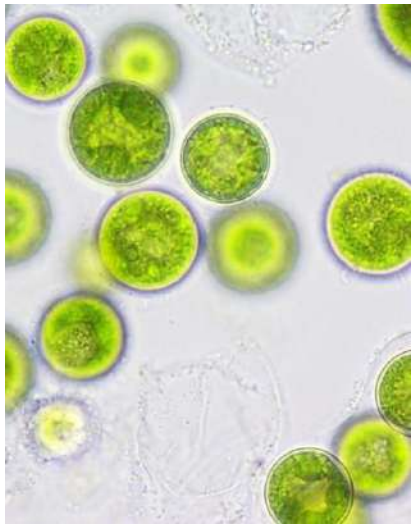
Lab 8: Introduction to the ALGAE

MADEHA AL-ONAZI

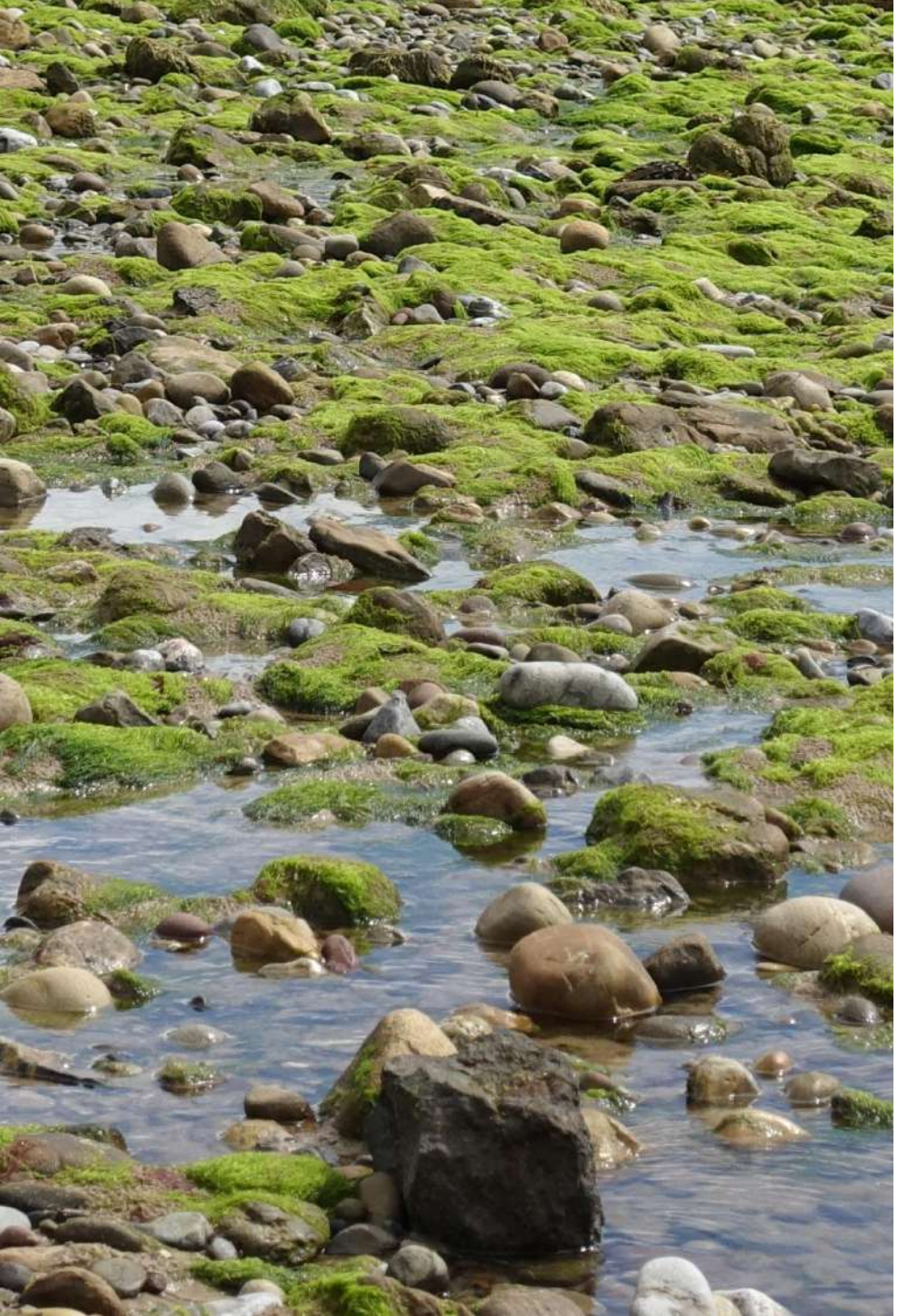


Definition

- **Algae** are eukaryotic organisms, Some algae Prokaryotic (cyanobacteria).

- Most algae are photoautotrophic and carry on photosynthetic (meaning they use sunlight and chlorophyll to make food).

- At one time, algae were thought to be plants, but are not because they lack roots, stems and leaves.



