

An aerial photograph of an algae cultivation facility. The facility consists of numerous rectangular ponds of varying sizes, separated by concrete or earthen paths. The ponds contain liquids of different colors: some are a deep red or brown, others are a bright yellow, and some are a dark green. The background shows a vast, flat landscape under a clear sky, with some distant structures and a body of water on the horizon.

# INTRODUCTION TO ALGAE

PPT for UG Students prepared by Dr. D. Barman, with the help from google, books and journals.

# Algae vs. **'REAL'plants**

## Similarities and differences:

- Both are photoautotrophic
- Similar metabolic functions to higher plants eg. photosynthesis
- different anatomical structures,
- different reproduction.
- **No true roots, stems leaves.**
- **Non-vascular**, therefore nutrient uptake over surface. And wastes washed away from surface by aquatic environment

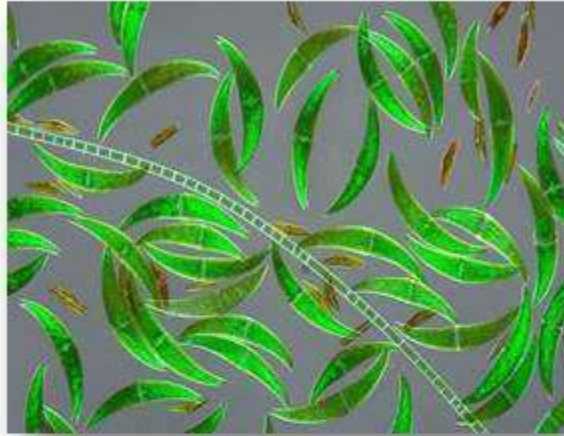


# INTRODUCTION

- *Algae are chlorophyll bearing organisms which are thalloid.*
- *They are important member in plant world.*
- *Plant body shows no differentiation into true tissues.*
- *It never forms true roots, stems and leaves.*
- *This plant body is called thallus.*
- *The thallus is non vascular and thus has a no element for the transport of fluids.*
- *They are active only in very most places.*

*Slide prepared by Dr. D. Barman, Asst professor, Goalpara College*

# ALGAE: THALLUS DIVERSITY



*Desmids*



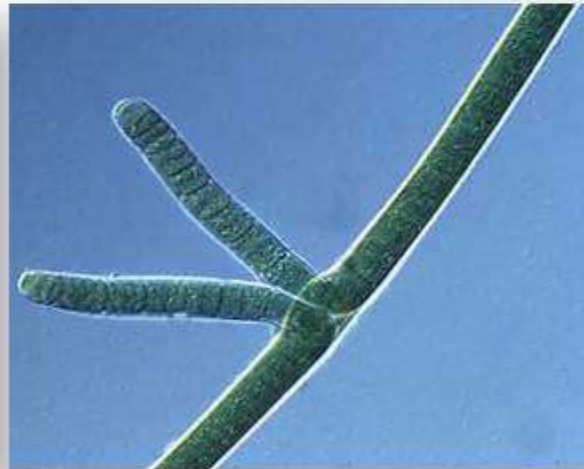
*Cladophora*



*Oscillatoria*



*Spirogyra*

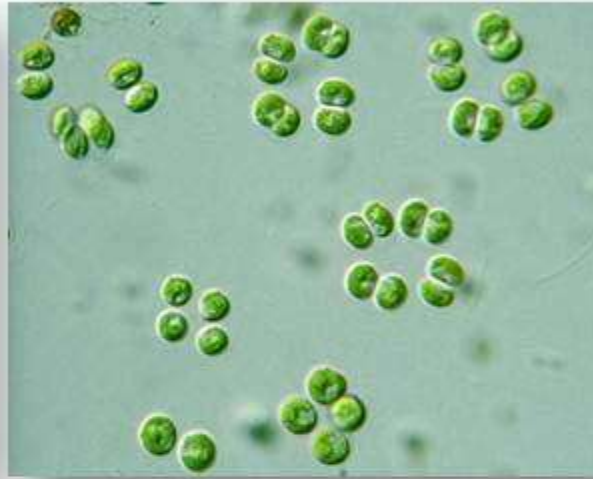
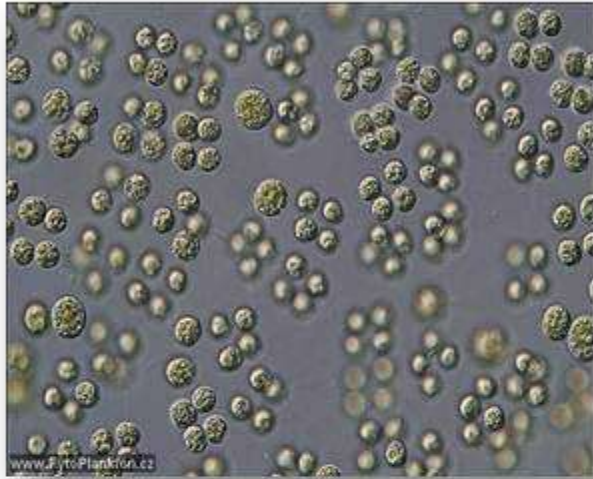


