

# Phycology

For 2<sup>nd</sup> Year Biology & Geology

BY

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CHLOROPHYTA:  
Green Algae



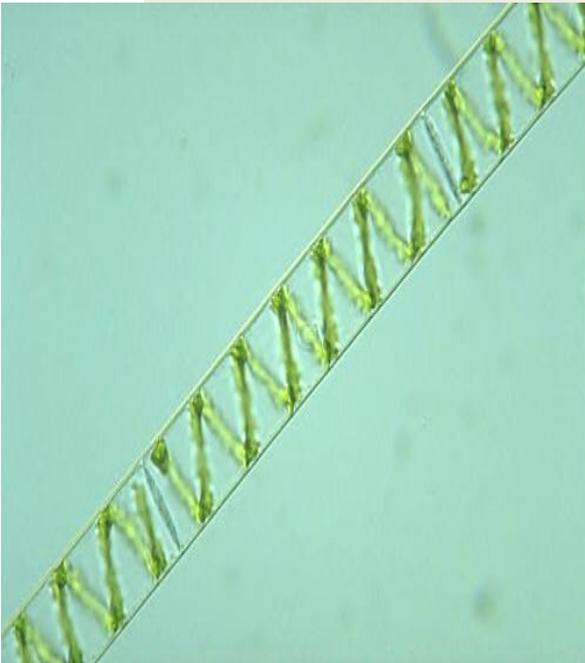
# Salient Features of Chlorophyta

- ❖ **Chlorophyta** is a division of green algae
- ❖ Grass green in colour owing to the preponderance of chlorophyll a and b over carotene and xanthophyll.
- ❖ The pigments are localised in the green plastids known as **chloroplasts**.
- ❖ The reserve carbohydrate food is stored as starch.
- ❖ The chloroplasts normally contain the pyrenoids.
- ❖ The cell has a well defined nucleus and in the higher forms a central sap cavity in addition.