Characteristics

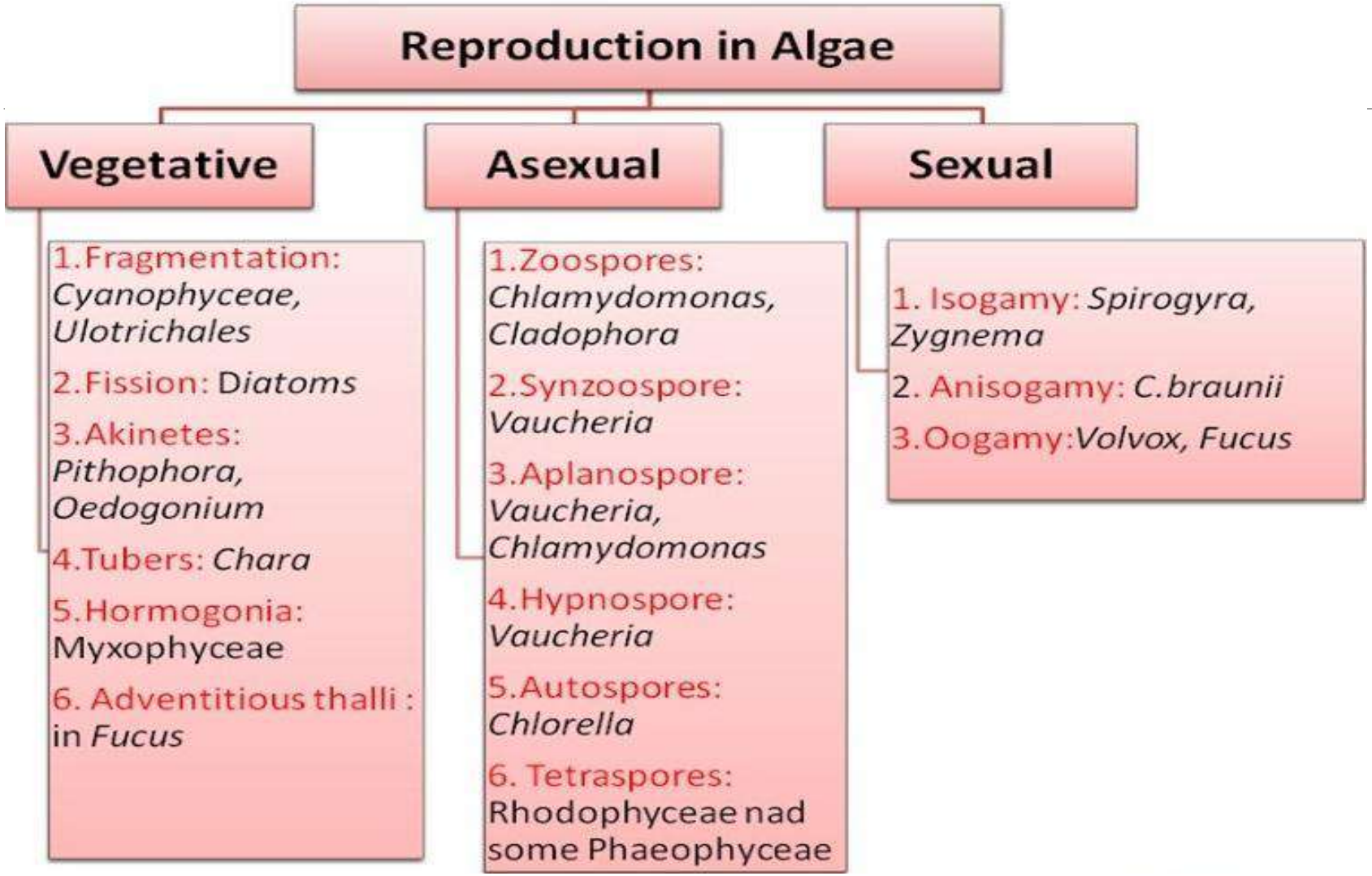
- Range in size from microscopic to single celled organisms to large seaweed.

- Most are free-living in fresh and marine water – **plankton.**

- May or may not have flagella.

- Contain chloroplasts with **chlorophyll** and other **pigments**.

- Often contain **pyrenoids,** organelles that synthesis and store starch.

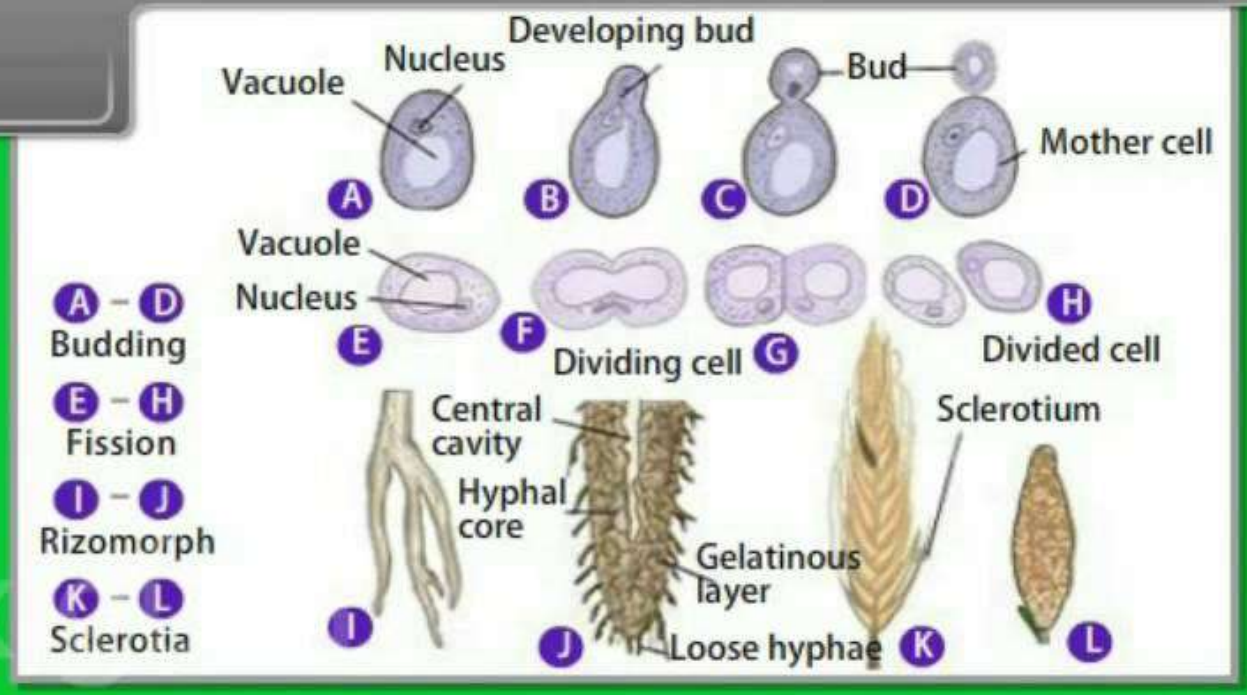

Reproduction in Algae
Vegetative
Asexual
Sexual
1.Fragmentation: Cyanophyceae, Ulotrichales
2.Fission: Diatoms
3.Akinetes: Pithophora, Oedogonium
4.Tubers: Chara
5.Hormogonia: Myxophyceae
6. Adventitious thalli : in Fucus
1.Zoospores: Chlamydomonas, Cladophora
2.Synzoospore: Vaucheria
3.Aplanospore: Vaucheria, Chlamydomonas
4.Hypnospore: Vaucheria
5.Autospores: Chlorella
6. Tetraspores: Rhodophyceae nad some Phaeophyceae
1. Isogamy: Spirogyra, Zygnema
2. Anisogamy: C.braunii
3.Oogamy:Volvox, Fucus