*Scytonema*

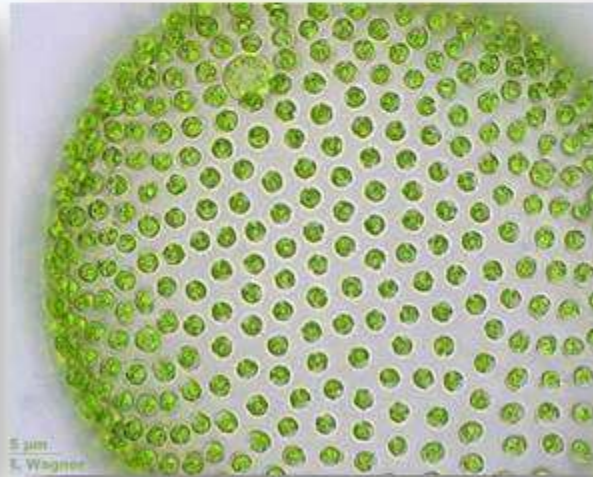
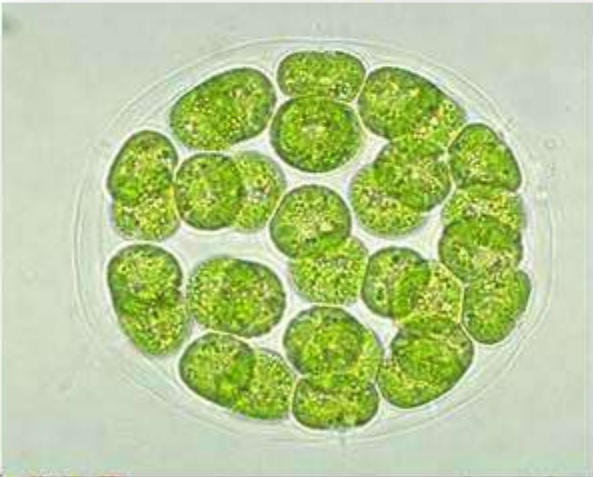


