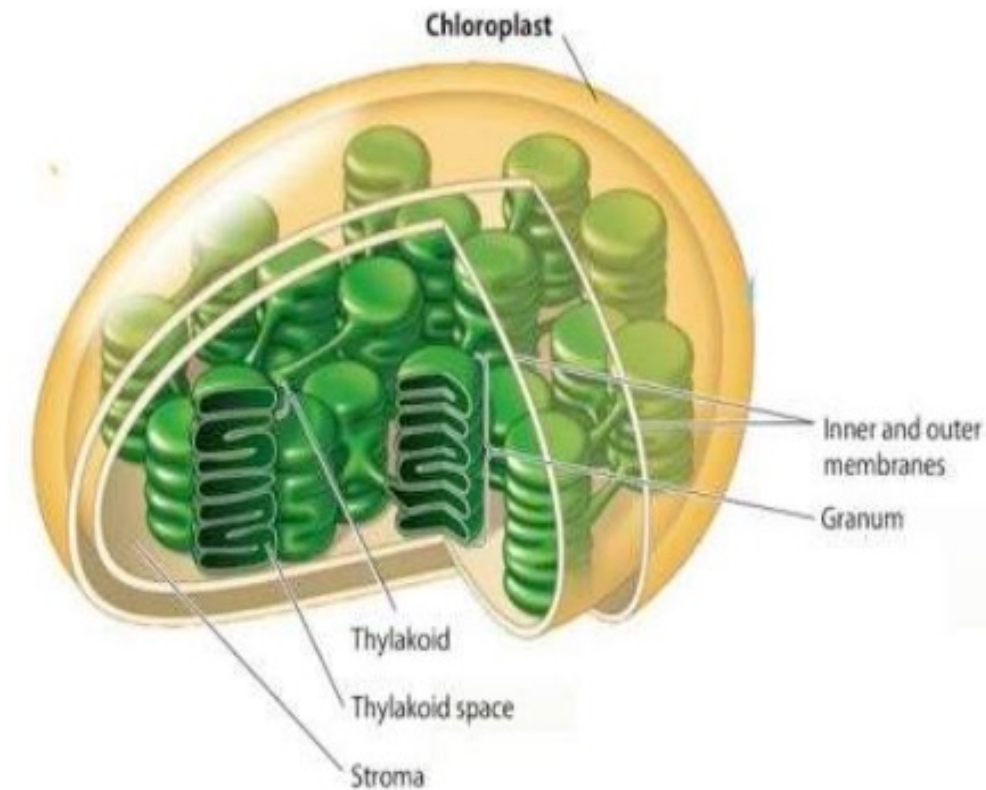
Cellular Organization (Internal Structure)

- Algae cells contain specialized organelles that perform vital life functions:

A. The Chloroplast:

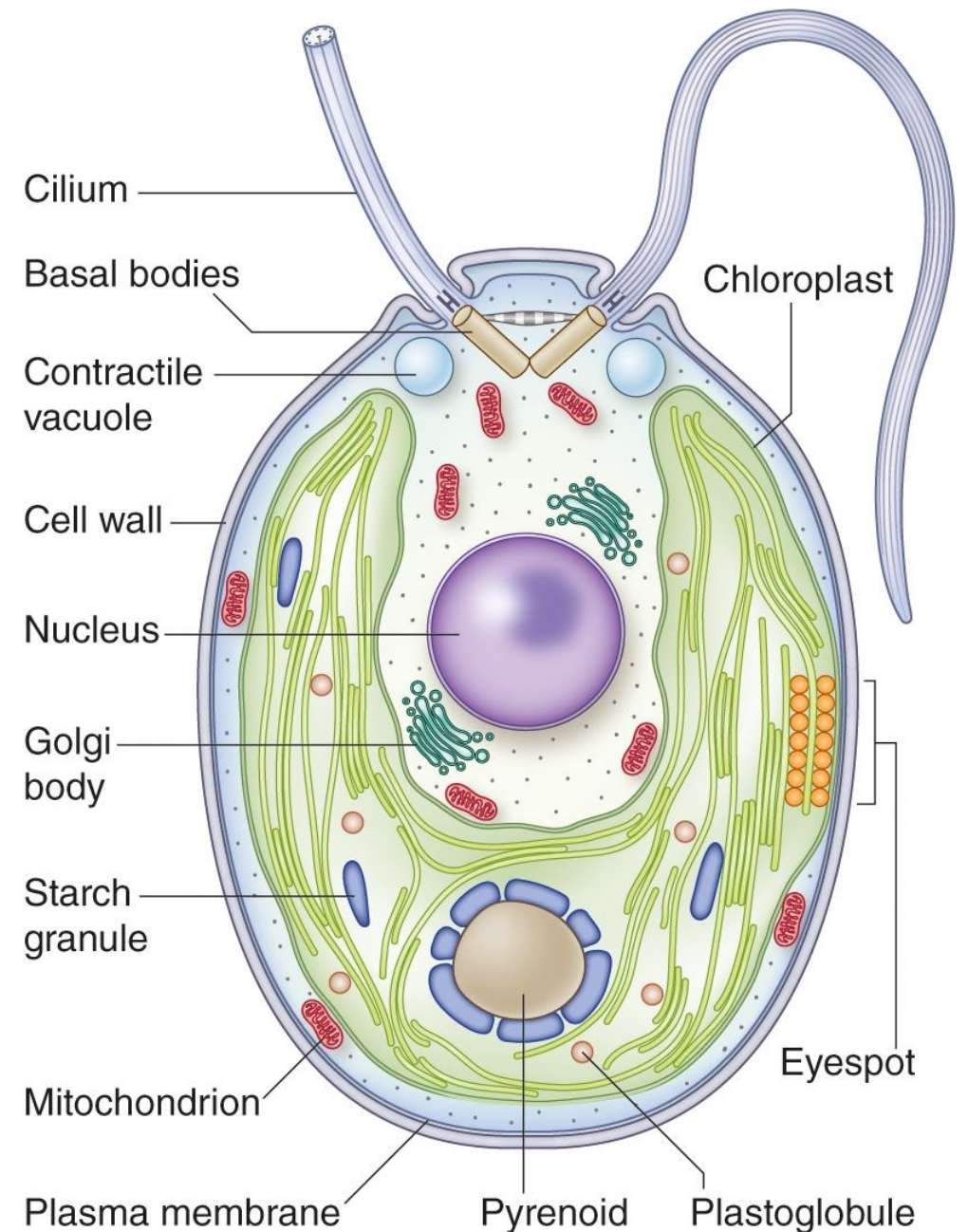
The site of photosynthesis. Its internal structure consists of:

- **Thylakoids:** Flattened membrane sacs containing pigments.
- **Grana:** Stacks or rows of thylakoids.
- **Stroma:** The fluid-filled space surrounding the thylakoids.



