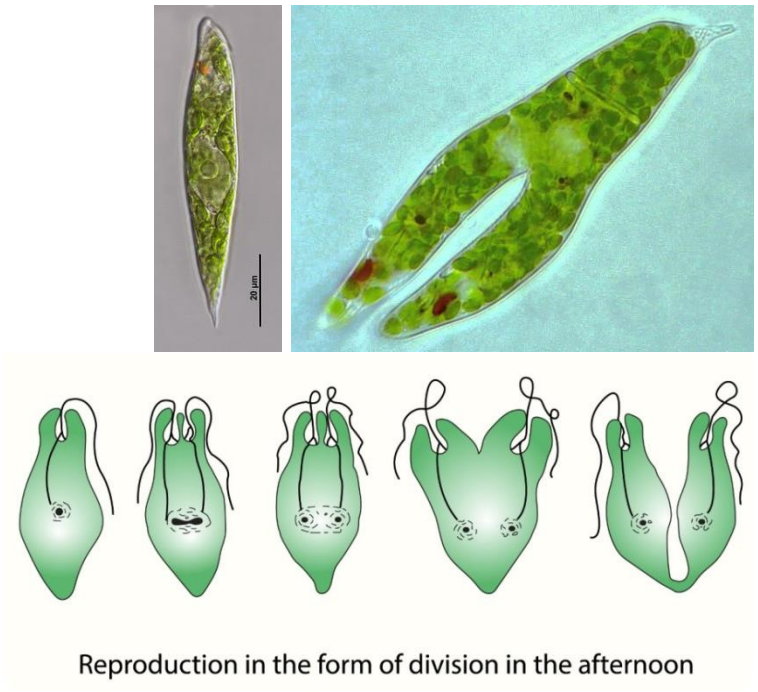
Algae Reproduction

Methods of reproduction in algae may be vegetative by the division of a single cell or fragmentation of a colony, asexual by the production of motile spore, or sexual by the union of gametes.

1- Vegetative Reproduction

a) Cell division

It is the simplest form of reproduction; the parent organism divides into two equal parts, each having the same hereditary information as the parent. In unicellular algae, cell division may be longitudinal as in *Euglena* (Euglenophyta) (Fig. 1) or transverse.



Reproduction in the form of division in the afternoon

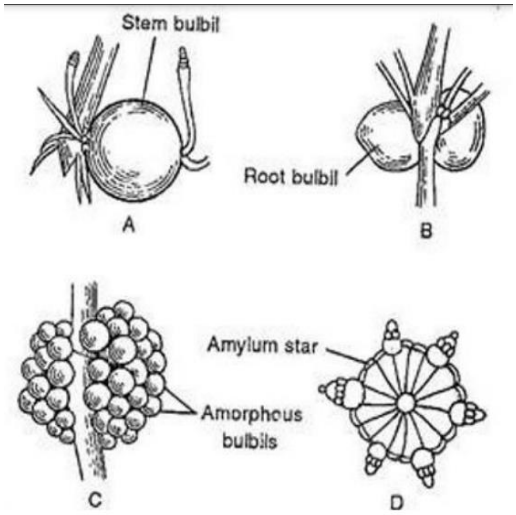
Figure (1)

b) Fragmentation

This is a more or less random process whereby non-coenobic colonies or filaments break into two to several fragments having the capacity of developing into new individuals. Such as hormogonia in *Oscillatoria*