*Cladophora*

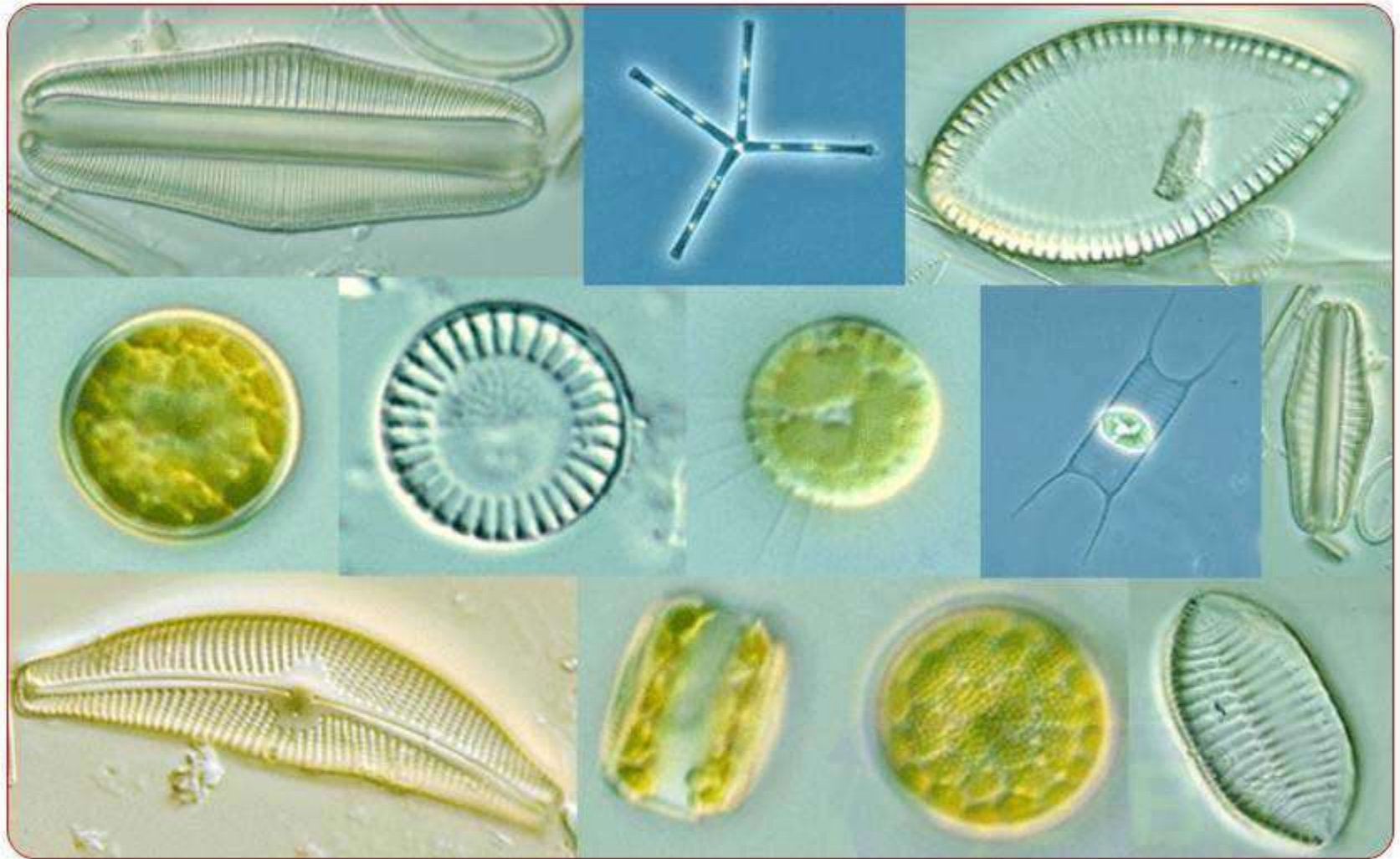
# ALGAE: THALLUS DIVERSITY



## *Colonial Forms*



# ALGAE: THALLUS DIVERSITY



*Diatoms*

# ALGAE: THALLUS DIVERSITY



*Sargassum*



*Macrocystis*



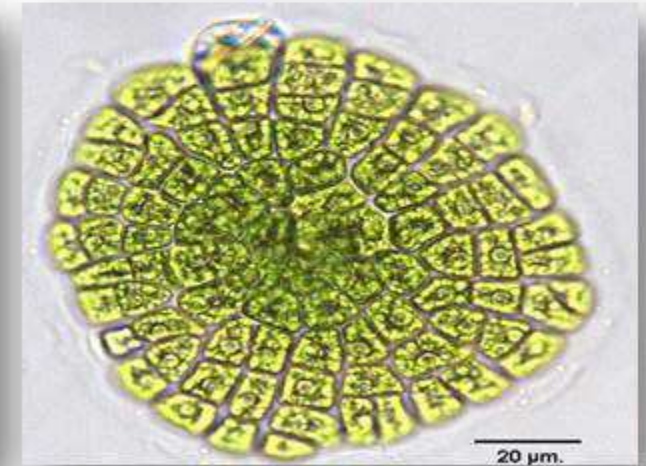
*Fucus*



*Scytosiphon*



*Ulva*



*Coleochaete*

# Habitat/Ecology of Algae

*Algae are almost throughout the world, being most common in aquatic and are found in fresh or salt waters.*

• *Algae can be categorized ecologically by their habitates as follows .*

❖ *Aquatic algae: Example:- Chlamydomonas.*

❖ *Terrestrial algae : Example:- Fritschiella.*

❖ *Aerophytes : Example:- Scytonema.*

❖ *Cryophytes : Example:- Scotiella.*

❖ *Thermophytes : Example:- Oscillatoria brevis.*

❖ *Algae of unusual habit : Example:- Dunaliella*



# Habit and Habitat

## Acquatic Algae

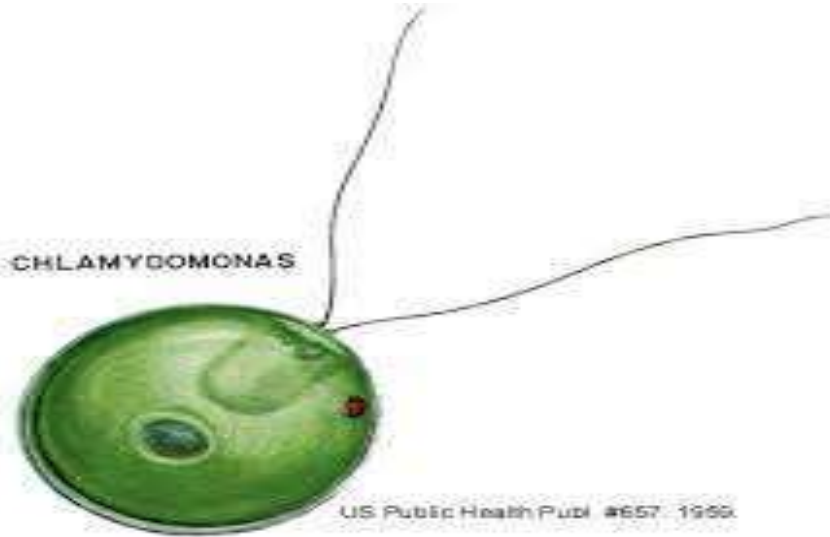
Found from tiniest ditch to the mightiest river and ocean.



