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Algal Structure

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2014

The Structure of Algae

- ▶ Most are Eukaryotes
- ▶ Phycology= Study of Algae

Algae

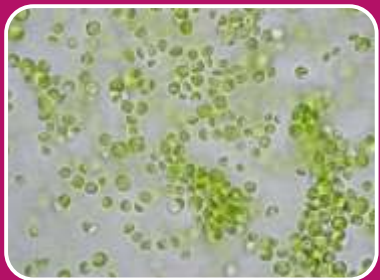
- ▶ All algae are eukaryotic.
- ▶ Found in freshwater, marine, and moist soil habitats.
- ▶ Photoautotrophs that produce oxygen (except for the water molds, which are fungus-like chemoheterotrophs).
- ▶ Contain chloroplasts (which are structures that generate energy for the cell).
- ▶ The pigment used for photosynthesis can even vary, resulting in algae that appear green, red, or brown.

Algae



Macroalgae

- e.g. Seaweed



Microalgae

- e.g. *Chlorella*

Algae

- ▶ How are algae similar to higher plants?
- ▶ How are algae different from higher plants?

Similarities

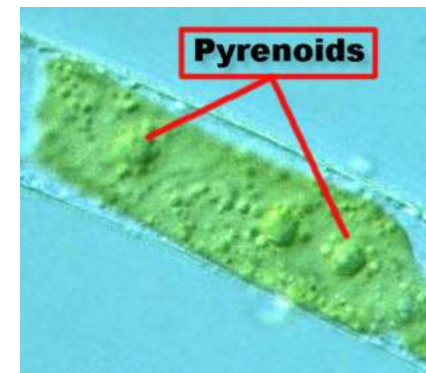
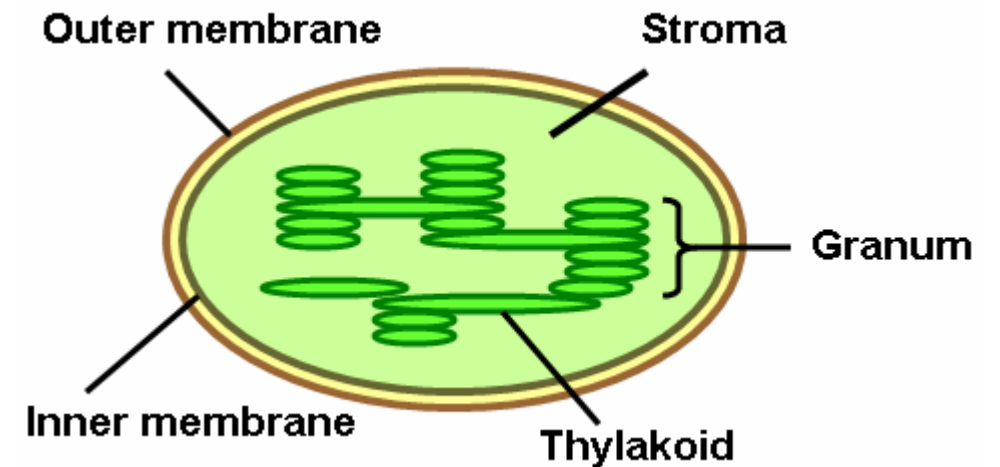
- ▶ Presence of cell wall- mostly cellulosic. Most green algae have a cellular wall, with cellulose content ranging up to 70% of the dry weight. While marine, red, and brown algae the cellulose content is rather low.
- ▶ Autotrophs/primary producers- carry out photosynthesis.
- ▶ Presence of chlorophyll a.

Differences

- ▶ Algae lack the roots, stems, leaves, and other structures typical of true plants.
- ▶ Algae don't have vascular tissues- non vascular plants.
- ▶ Variations in pigments.
- ▶ Variations in cell structure- unicellular, colonial, and multicellular.