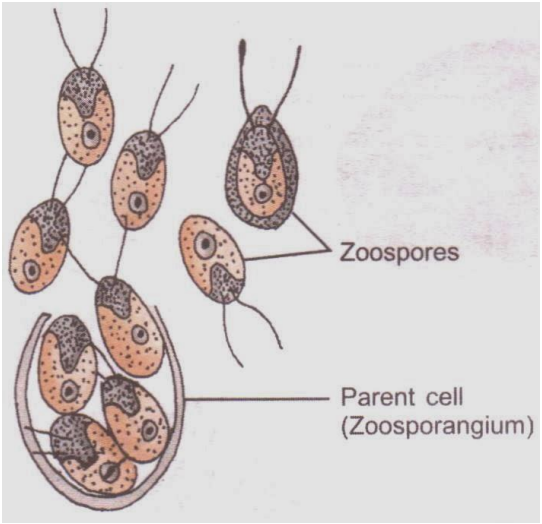
Oscillatoria (filamentous) with hormogonia

c) Formation of amylum stars tubers and bulbles as in *Chara*

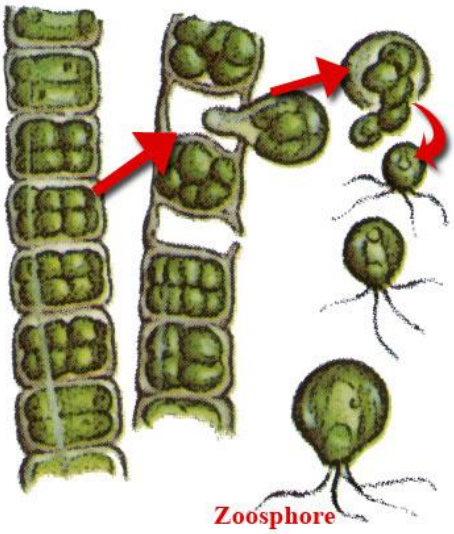


2- Asexual Reproduction

a) Zoospores: are flagellate motile spores that may be produced within a parental vegetative cell as in *Chlamydomonas* (Chlorophyta) (Fig. 2a). They are formed when conditions are favorable and vary with respect to flagellar number and flagellar insertion. They may be biflagellate, quadriflagellate (Fig. 2b), multiflagellate (Fig. 2c)

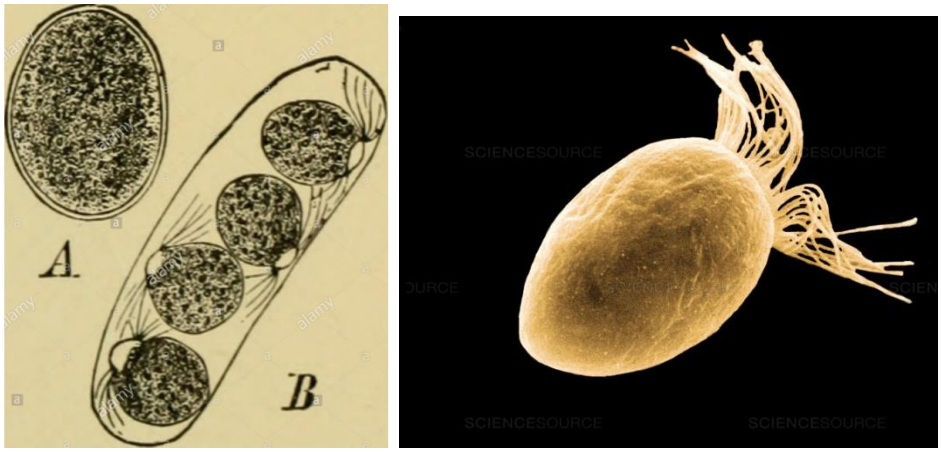


(Figure 2a)



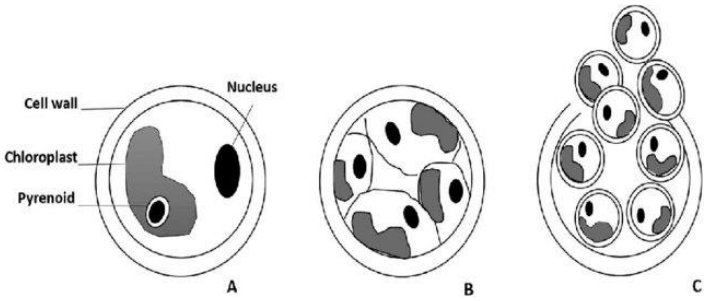
(Figure 2b)

b) Aplanospores: are aflagellate spores that begin their development within the parent cell wall before being released; these cells can develop into zoospores. (They are potentially motile)