# Fresh Water Algae



**Volvox**



**Chlamydomonas**

# Stagnant water algae



**Oedogonium**

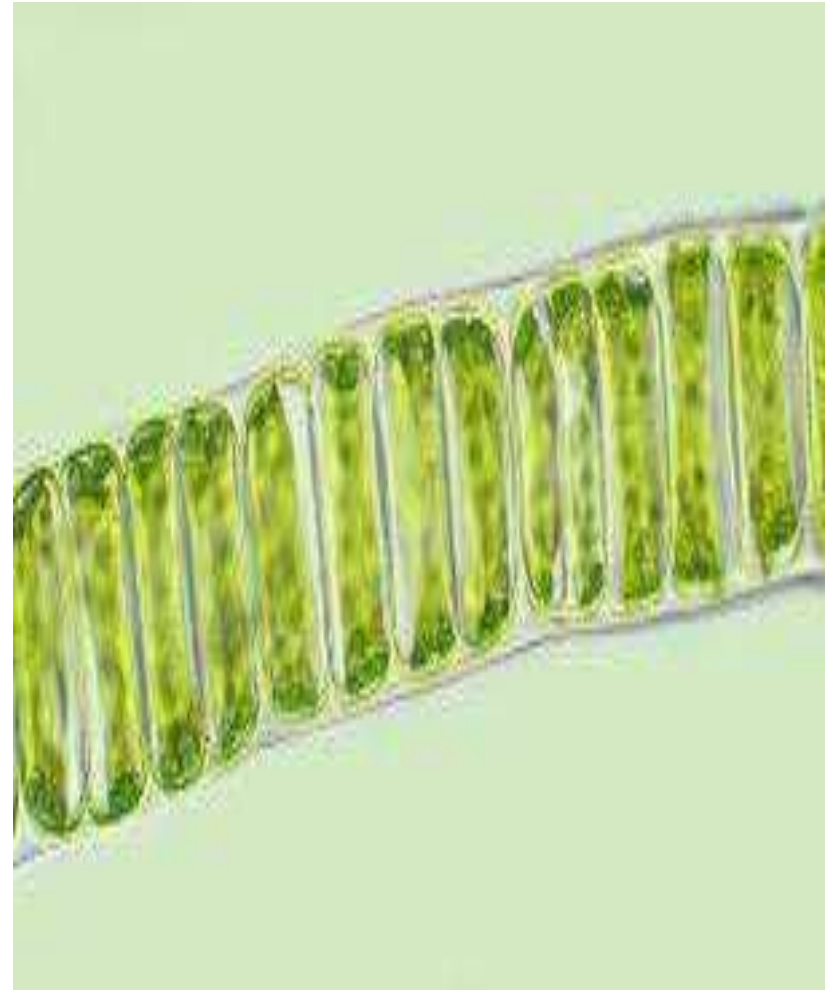


**Chara**

# Running water algae



**Cladophora**



**Ulothrix**

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# Sea Water Algae



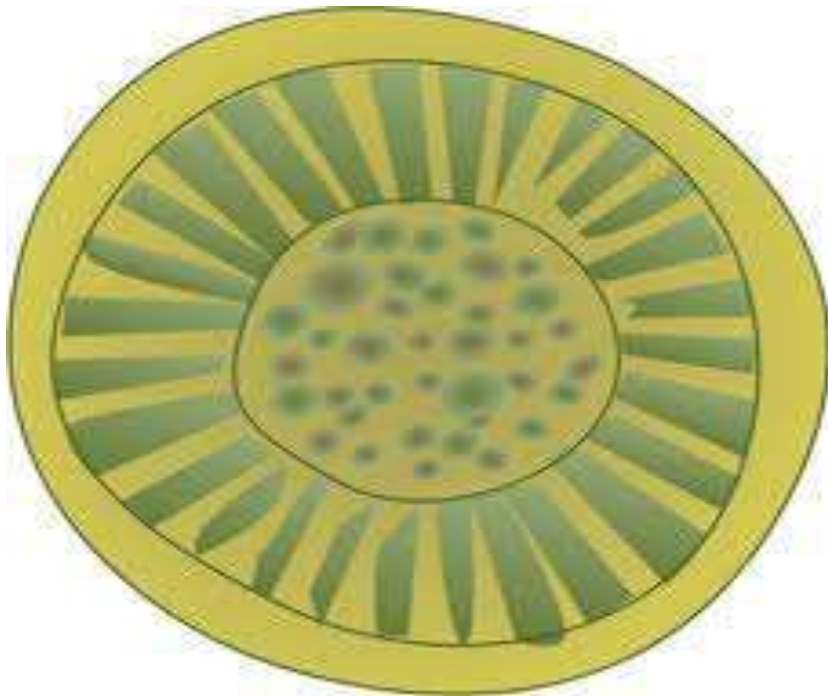