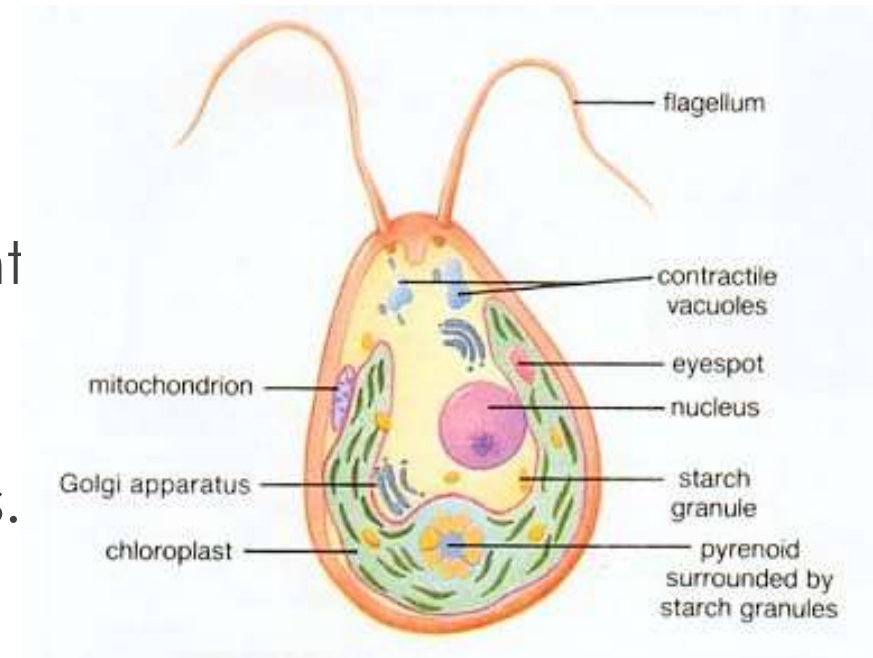
Eukaryotic Algae Structure

- ▶ Eukaryotes.
- ▶ Distinct chloroplast, nuclear region, and complex organelles.
 - ▶ Thylakoids are grouped into grana.



Cellular organization

- ▶ Flagella – organs of locomotion.
- ▶ Chloroplast- site of photosynthesis. Thylakoids are present in the chloroplast. The pigments are present in the thylakoids.
- ▶ Pyrenoid- structure associated with chloroplast. It contains carboxylase, proteins, and carbohydrates.
- ▶ Eye-spot- part of chloroplast. It directs the cell towards light.



Reproduction

3 types

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graph TD; A[3 types] --> B[Vegetative cell divisions/Fragmentation-]; A --> C[Asexual reproduction-]; A --> D[Sexual production-];
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Vegetative cell divisions/Fragmentation-