# Common Chloroplasts Shapes include

Cup Filament Star Reticulate (Net) Banded

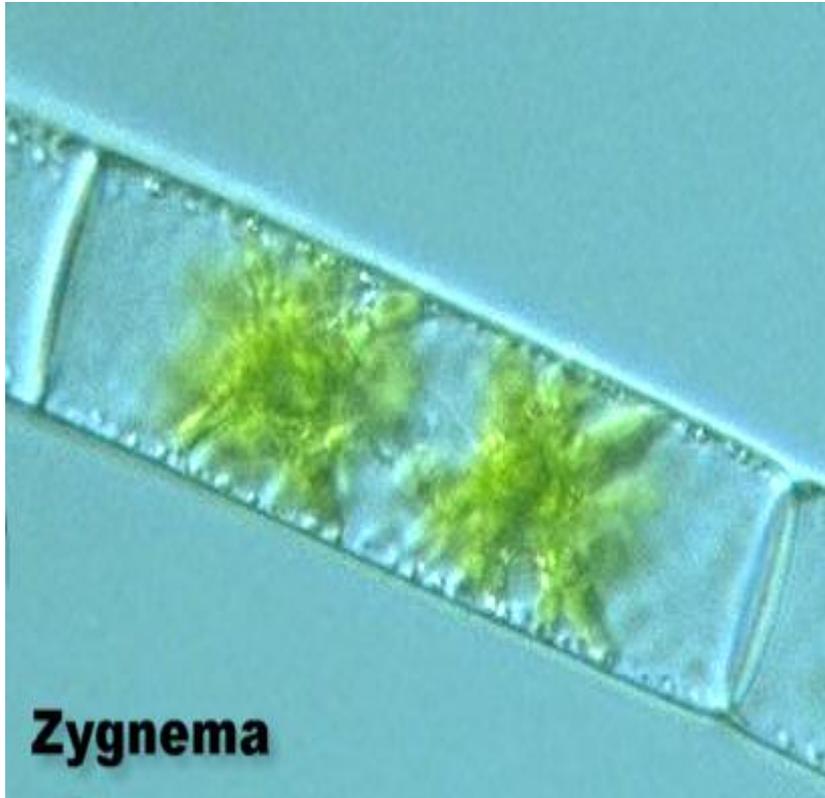


*Spirogyra* has spiral Chloroplasts

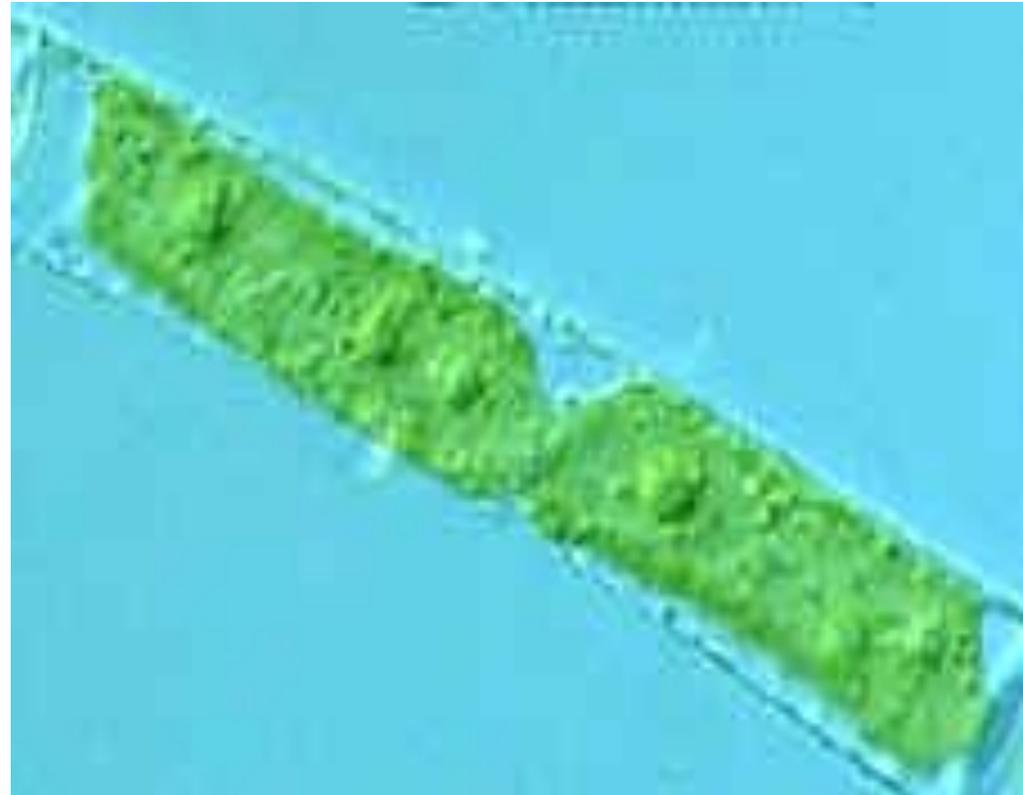


Ulothrix has band-shaped Chloroplasts





**Zygnema has Star-shaped Chloroplasts**

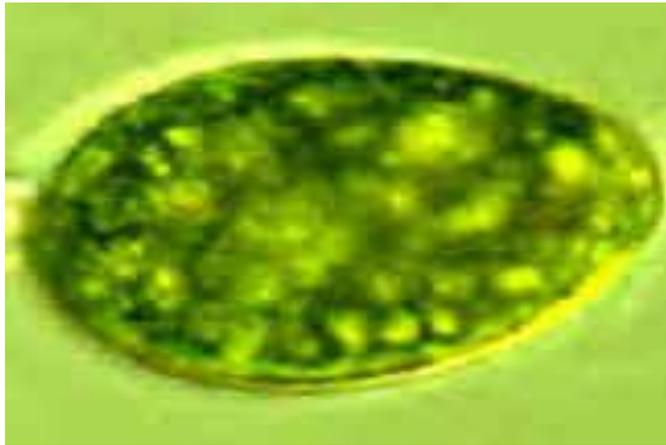


***Mougeotia* has a flat Chloroplast.  
The disk-like areas are Pyrenoids**



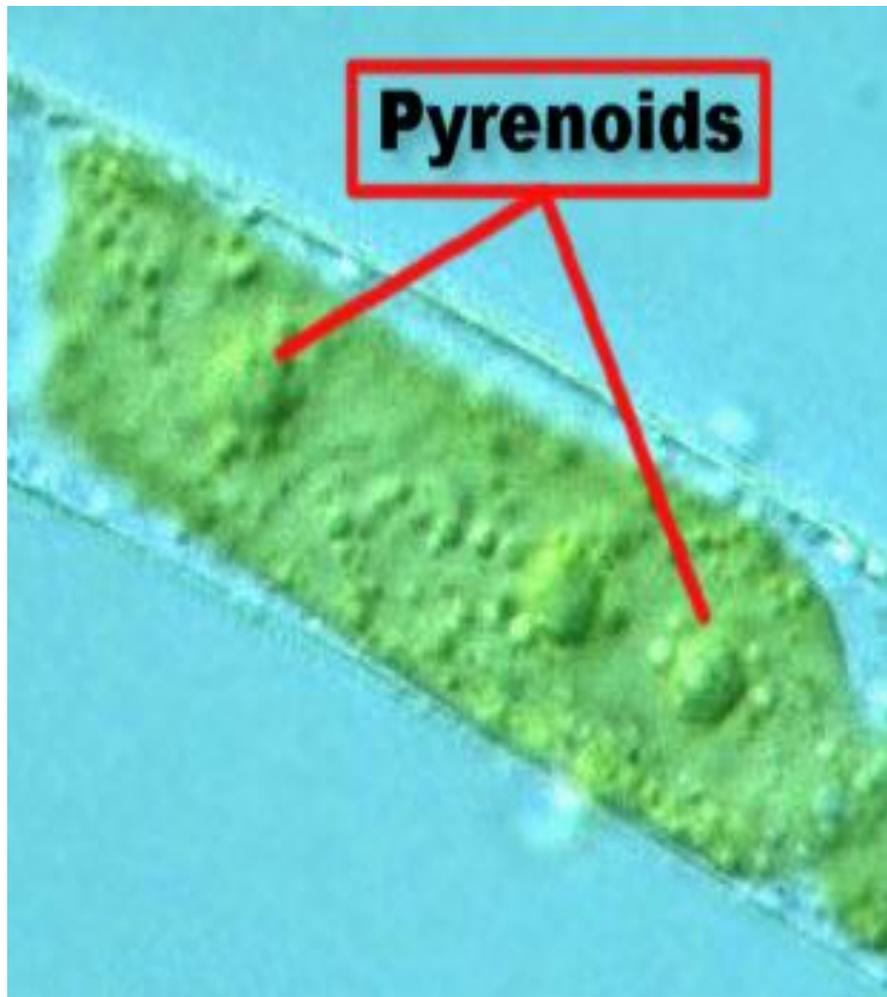


***Cladophora* has many small oval  
Chloroplasts**

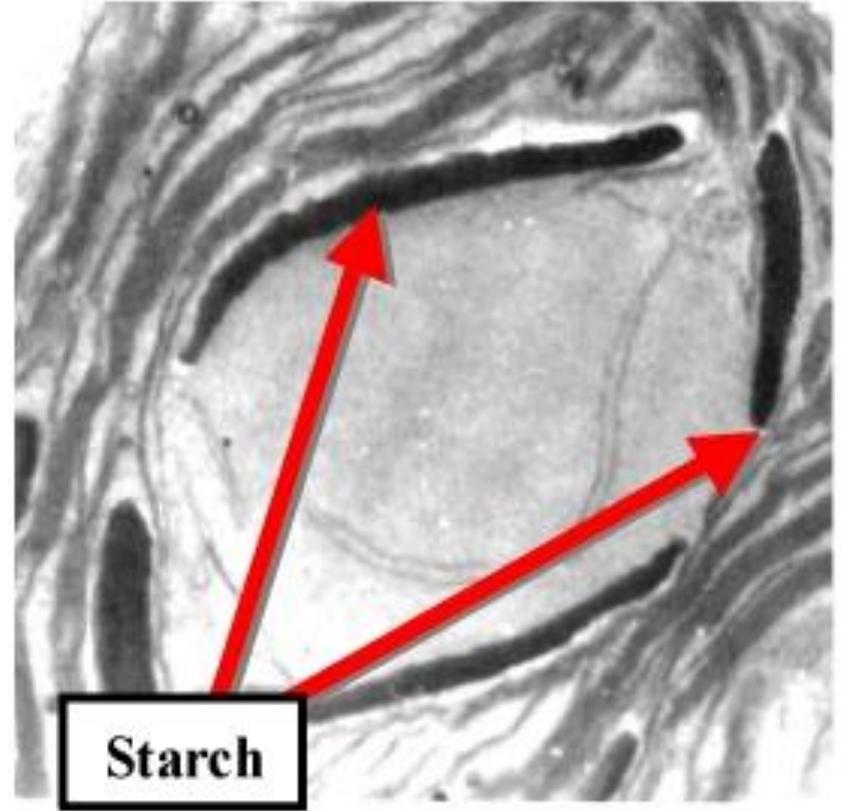


***Chlamydomonas* has one cup-shaped  
Chloroplast**





Light Microscope Photo of Pyrenoids  
in *Mougeotia* Chloroplast

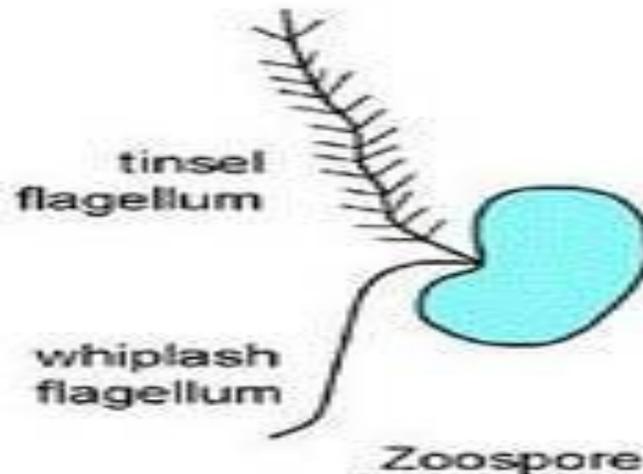


EM Photo of a Pyrenoid in  
*Chlamydomonas*



## Salient Features of Chlorophyta

- ❖ The cell wall is stable and invariably contains cellulose.