**Ectocarpus**



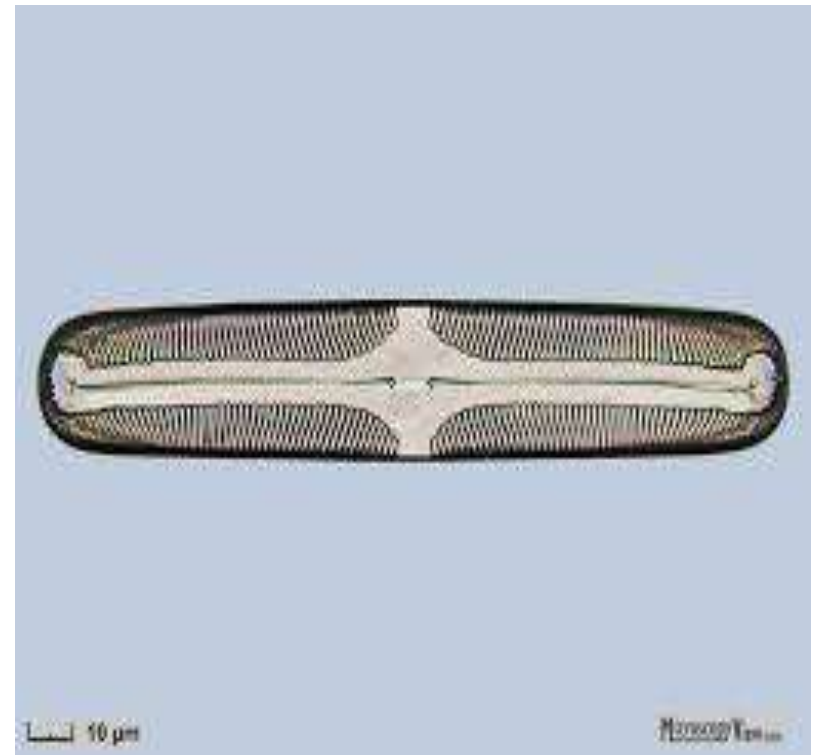
**Porphyra**

# Planktonic Algae

These are found free floating or freely swimming in water.



**Cyclotella**



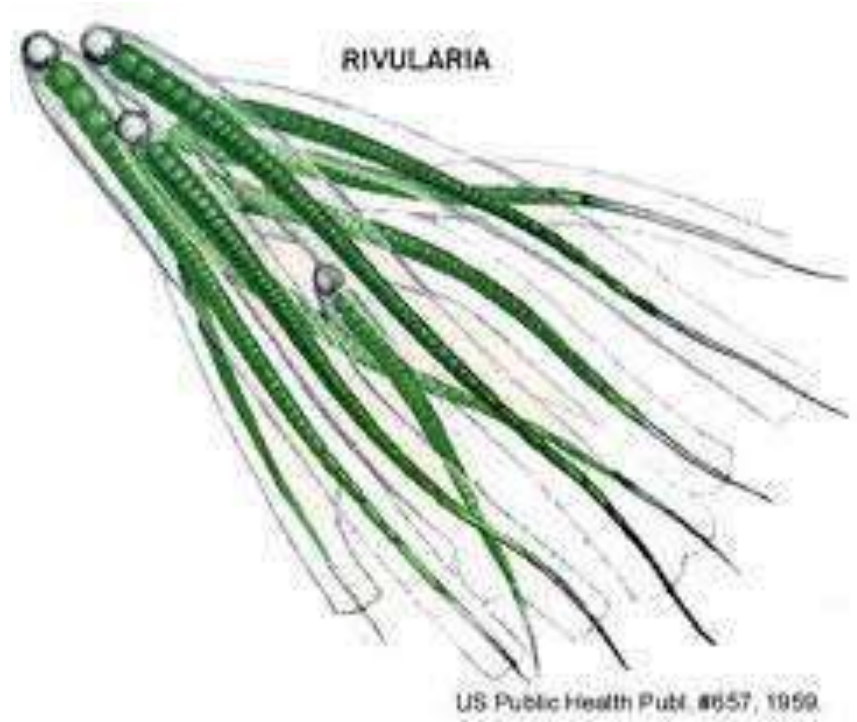
**Diatom**

# Tycho plankton

Beginning they get attached but later they get detached.