Part of the filament breaks off from the rest and forms

Asexual reproduction-

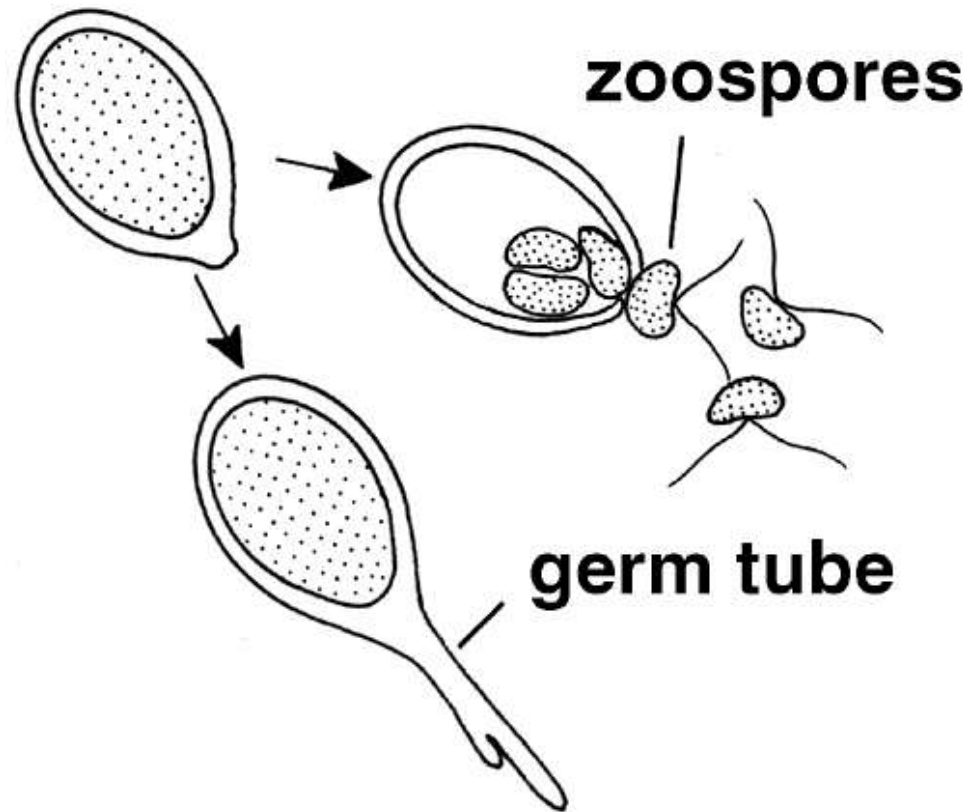
Zoospores after losing their flagella, forms new filaments. No sexual fusion.

Sexual production-

Gametes

Asexual reproduction

sporangium



Sexual reproduction

- ▶ **Isogamy**- Both have flagella and similar size and morphology.
- ▶ **Anisogamy**- Gametes
- ▶ **Oogamy**- gametes with flagella (sperm) fuses with a larger, non-flagellated gamete (egg).

Morphological Characteristics

▶ **Unicellular Algae:**

- ▶ Motile
- ▶ e.g. *Chlamydomonas sp.* , *Euglena sp.*
- ▶ Non-motile
- ▶ e.g. *Chlorella sp.*