(Figure 2c)

c) Autospores: are aflagellate daughter cells that will be released from the ruptured wall of the original parent cell. They are almost perfect replicas of the vegetative cells that produce them and lack the capacity to develop into zoospores. Exa. *Chlorella* (Chlorophyta) (Fig. 3)



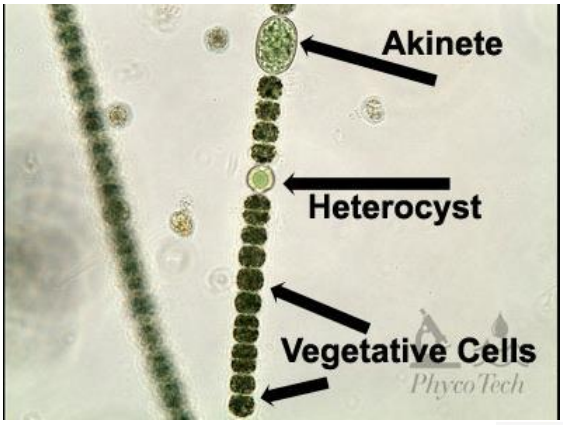
(Figure 3)

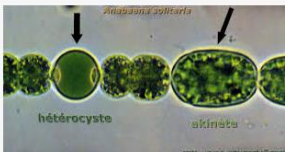
d) Hypnospores: thick walled aplanospore are called as hypnospores, which are formed in adverse condition.

e) Statospores: (Fig. 4)

(Figure 4)

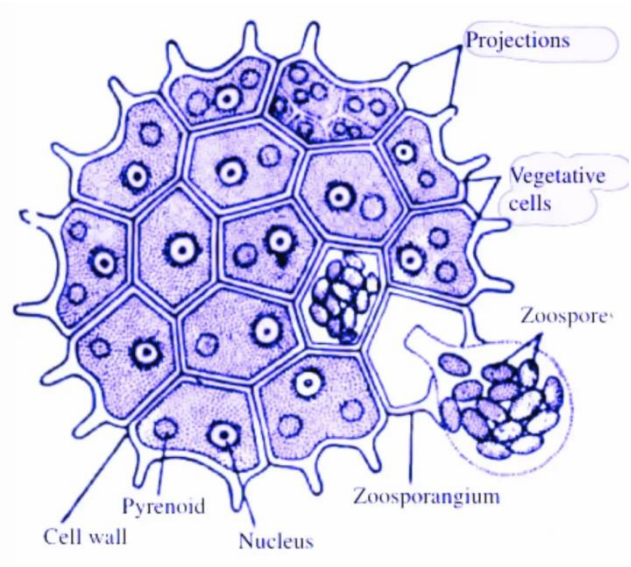
f) Akinetes are of widespread occurrence in the blue-green and green algae. They are essentially enlarged vegetative cells that develop a thickened wall in response to limiting environmental nutrients or limiting light. When suitable conditions for vegetative growth are restored, the akinete germinates into new vegetative cells.





Autocolony Formation

In this reproductive mode, when the coenobium/colony enters the reproductive phase, each cell within the colony can produce a new miniature colony similar to the parental colony. Cell division produces multicellular groups, a sort of embryonic colony that differs from the parent in cell size. This mode characterizes green algae such as *Volvox* (Chlorophyta) and *Pediastrum* (Chlorophyta) (Fig. 5)



(Figure 5) *Pediastrum*

3- Sexual Reproduction

Gametes may be morphologically identical with vegetative cells or markedly differs from them, depending on the algal group. The main difference is obviously the DNA

content that is haploid instead of diploid. Different combinations of gamete types are possible.