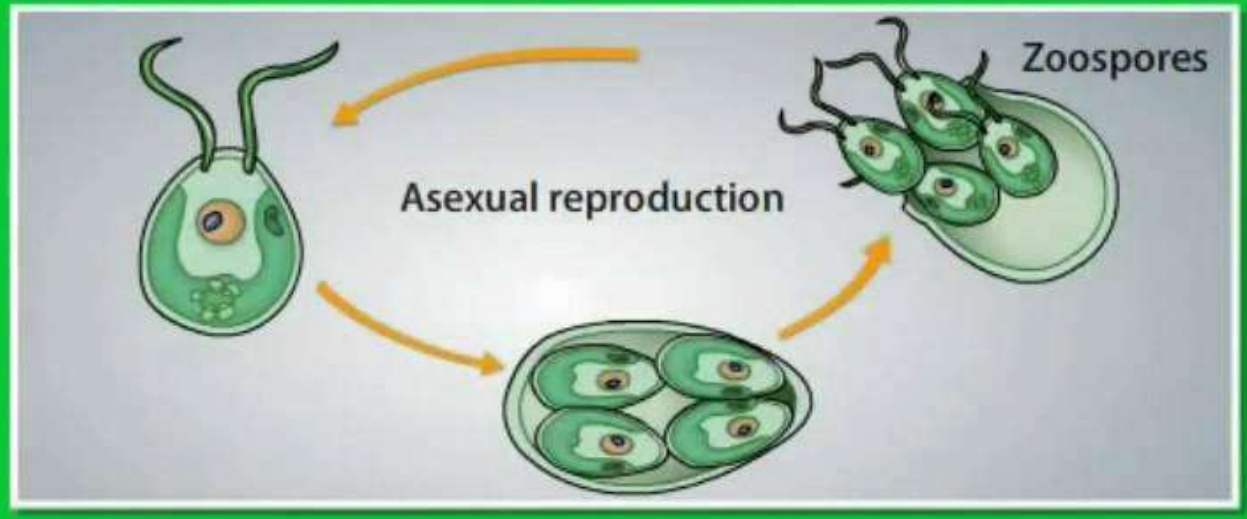
Algae

Reproduction in algae is by vegetative, asexual and sexual methods.

Vegetative reproduction takes place by fragmentation. Each fragment develops into a thallus.

Asexual reproduction is by the production of different types of spores, the most common being the zoospores. Zoospores are flagellated (motile) and on germination gives rise to new plants.

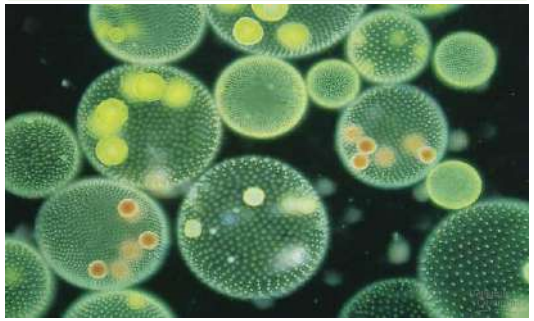


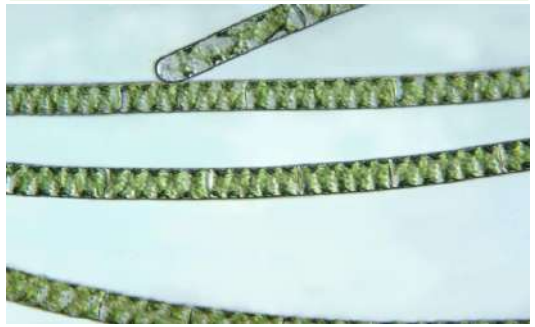


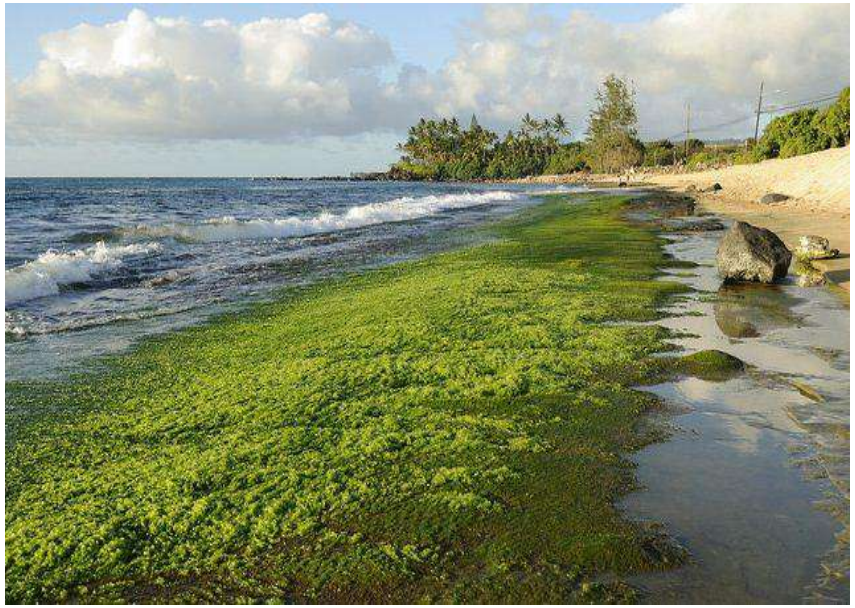
STRUCTURE

- Four types of algae

Unicellular	Colonial	Filamentous	multicellular
Chlamydomonas •	Volvox •	Spirogyra •	Ulva sp. •







Where can Algae live ?

- Soil → *Nostoc sp.*
- Sea water → Diatoms
- Fresh water → *Volvox sp*

Algae Classification

- According to five kingdome classifiction system whish was suggested by Ropert wittaker in 1969. the 5 kingdoms were (monera , protista , plants ,animals ,fungi).