▶ **Multicellular Algae:**

- ▶ Colonial
- ▶ e.g. *Volvox sp.*

Morphological Characteristics

▶ **Filamentous Algae:**

- ▶ Single algae cells that form long visible chains.
- ▶ e.g. *Spirogyra sp.*

▶ **Coenocytic Algae:**

- ▶ Composed of one large cell without cross-walls.
- ▶ e.g. *Vaucheria sp.*

Morphological Characteristics

▶ **Multicellular Algae:**

- ▶ Have large, complex, leaf-like thallus.
- ▶ e.g. *Ulva sp.*

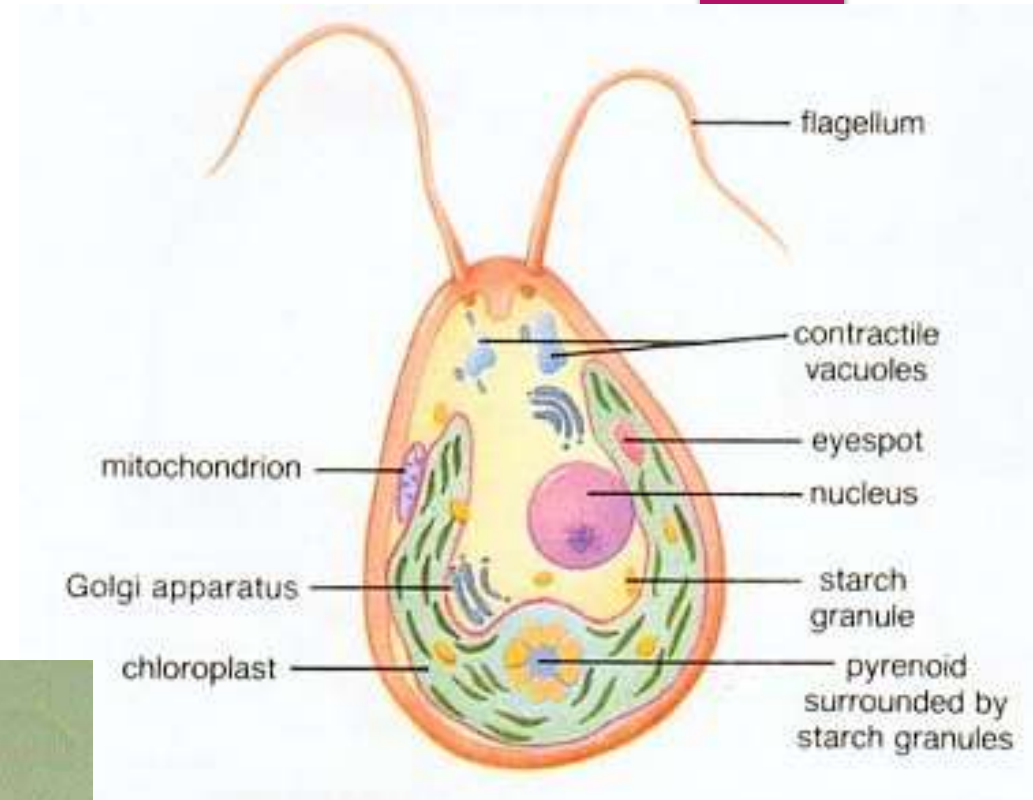
▶ **Diatoms:**

- ▶ Have silica cell walls.
- ▶ e.g. *Diatoma sp.*, *Cyclotella sp.*

Examples

Chlamydomonas sp.

- Unicellular, motile cells.
- Cup-shaped chloroplast, with pyrenoid.

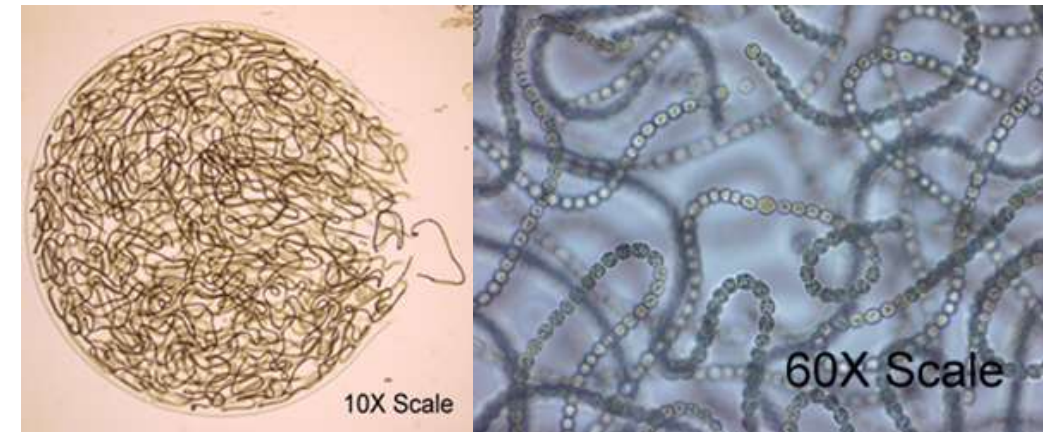
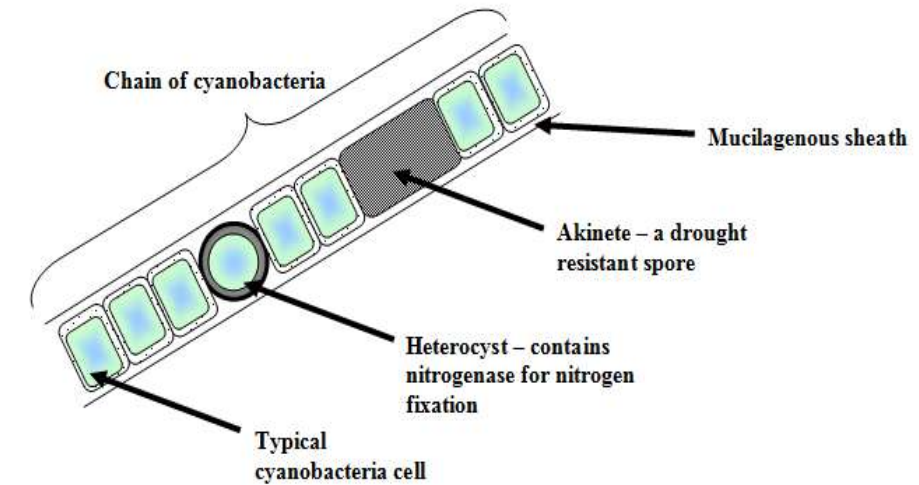