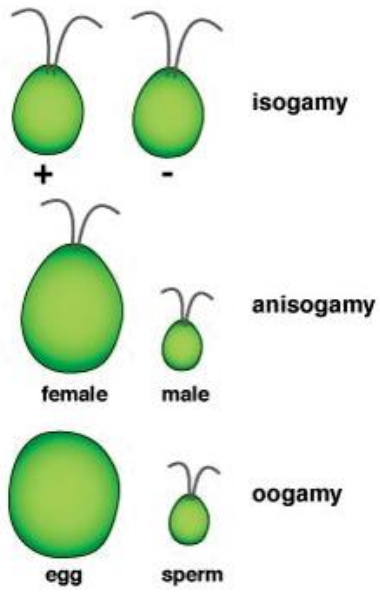
1- **Isogamy**: in the case of isogamy, gametes are both motile and indistinguishable.

2- **Heterogamy**: when the two gametes differ in size, we have heterogamy.

This combination occurs in two types:

a) **Anisogamy**, where both gametes are motile, but one is small (sperm) and the other is large

B) **Oogamy**, where only one gamete is motile (sperm) and fuses with the other that is non-motile and very large (egg).

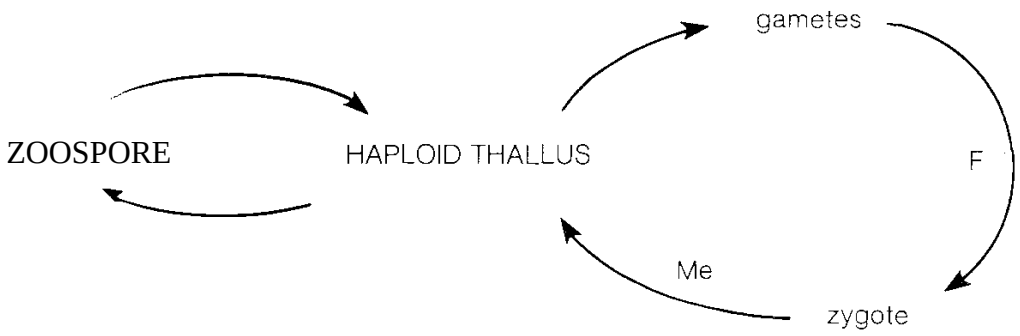


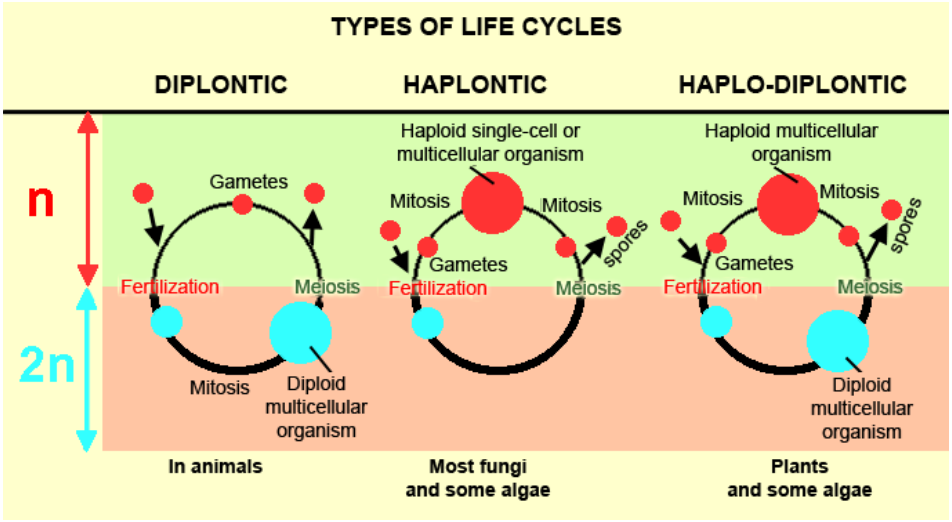
Patterns of life cycles

There are three basic patterns of life cycle depending on when miosis occurs, and whether there is more than one free-living stage in the life cycle.