B. Specialized Organelles:

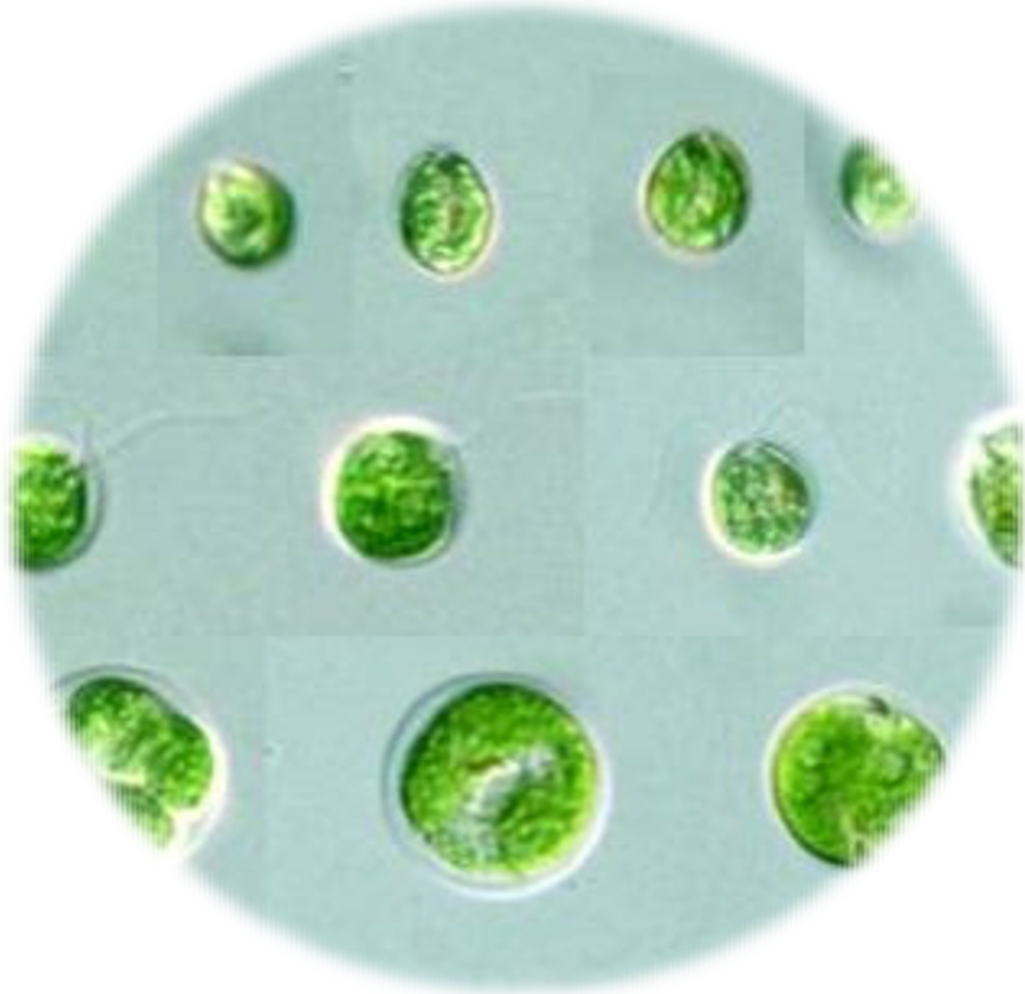
- **Pyrenoid:** A specialized region within the chloroplast that functions as a centre for **CO₂ fixation**.
- **Stigma (Eyespot):** A pigmented part of the chloroplast that helps the cell **detect** and move toward light.
- **Flagella:** Whip-like structures used for **movement** in motile species.
- **Contractile Vacuoles:** Used for **osmoregulation** (regulating water content).



Morphological Characteristics (External Form)

- Algae exhibit a wide variety of shapes and organizational levels:

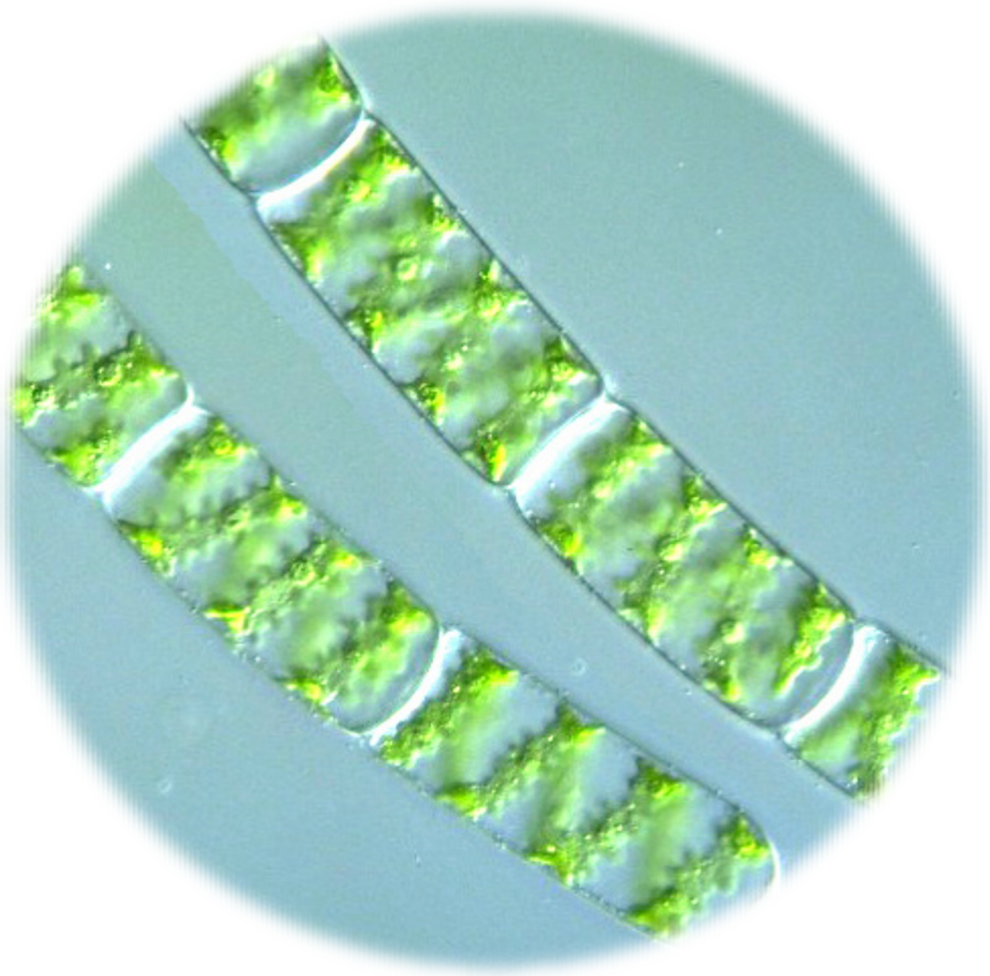
Pattern	Description	Example
Unicellular	Single cells; can be motile or non-motile.	- <i>Chlamydomonas</i> (motile) - <i>Chlorella</i> (non-motile)
Colonial	A group of cells living together in a coordinated way.	<i>Volvox sp.</i>
Filamentous	Cells joined end-to-end to form long, visible chains.	<i>Spirogyra sp.</i>
Coenocytic	Large, single-celled structures without cross-walls (multinucleate).	<i>Vaucheria sp.</i>
Thallus (Leaf-like)	Complex, multi-layered structures resembling leaves.	<i>Ulva sp.</i> (Sea lettuce)
Siliceous	Unicellular with a unique cell wall made of Silica (hydrated silicon dioxide) called frustule	Diatoms (Frustule)