Chlorella sp.

- ❑ Unicellular, non-motile cells.
- ❑ Cup-shaped chloroplast, with pyrenoid.

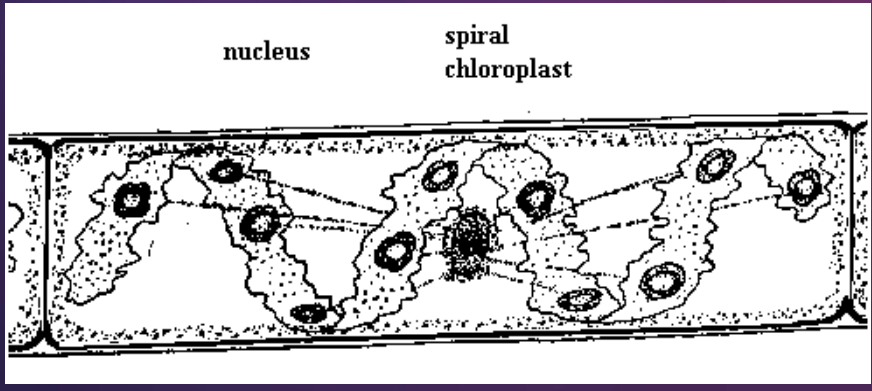
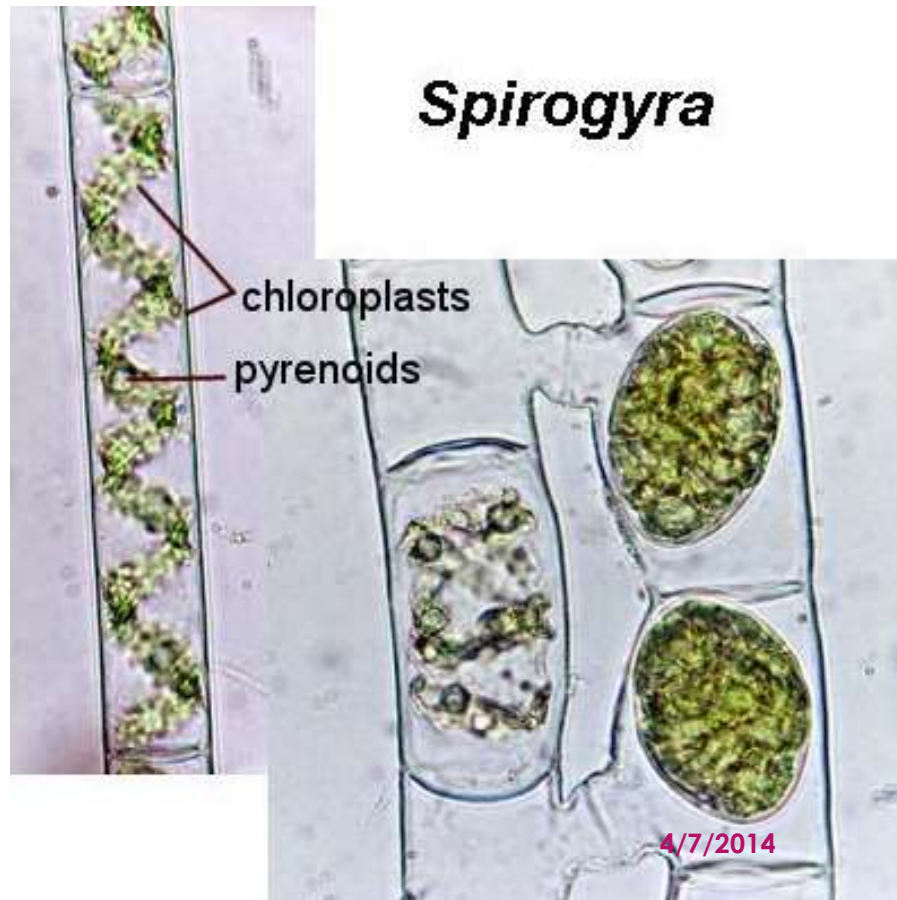
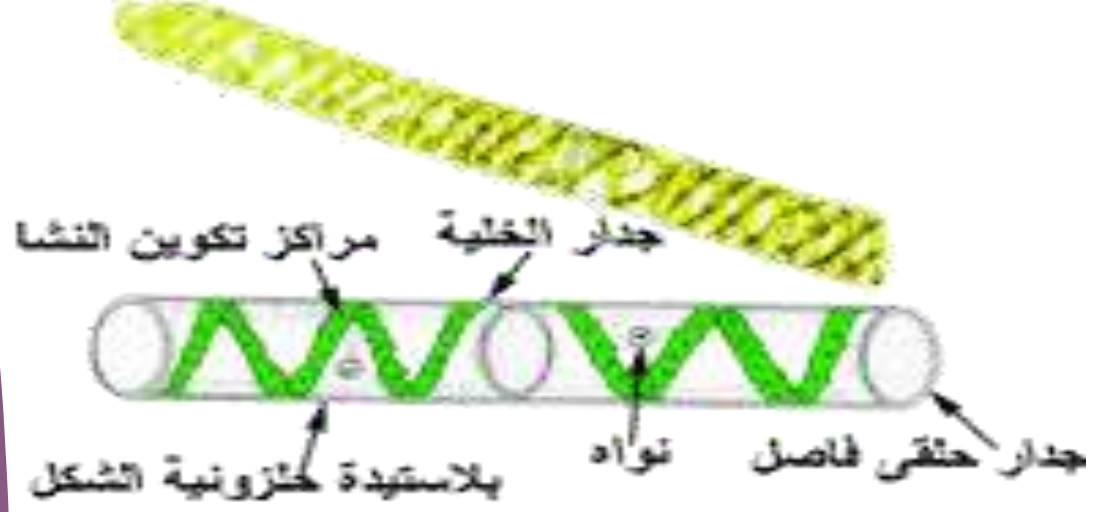
Nostoc sp. & *Anabaena sp.*