- So algae included in kingdome monera wich contains cyanophyta or blue green algae and kingdom protista which contains all other groups of algae.

Classification of algal division based on:

1-Biochemical criteria:

A-pigments.

B-storage products.

C- cell wall composition.

2-Morphological criteria.

3-genetic differences.

4-many can survive desiccation for several years

Kingdome

Division

Monera

(Cyanobacteria)
Cyanophyta.

Protista

A. Euglenophyta

B. Chlorophyta(Green algae)

C. Chrysophyta (yellow-green)

D. Bacillariophyta(diatoms)

E. Phaeophyta (brown algae)

F. Rhodophyta (red algae)

Cyanobacteria or Blue-green algae

- Cyanobacteria are prokaryotic, Prokaryotic means they don't have a membrane-bound nucleus, mitochondria or other type of membrane-bound organelle (like true algae do).

- Cyanobacteria also contain other pigments such as the phycobiliproteins which include **phycocyanin (blue),** allophycocyanin (blue) and sometimes phycoerythrine (red).

- Cyanobacteria also has the ability to **fix nitrogen**, therefore, the bacteria plays a significant role in the nitrogen cycle as well as in the cycles of oxygen and carbon.

- Example:

E.X: Nostoc Sp.

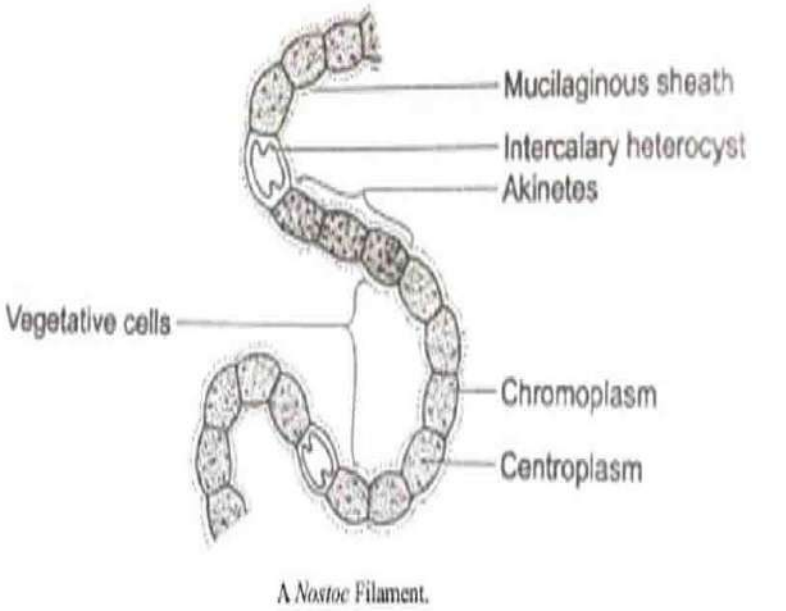
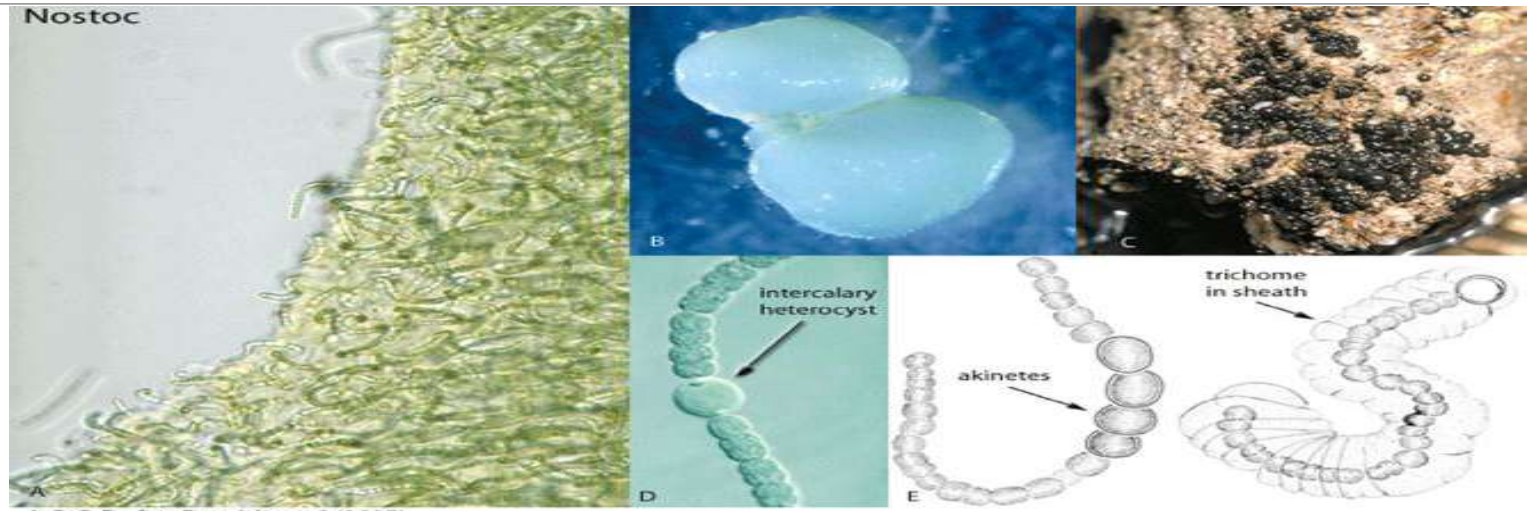
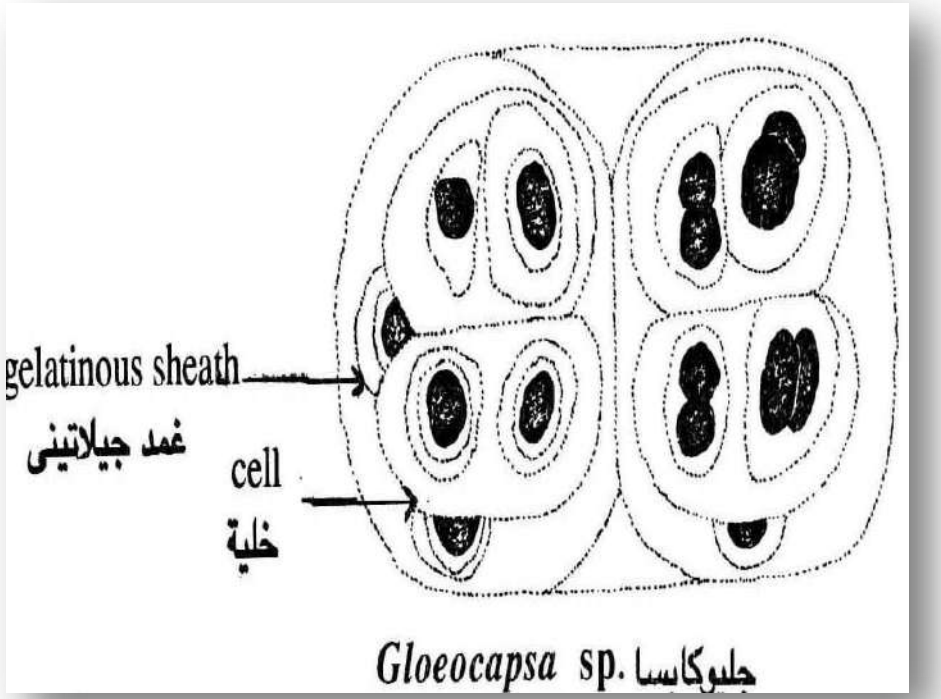