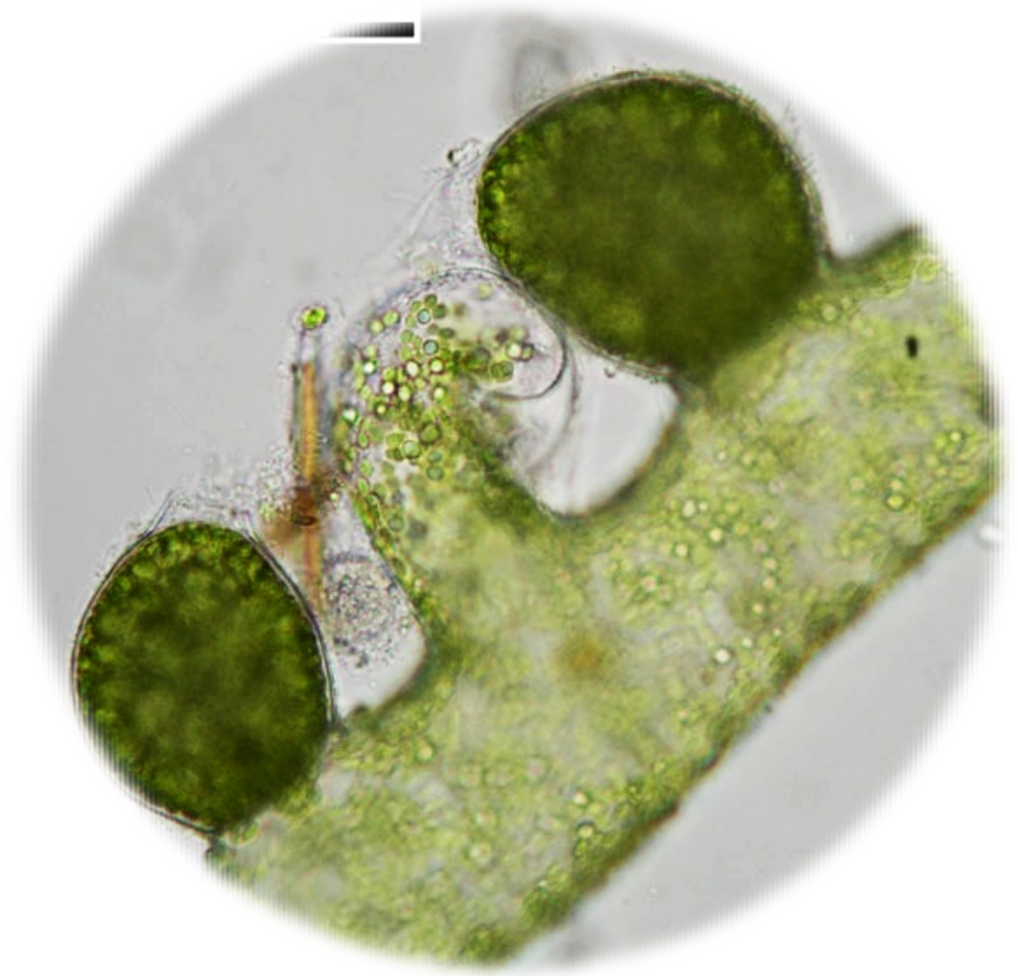
Chlamydomonas sp.



Chlorella sp.



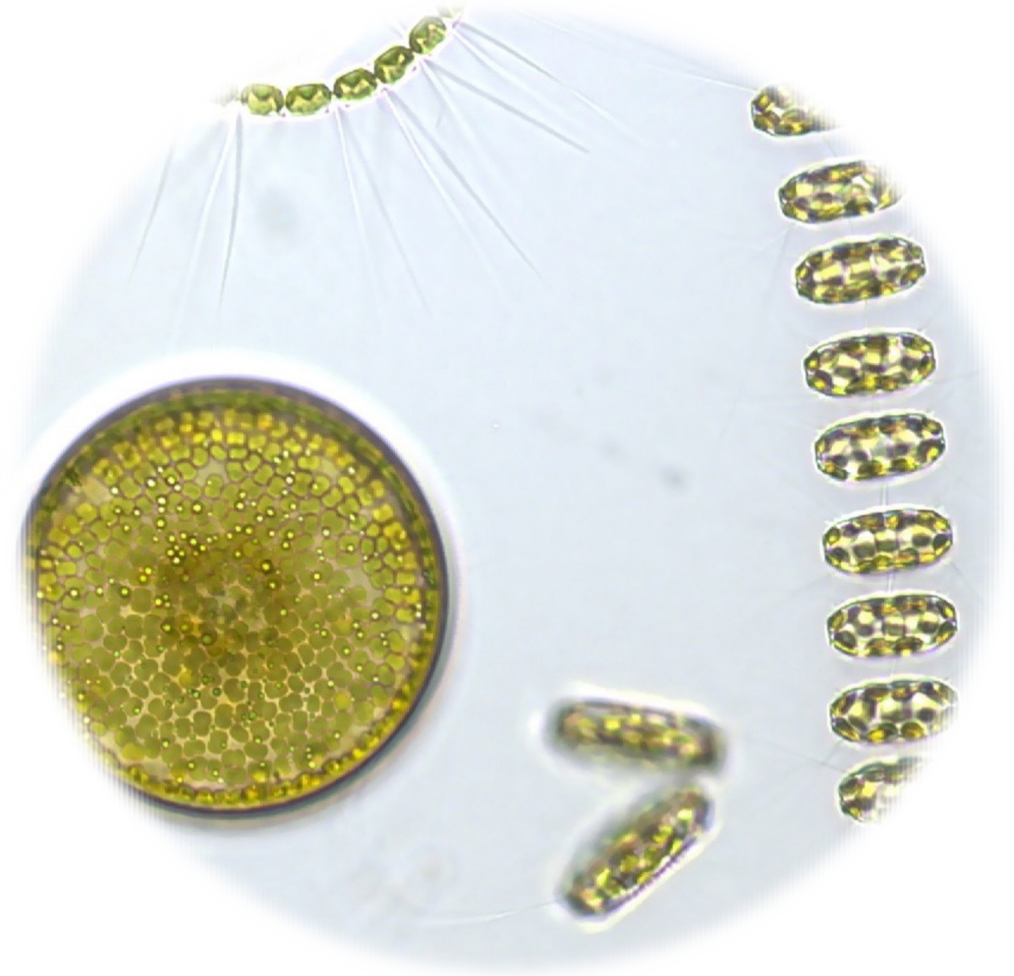
Spirogyra sp.