- ❖ The majority produce motile reproductive cells which may be bi-or quadriflagellate rarely with a ring of flagella as in oedogoniales.
- ❖ The flagella are of equal length and of whiplash type inserted at the anterior end.



# Salient Features of Chlorophyta

- ❖ Sexual reproduction ranges from isogamy to oogamy.
  - ❖ The sex organs are always **unicellular**.
- 10. Zygote generally is the only diploid structure in the life cycle.**



# Reproduction in Chlorophyta

**Reproduction** In green algae it takes place by all the **three** methods, namely, **vegetative**, **asexual** and **sexual**.

## 1- Vegetative

It may take place by cell division, fragmentation or akinetete formation.



# Reproduction in Chlorophyta

## Asexual reproduction

- ❖ **Spore** formation is common method of asexual reproduction.
- ❖ **They produce different types of spores:**
  - Zoospore:** These are motile spores.
    - They have 2-4 flagella.
    - They may be bi-or quadric-flagellate (*Ulothrix*), with a ring of flagella and thus multiflagellate (*Oedogonim*)
    - These spores are produced in zoosporangia.



# Zoospores Formation

- They are usually formed during **night** and develop either in any of the **vegetative cells**
- or in **specialized cells** called the **zoosporangia**.

The protoplast of the cell may develop into a single zoospore (*Oedogonim*) or it may **divisions resulting in the formation of several zoospores** (*Ulothrix*).

They escape in the **morning** from the parent cell **through a pore in the surrounding cell wall** or by **rupturing of the cell wall**.