fig: nostoc filament



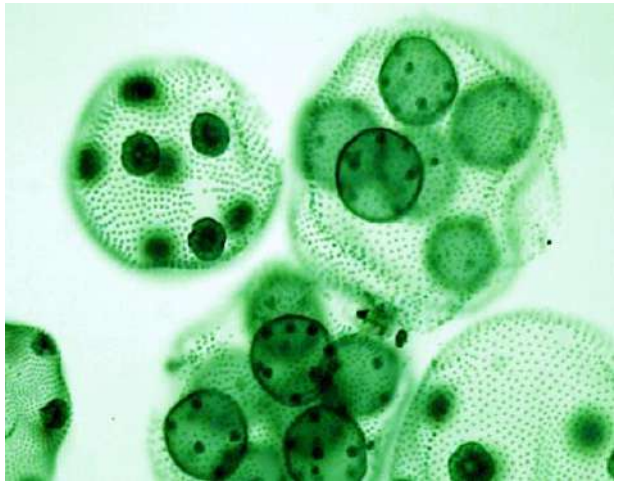
A, B, C, D after Entwisle et al. (1997)
E © Royal Botanic Gardens & Domain Trust. Artist S. Skinner.

Gloeocapsa sp.



2- Kingdom: Protista

1- Division: Euglenophyta
2- Division: Chlorophyta
3- Division: Bacillariophyta
4- Division: Xanthophyta
5- Division: Charophyta
6- Division: Phaeophyta
7- Division: Rhodophyta

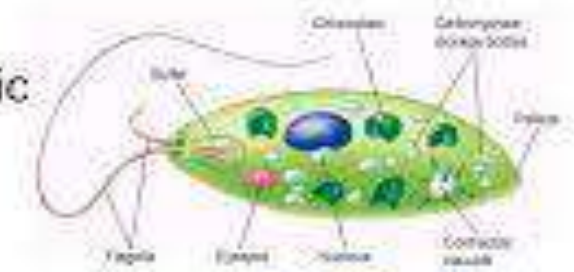


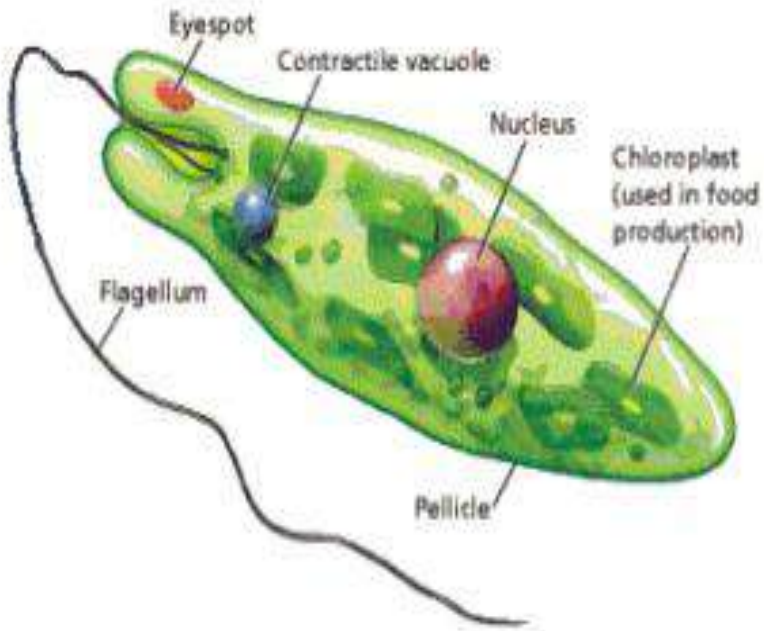
Euglenophyta

Phylum Euglenophyta

- 2 Flagella - Live in Ponds
- Unicellular
- No Cell Wall
- Autotrophs
- Heterotrophs - when sun is not available

Unique characteristic
Red Eye Spot





E.X: <u>Euglena Sp.</u>

Chlorophyta (Green Algae)

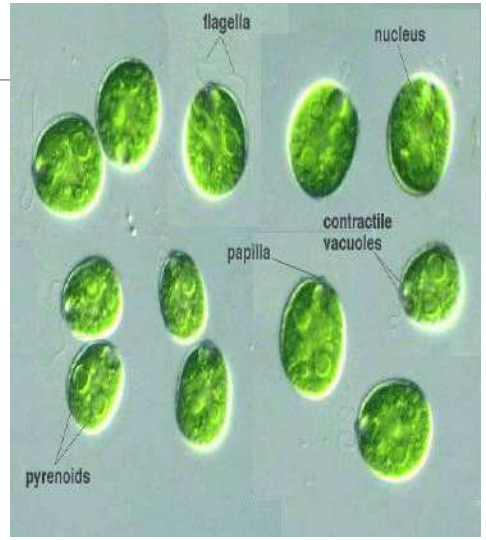
- The green algae include unicellular and multicellular algae. They have cell walls made of cellulose and pectin.