- ❑ Filamentous cyanobacteria.
- ❑ Exists as a plankton.
- ❑ Under N₂ limitation conditions, vegetative cells differentiate into heterocysts.



Spirogyra sp.

- ❑ Filamentous green algae.
- ❑ Spiral-shaped chloroplast.

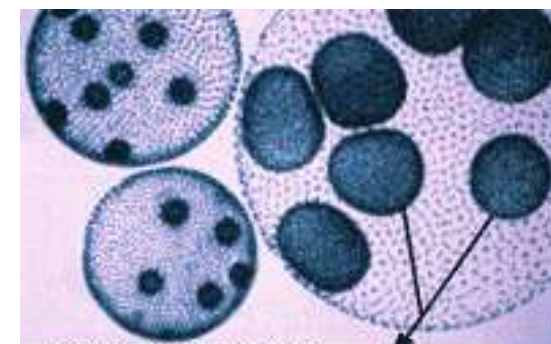
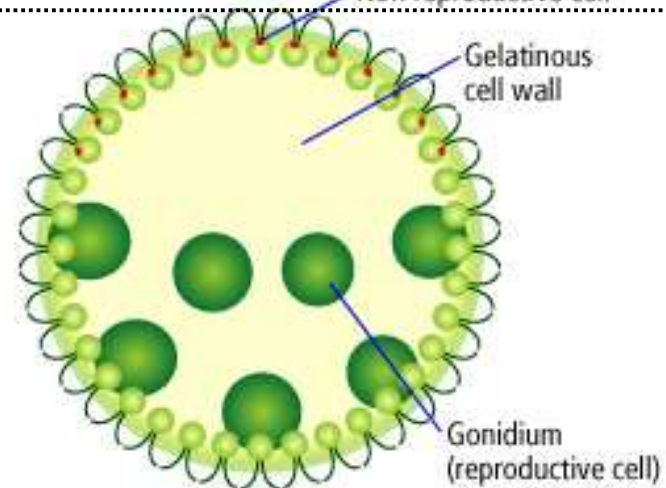
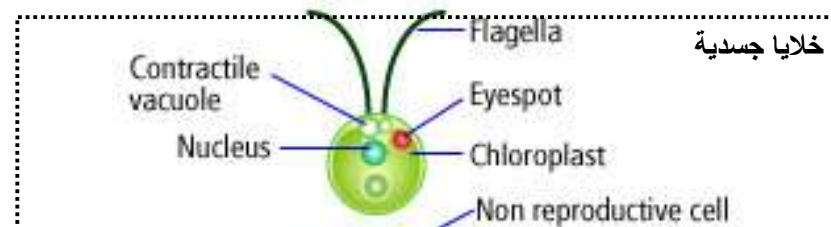
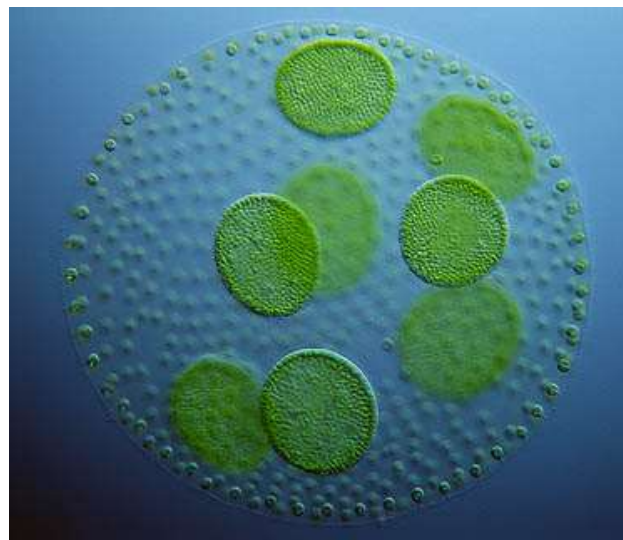


Zygnema sp.

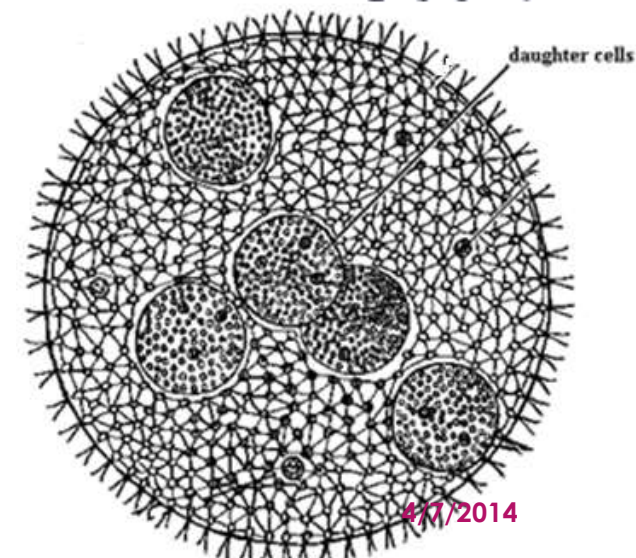
- ❑ Filamentous green algae.
- ❑ Star-shaped chloroplast.

Volvox sp.

□ Multicellular colony.



المستعمرات البنيوية في
طحلب الفولفوكس



Bacillariophyta (Diatoms) :



منظر حزامي



منظر مصراعي