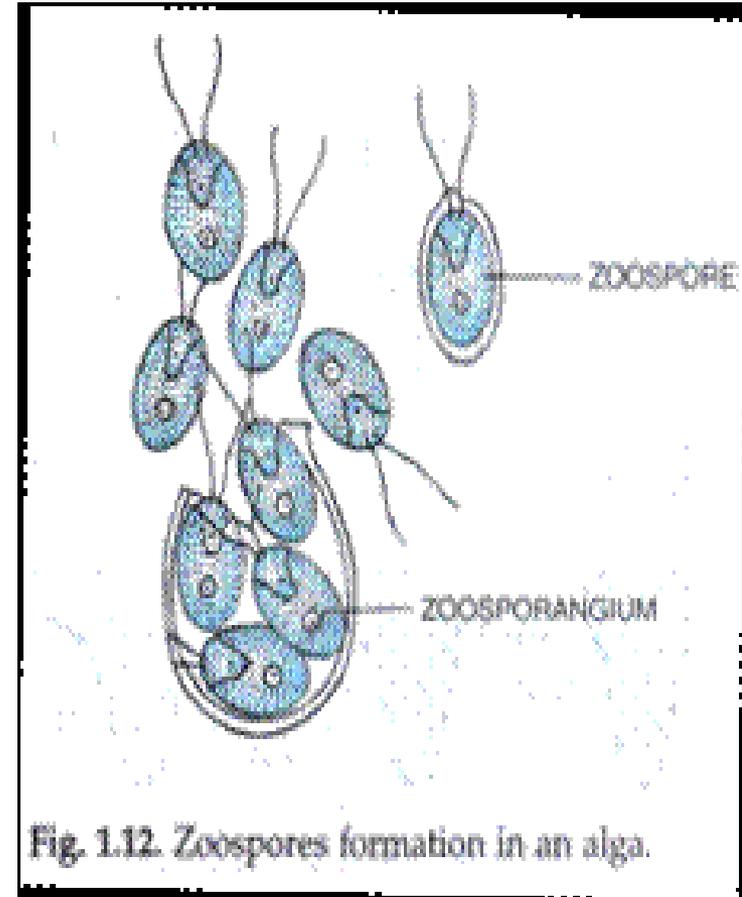
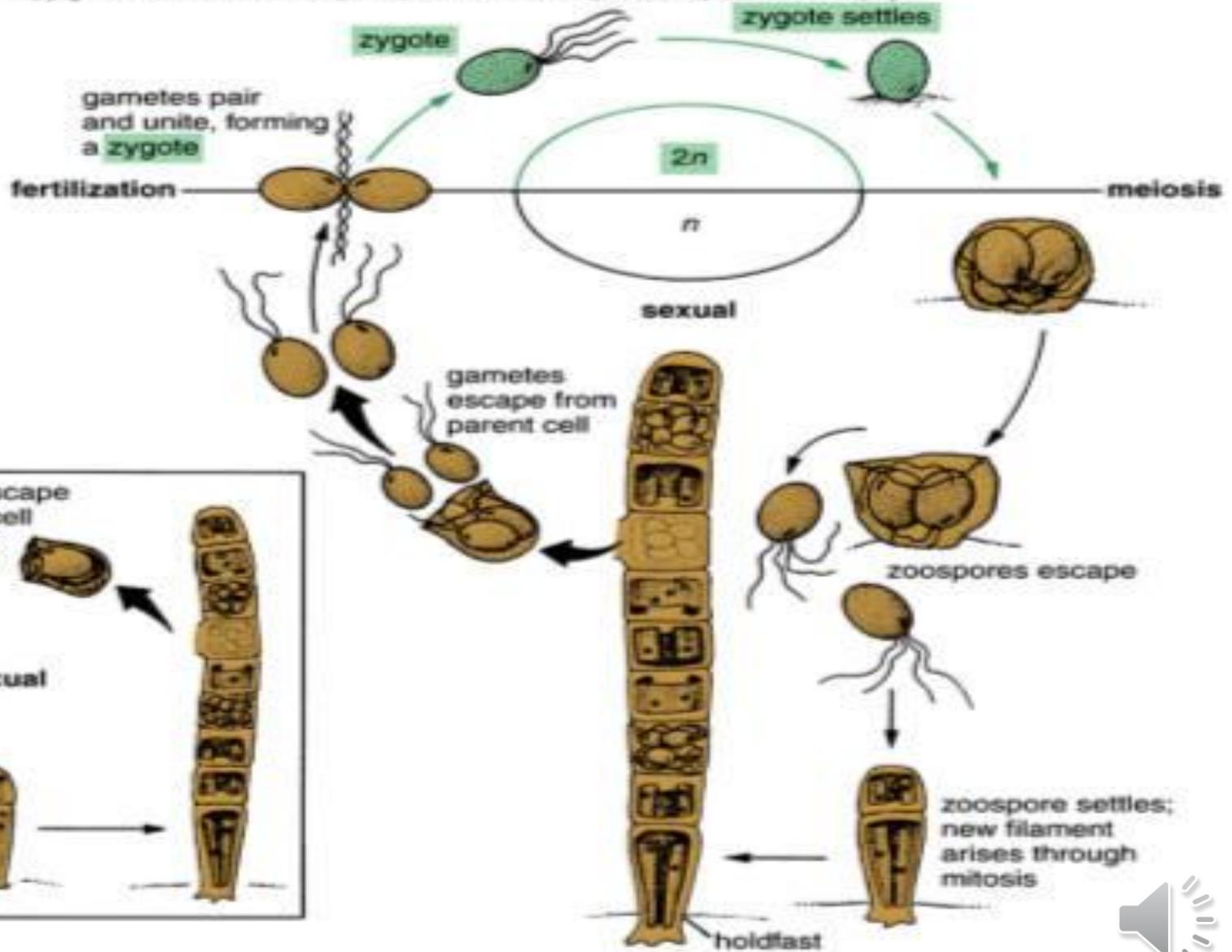


Fig. 1.12. Zoospores formation in an alga.



# Ulothrix Life Cycle

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❖ (ii) **By aplanospores:**

- When motile phase of zoospores is eliminated, the bodies are called aplanospores.
- The aplanospore are produce when there is a lack of sufficient water.
- These are covered by a thin wall but do not possess flagella like the zoospores.
- The also germinate directly to give rise to new plant .