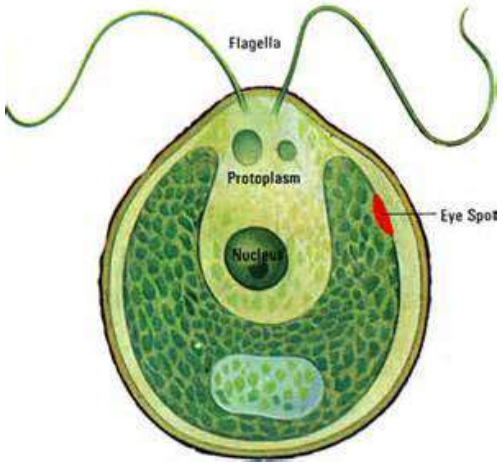
- Pigments: Chlorophylls *a*, and *b.*

- They are mostly fresh water.

- Food is reserve starch which is stored in pyrenoids.

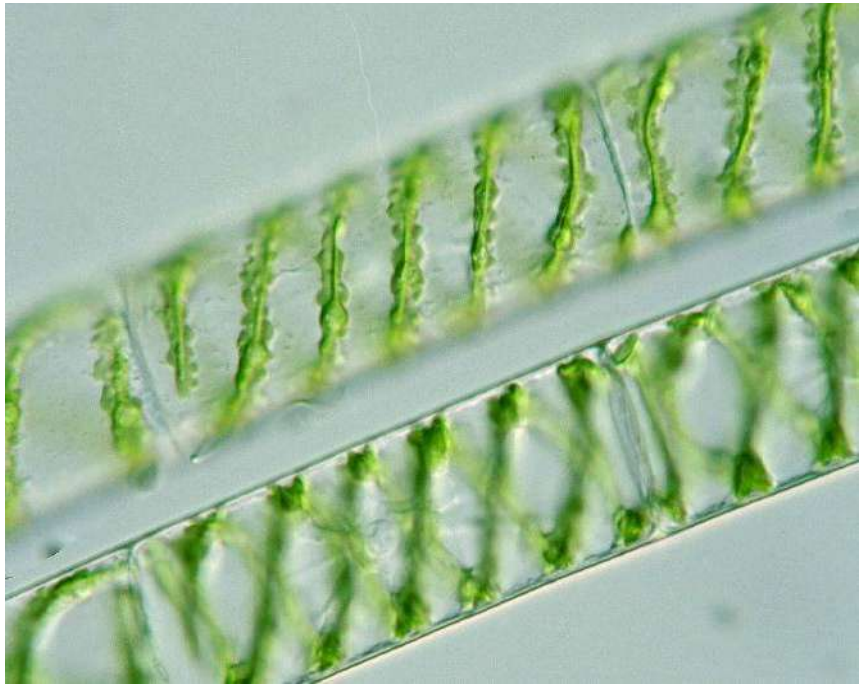
Example: **Chlamydomonas sp.**

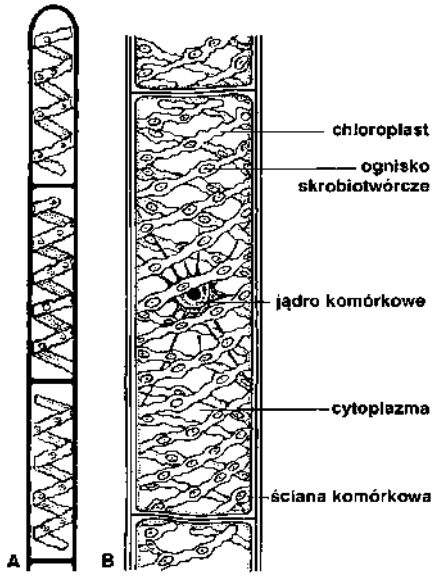


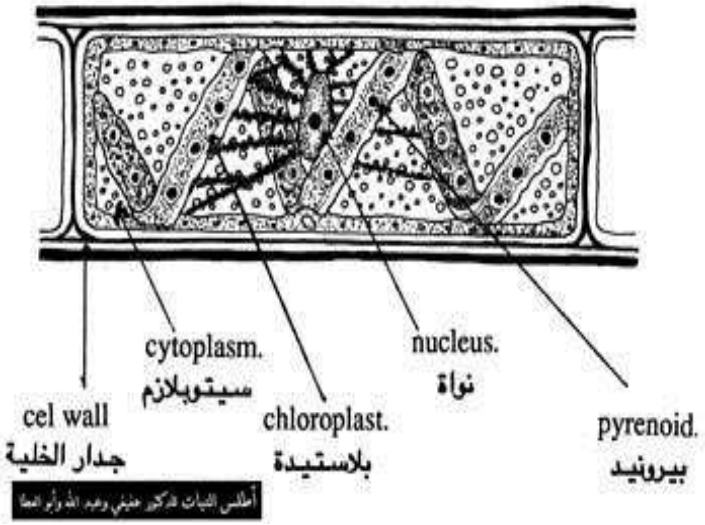


Chlorophyta (Green Algae)