**Cylindrospermum**



**Rivularia**

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# Terrestrial Algae

These are found on or beneath the soil surface.  
Example: Trentifolia sp.





# AEROPHYTES

They are adapted to the aerial life, occur on tree trunks, moist walls, flower pots, rocks..etc



**Phormidium**

# Cryophytes(snow algae)

Found on mountain peaks with snow.



**Haemococcus nivalis**



**Chlamydomonas stonensis**  
( green Colour)

# Thermophytes

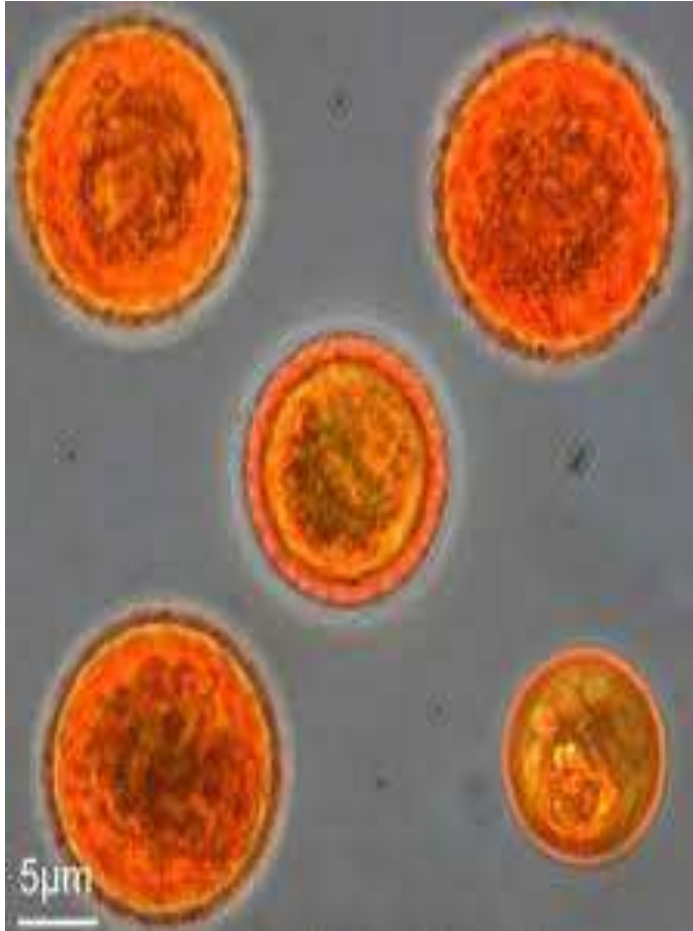
Hot springs, tolerate temperature upto 85c.



**Haplosiphon lignosus**

# Halophytic Algae

They are present in water containing high percentage of salt.



**Haplosiphon salina**



# Lithophytes

Found on moist rocks and rocky surfaces.



**Gleocapsa**



**Rivularia**

# Epiphytic Algae

The algae grow on other plants.