Akinetes



Aplanospores



**(b) Aplanospores:** These are non-motile spores. They have thin wall.

## Types of Aplanospores

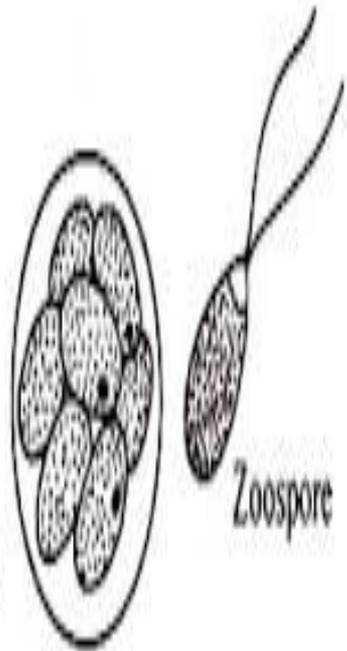
**(1) Hypnospore:** The non-motile spores with thick wall are called aplanospore.

### 2) Autospores

when the non-motile spores produced appear identical to the parent cell, they are autospores (*Chlorella*).

The protoplast of the cell may form a single aplanospore (*Microspora*) or more than one.

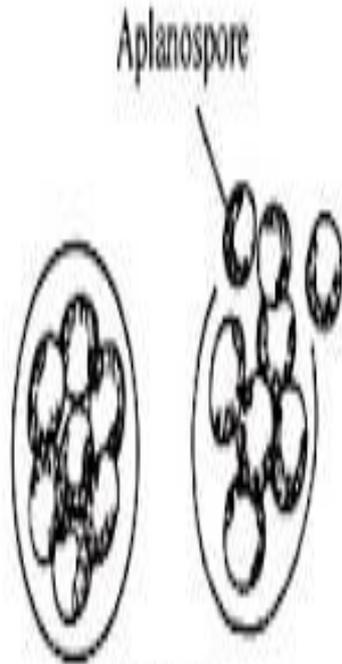




Zoospore

*Chlorococcum*

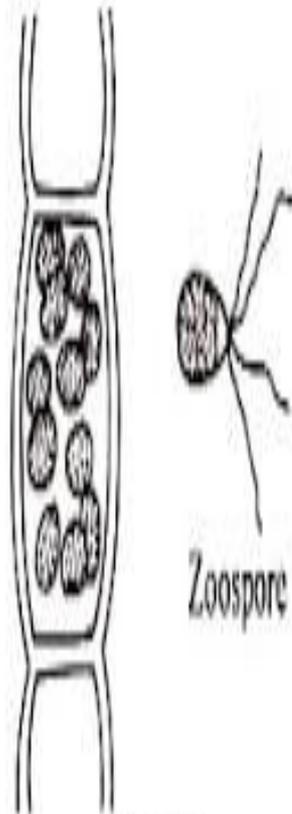
(Protoplast divides to form eight zoospores which have an eye spot and two equal flagella)



Aplanospore

*Chlorella*

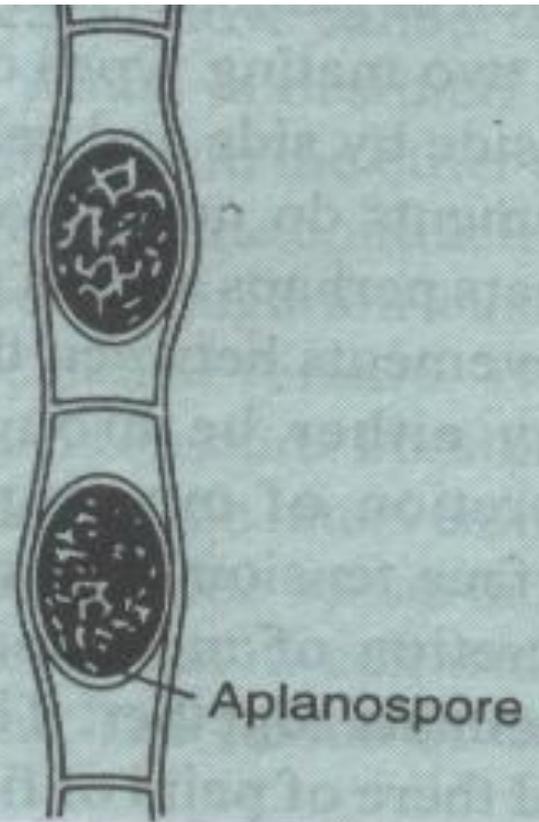
(Protoplast divides to form eight aplanospores)



Zoospore

*Ulothrix*

(Formation of quadriflagellate zoospores)



**Fig. 11.19.** *Spirogyra karnalae*. Aplanospore formation (After Randhawa).



# Sexual reproduction

## ❖ Sexual reproduction may be

- ✓ -Isogamy, (gametes both motile and same size) –
- ✓ Anisogamous (both motile and different sizes - female bigger) or
- ✓ Oogamous (female non-motile and egg-like; male motile)

Gametes are produced in gametangia.