Spirogyra sp

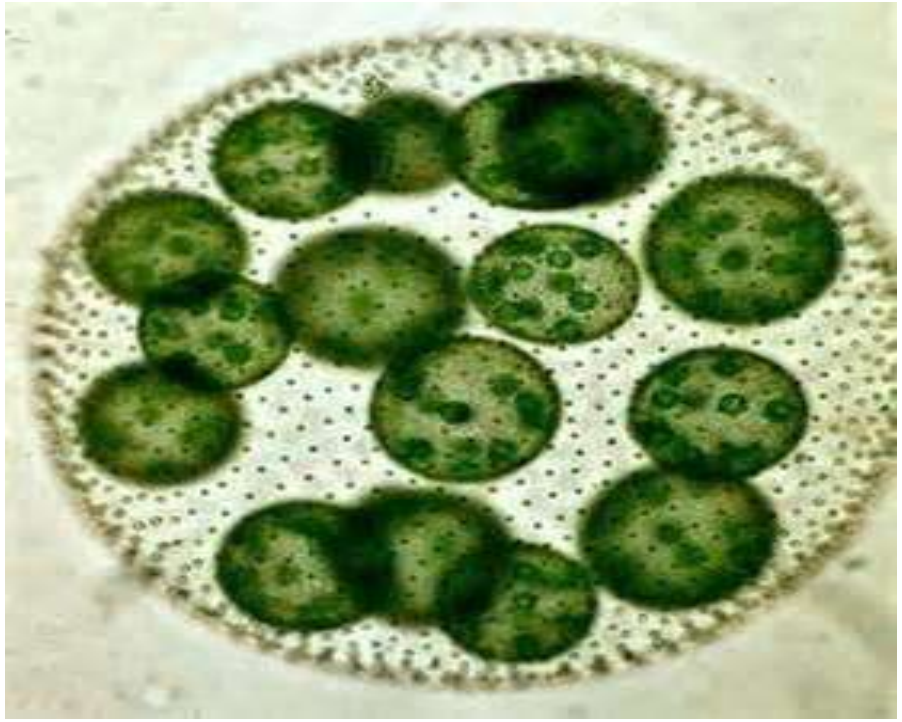


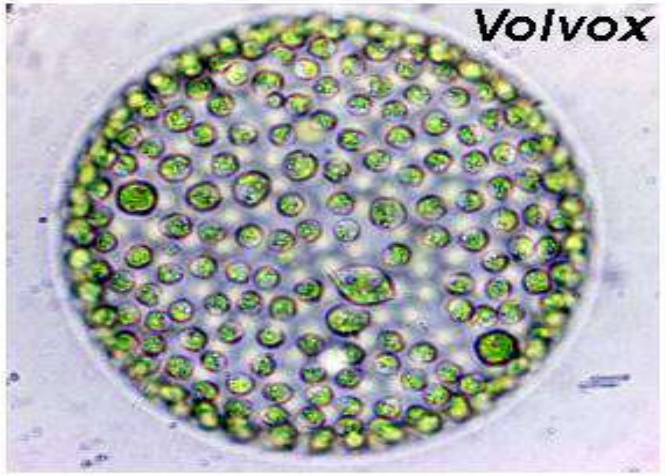


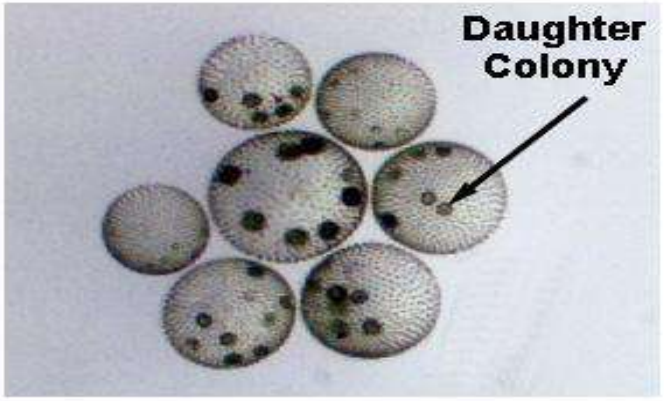


Chlorophyta (Green Algae)

Volvox sp.







Chlorophyta (Green Algae)

Hydrodictyon sp.

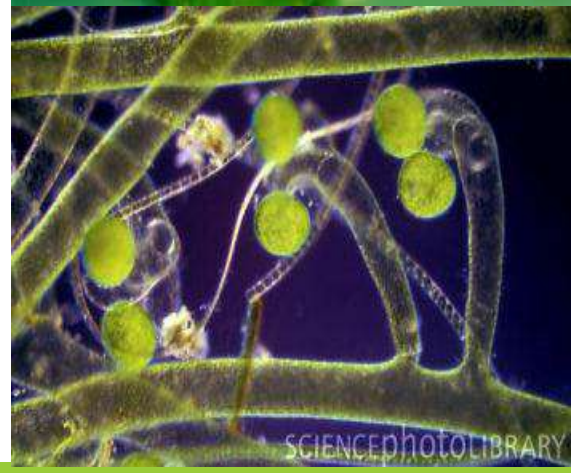
Chryophyta (Xanthophyceae or yellow-green algae)

- Chrysophytes (Chrysophyceae, Heterokontophyta) are mainly unicellular or colonial golden-brown algae.

- most of them are found in fresh waters.

- chloroplasts contain large amounts of the pigment fucoxanthin.

- Vaucheria sp. species are characterized by multinucleate **tubular** branches that lack cross walls.



Diatoms

Bacillariophyceae- diatoms

- Characteristics
  - Unicellular, colonial.
  - Chlorophylls A & C, fucoxanthin.
  - Food reserve- chrysolaminarin in vesicles.
  - Thylakoids in 3.
  - Eukaryotic nucleus.
  - No flagella, or 1 tinsel on male gamete.
  - Cell wall is silica and made of 2 frustules.
- Habitat- **marine** and freshwater.
- 100,000 species.
- Examples- Acnanthes, Bacillaria, Licmophora, Navicula, Coscinodiscus.