Vaucheria sp.



Ulva sp. (Sea Lettuce)



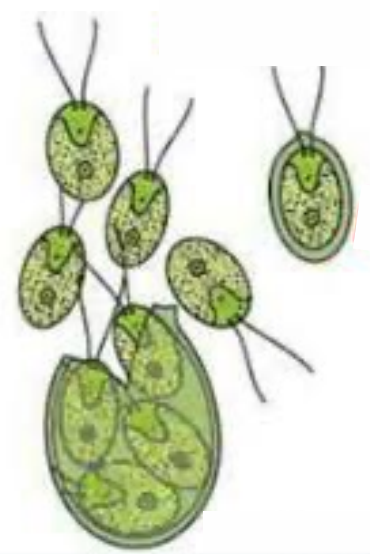
Diatoms (Frustule)

Reproduction

- Algae reproduce through both asexual and sexual methods, depending on the species and environmental conditions:

A. Asexual Reproduction:

- **Fragmentation/Binary division.**
- **Zoospores:** These are motile spores that swim to new locations to grow into new algae after losing their flagella.



B. Sexual Reproduction

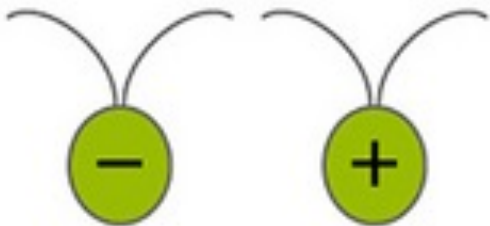
This involves the fusion of **Gametes**, categorized into three types

Isogamy

Identical gametes (both motile).



Chlamydomonas sp.

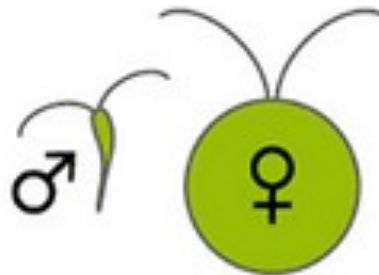


Anisogamy

Gametes of different sizes (both motile).



Eudorina sp.



Oogamy

A small motile male gamete (sperm) and a large non-motile female gamete (egg).



Volvox sp.



"Success in this course comes from practice, attention to detail, and responsibility in the laboratory. Engage actively and make the most of every practical session."

End of the Lab 🧐