1- Haplontic or Zygotic Life Cycle (Fig. 6)

This cycle is characterized by a single predominant haploid vegetative phase, and zygotes are the only diploid stage in the life cycle. Often zygotes are dormant stages formed in response to stressful conditions. Miosis occurred when zygotes germinate. *Chlamydomonas* exhibits this type of life cycle.

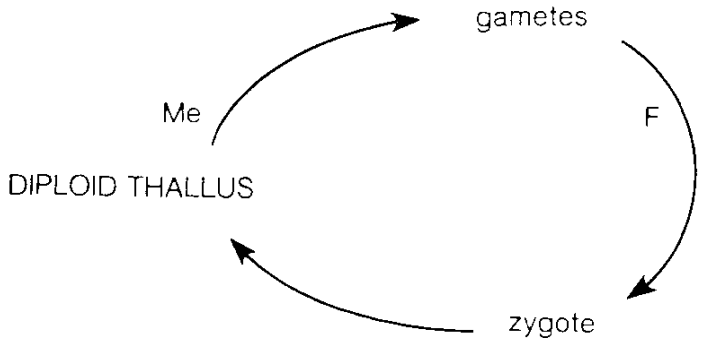




(Figure 6)

2- Diplontic or Gametic Life Cycle (Fig. 7)

This cycle has a single predominant vegetative diploid phase, and the meiosis gives rise to haploid gametes. The gametes are the only haploid cells. This type of life cycle is found in *Fucus*.



(Figure 7)

3- Diplohaplontic or Sporic Life Cycles (Fig. 8)

These cycles present an alternation of generation between two different phases consisting in a haploid gametophyte and a diploid sporophyte. The gametophyte produces gametes by mitosis; the sporophyte produces spores through meiosis. Alternation of generation in the algae can be isomorphic, in which the two phases are morphologically identical as in *Ulva* (Chlorophyta) or heteromorphic, with the predominance of the sporophyte as in *Laminaria* or with the predominance of the gametophyte as in *Porphyra* (Rhodophyta).

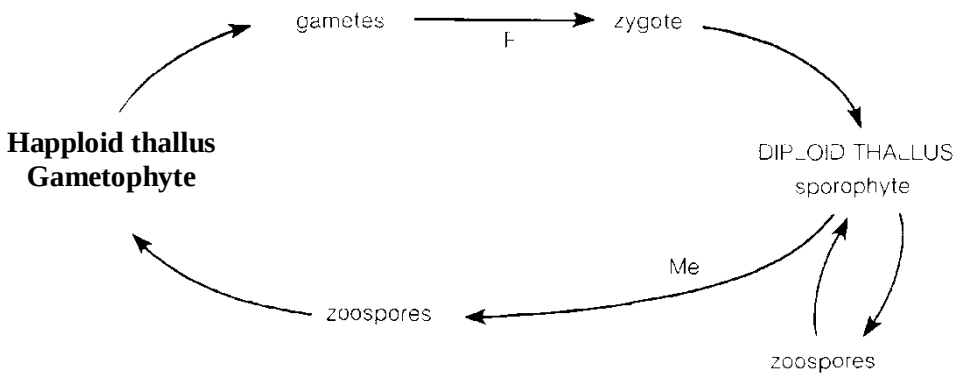


Figure 8

Importance of Algae for Human

A: Advantages of Algae

1. Food for sea animals and fishes
2. Direct use of algae as food for man
3. As a source of vitamins
4. As a source of agar
5. Medicines and minerals
6. Alginic acid, algin and mannitol
7. As a fodder for hens and milk cattle
8. Used as fertilizers
9. Manufacture of light weight buildings
10. Nitrogen fixation by blue green algae (cyanobacteria)

B: Disadvantages of Algae

1. Harmful to fish
2. Blocking of photosynthesis
3. Parasitic algae
4. Contamination of water supply
5. Algal Toxins and their Impact on Human Health.