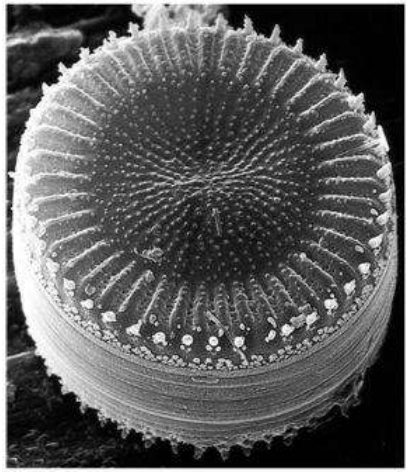
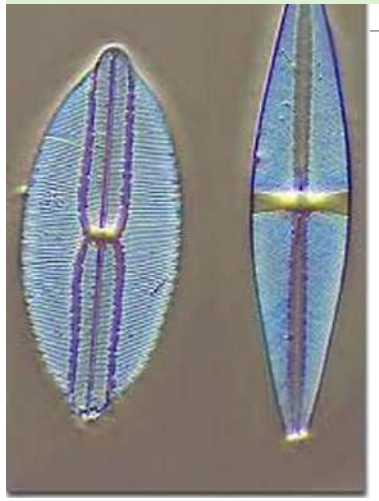
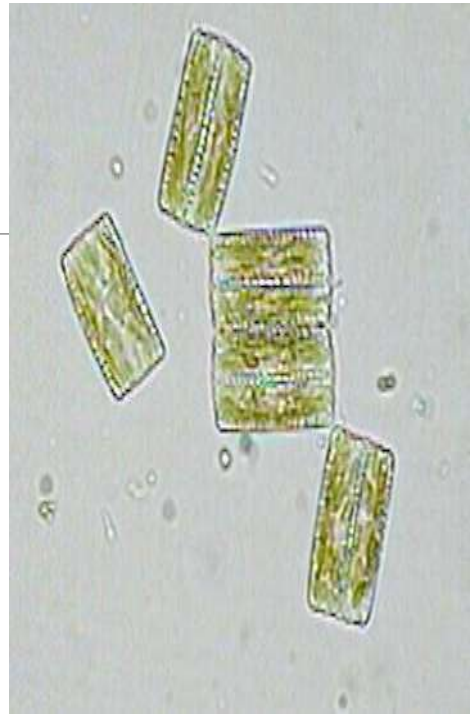


Figure 15-20d
Biology of Plants, Seventh Edition
© 2005 W. H. Freeman and Company

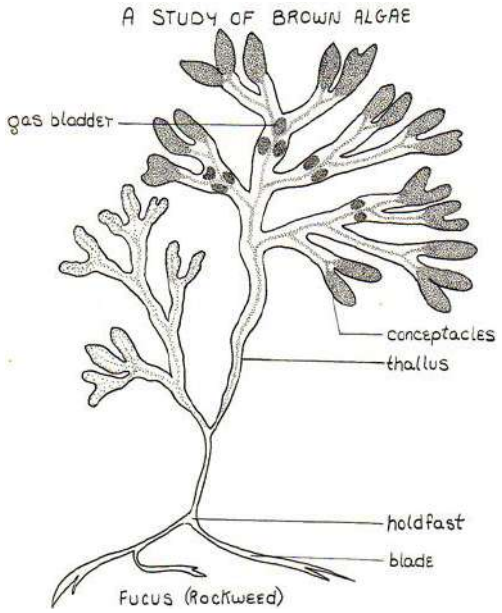




Phaeophyta (Brown Algae)

- Brown algae are multicellular.
- They grow on rocks in shallow water of the sea.
- Large brown algae are called **kelps**. Kelps may grow densely in the sea and form kelp forests. They form important food sources for fish and invertebrates.
- The brown algae growing on rocks are known as rockweed.
- Example of rockweed is *Sargassum*. Algin is a substance derived from some algae which is used in making ice cream, lotion and plastics.

Phaeophyta (Brown Algae)

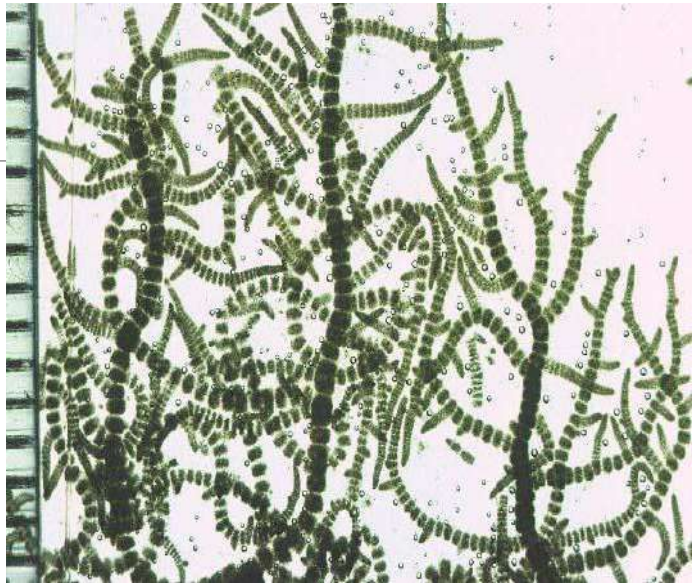


E.X: Fucus sp.

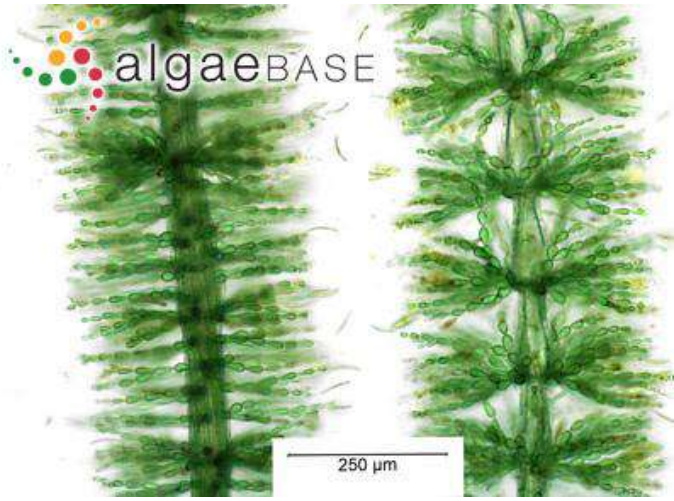
Phaeophyta (Brown Algae)

Sargassum sp.

Rhodophyta (Red Algae)



- Red algae are mostly large and multicellular.
- They grow in oceans.
- Carragean and agar are glue-like substances in red-algae. Agar is used as a medium used for growing bacteria and other organisms under laboratory conditions.
- Agar is also used to make gelatin capsules. and a base for cosmetics.
- Carragean is used as a stabilizer and thickener in dairy products. It is also used to give toothpaste its creamy texture



E.X: Batrachospermum sp.

Observe a variety of Algae under the microscope.

Draw a labelled diagram of each slide observed in the class.
(Take the help of the book or different websites)