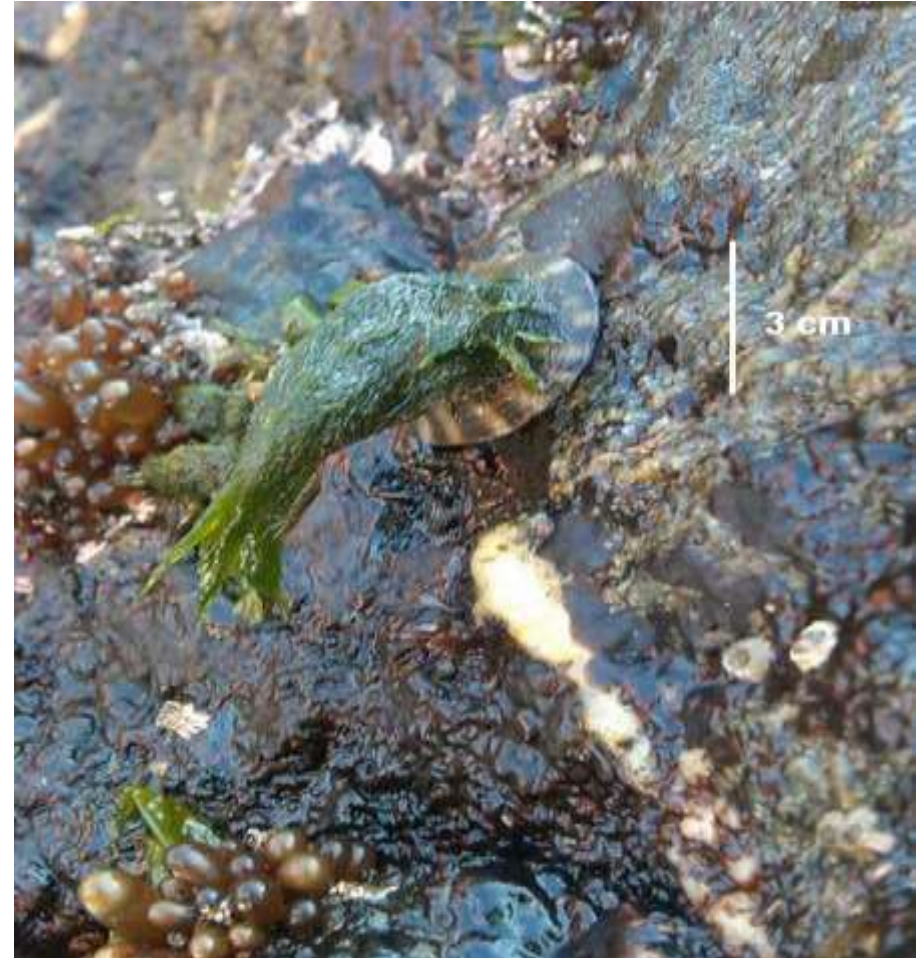
**Ceplaleuros**



**Audourinella**

# Epizoic Algae

These algae are found on shells of molluscs, turtles and fins of fishes. Example: *Acrosiphonia*.



# Endozoic Algae

These are found inside the body of aquatic animals.

Example: Zoochlorella found  
inside the *Hydra Viridis*





# Parasitic Algae

Eg: *Cephaleuros virescens* causes 'Red rust of tea', by which a severe damage is caused.

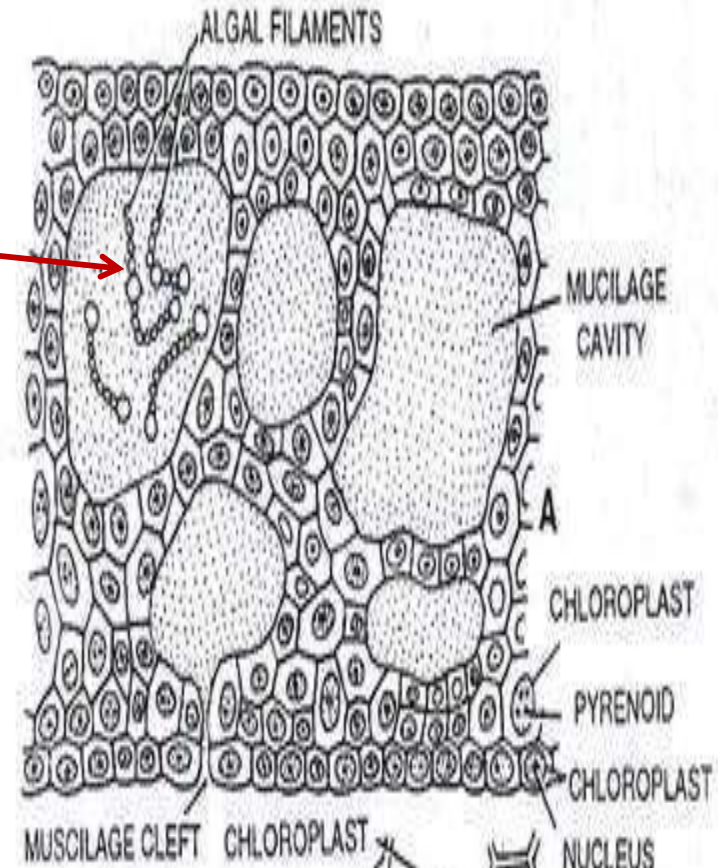


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# Symbiotic Algae

Many Cyanophycean members grow in symbiotic association with other plants.

Association of Nostoc within thalli of Anthoceros.