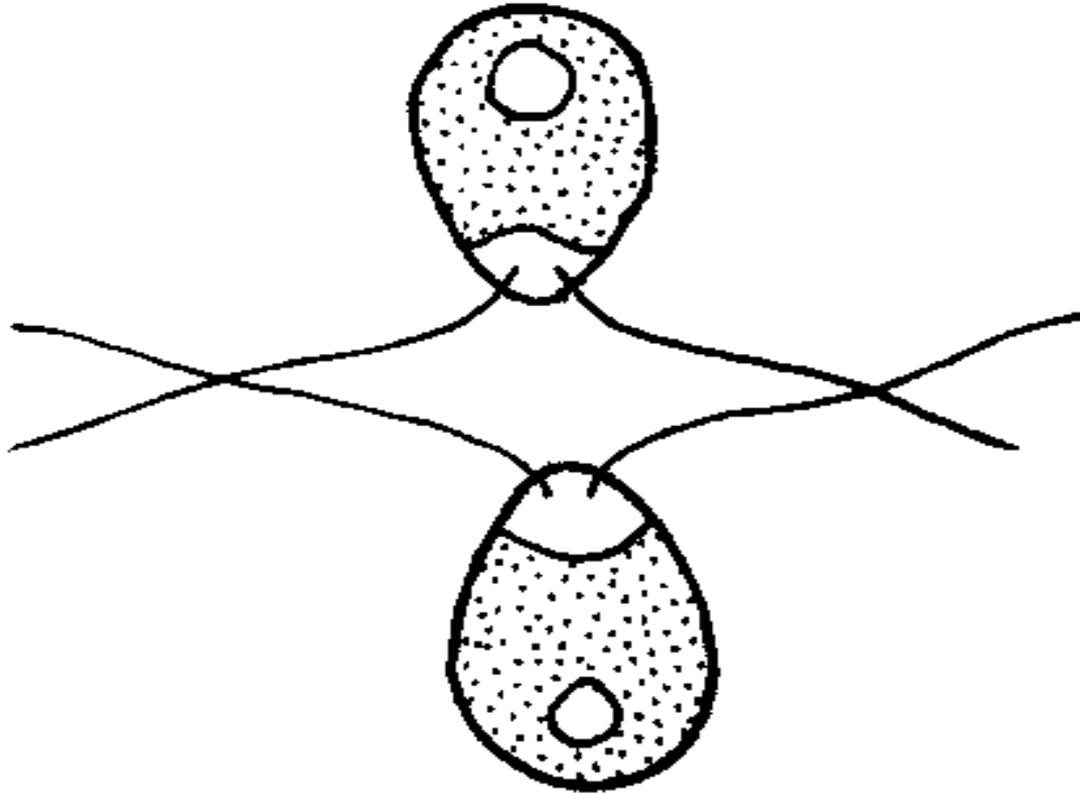


- ✓ When two gametes meet, **fertilization** takes place and a **diploid zygote** is formed.
- ✓ The zygote then germinates, undergoes meiosis and forms **haploid spores**.
- ✓ **Zygotes** secrete thick wall to become **zygospore**.