# Distribution

- *Algal abundance and diversity vary from one environment to the next.*
- *Abundance and diversity vary from tropical to deserts.*
- *Terrestrial vegetation is influenced most by precipitation and temperature .*
- *Aquatic vegetation is influenced by light and nutrients.*
- *When nutrients are abundant as in some polluted waters, algal cells numbers can become great enough to produce patches of algae called blooms.*

# ALGAE: GENERAL CHARACTERS



*Oscillatoria* Thallus

- A group of chlorophyll containing thalloid plants
- **Thallus**: undifferentiated plant body
- Not differentiated into true roots, stem and leaf or leaf like organ
- Placed in the division **Thallophyta** along with Fungi and Lichens
- Most of algae are autotrophs (synthesize food using light energy)
- Differ from fungi:
  - Presence of photosynthetic pigment - chlorophyll
  - Mode of nutrition (autotrophs)



# ALGAE: GENERAL CHARACTERS

- **Habitat:** majority are aquatic, Universal occurrence
- Sex organs are unicellular
- Sex organs lack jacket cells around them
- If jacket cells are present, they have different origin
- There is a progressive complexity in reproduction
- Embryos is not formed after zygote formation
- Show distinct alternation of generation
- Cellular organization may be prokaryotic or eukaryotic



# ALGAE: GENERAL CHARACTERS



## (3). Algae of unusual habitat:

- **Halophytic algae:** found in highly saline water (*Dunaliella*)
- **Epiphytic algae:** on surface of other plants/algae (*Oedogonium*)
- **Epizoic algae:** on animals - snails, fishes (*Cladophora* grow on snails)
- **Endozoic algae:** grow inside animals (*Zoochlorella* inside *Hydra*)
- **Symbiotic algae:** Symbiotic association with fungi in lichen, in bryophytes, pteridophytes, gymnosperms and angiosperms.
- **Parasitic algae:** parasite on plants/animals (*Cephaleuros* red rust)
- **Thermophytic algae:** grow in hot springs. (*Heterohormogonium*)



# ALGAE: GENERAL CHARACTERISTICS

## *Pigmentation in algae:*

- Great diversity in pigmentation of algae
- Different groups of algae have different pigments
- Distribution pattern of pigments has great taxonomic significance
- All major algal groups have at least one characteristic pigment
- Pigments in algae belongs to three major categories:

1. *Chlorophylls*

2. *Carotenoids*

3. *Phycobilins*



# ALGAE: GENERAL CHARACTERISTICS

## *Plastids in algae:*

- Except Cyanophyceae (blue green algae, BGA) pigments in algae are found in membrane bound organelles called plastids
- In BGA, plastids are absent, pigments located at peripheral cytoplasm (chromoplasm)
- Plastids are two types:
  - Leuoplast: - Colourless plastids
  - Chromoplast: - Coloured plastids

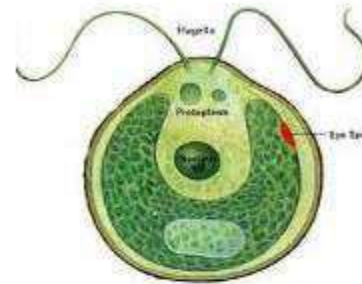




# ALGAE: GENERAL CHARACTERISTICS

## *Plastid forms in algae:*

- Cup shaped: *Clamydomonas*, *Volvox*
- Discoid: *Voucheria*, *Chara*
- Girdle shaped: *Ulothrix*
- Reticulate: *Oedogonium*, *Hydrodictyon*, *Cladophora*
- Spiral: *Spirogyra*
- Stellate: *Zygnema*



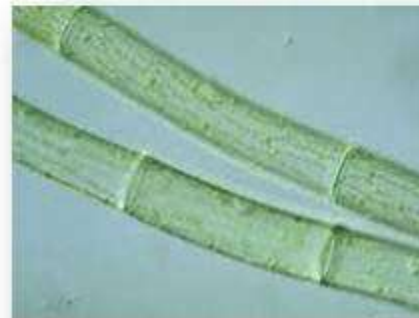
*Clamydomonas*



*Voucheria*



*Ulothrix*



*Oedogonium*



*Spirogyra*



*Zygnema*



# ALGAE: GENERAL CHARACTERISTICS

## *Reserved food materials in algae:*

- ❖ Also called as food reserve
- ❖ Stored form of food function as an important store of energy that can be released and used in ATP production when required.
  - ❖ **Cyanophyceae:** cyanophycean starch
  - ❖ **Chlorophyceae:** Starch
  - ❖ **Rhodophyceae:** Floridean starch
  - ❖ **Phaeophyceae:** Laminarin, manitol and oil



*“The life of the planet began the long, slow process of modulating and regulating the physical conditions of the planet. The oxygen in today's atmosphere is almost entirely the result of photosynthetic living, which had its start with the appearance of blue-green algae among the microorganisms”*

*Lewis Thomas, 1984*

Thank you