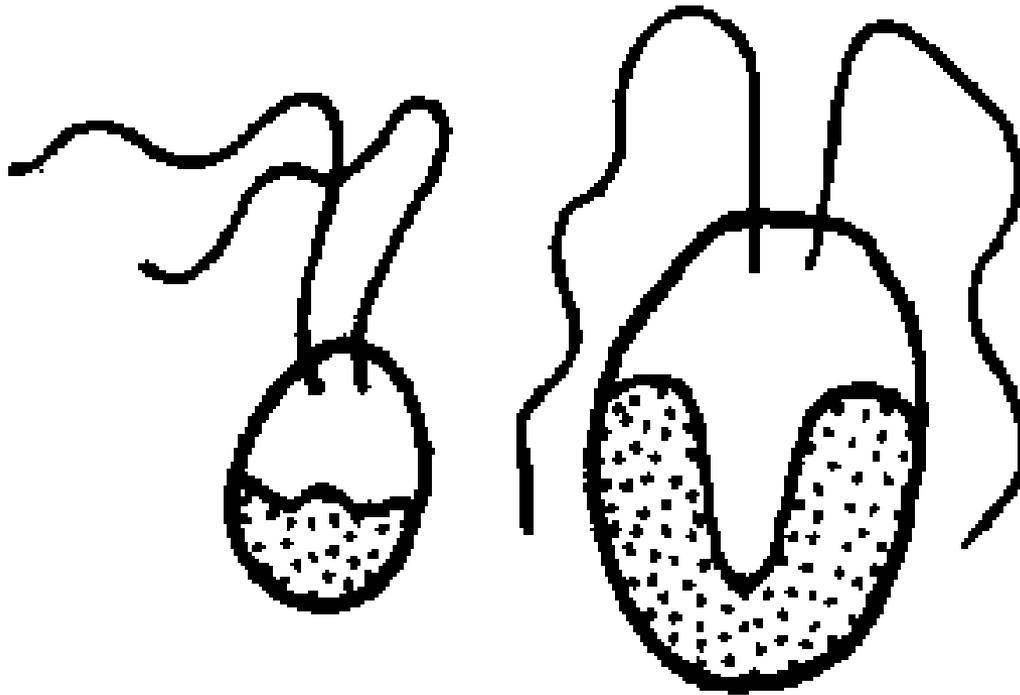


# Sexual reproduction

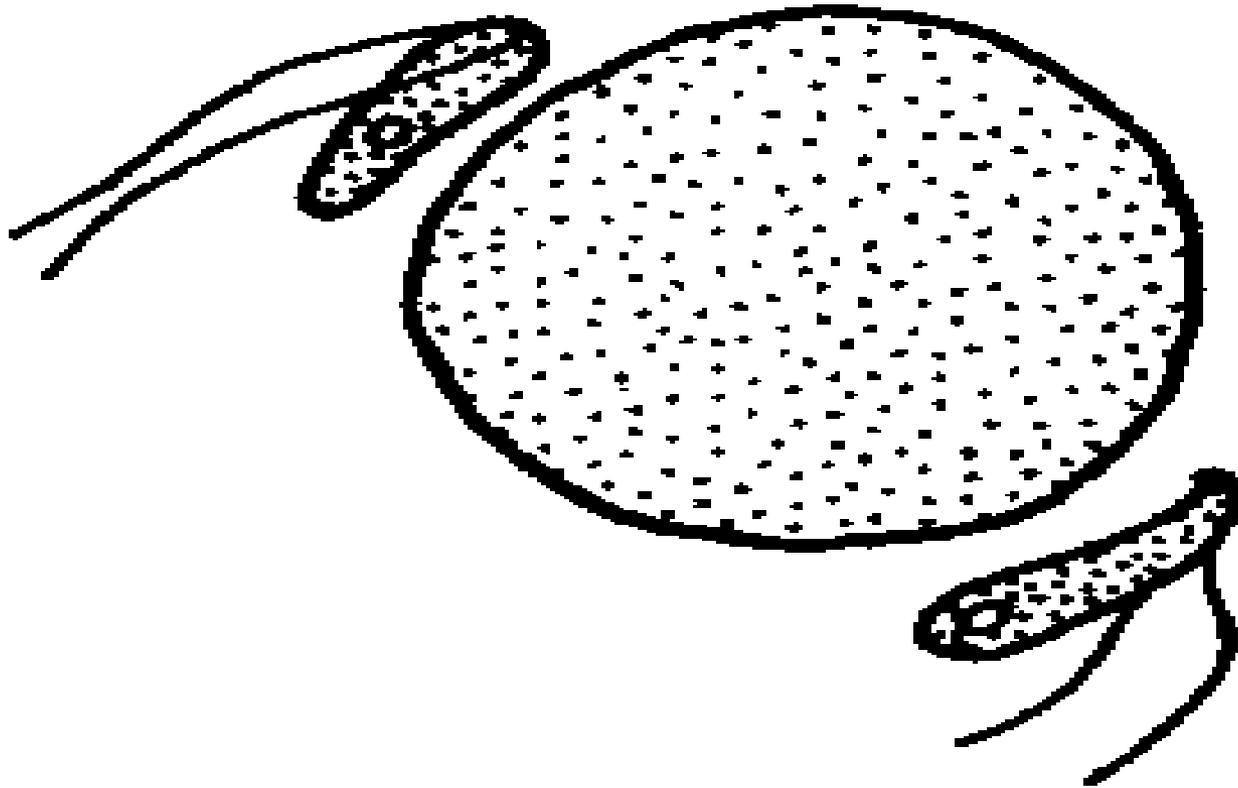
## A- Isogamy



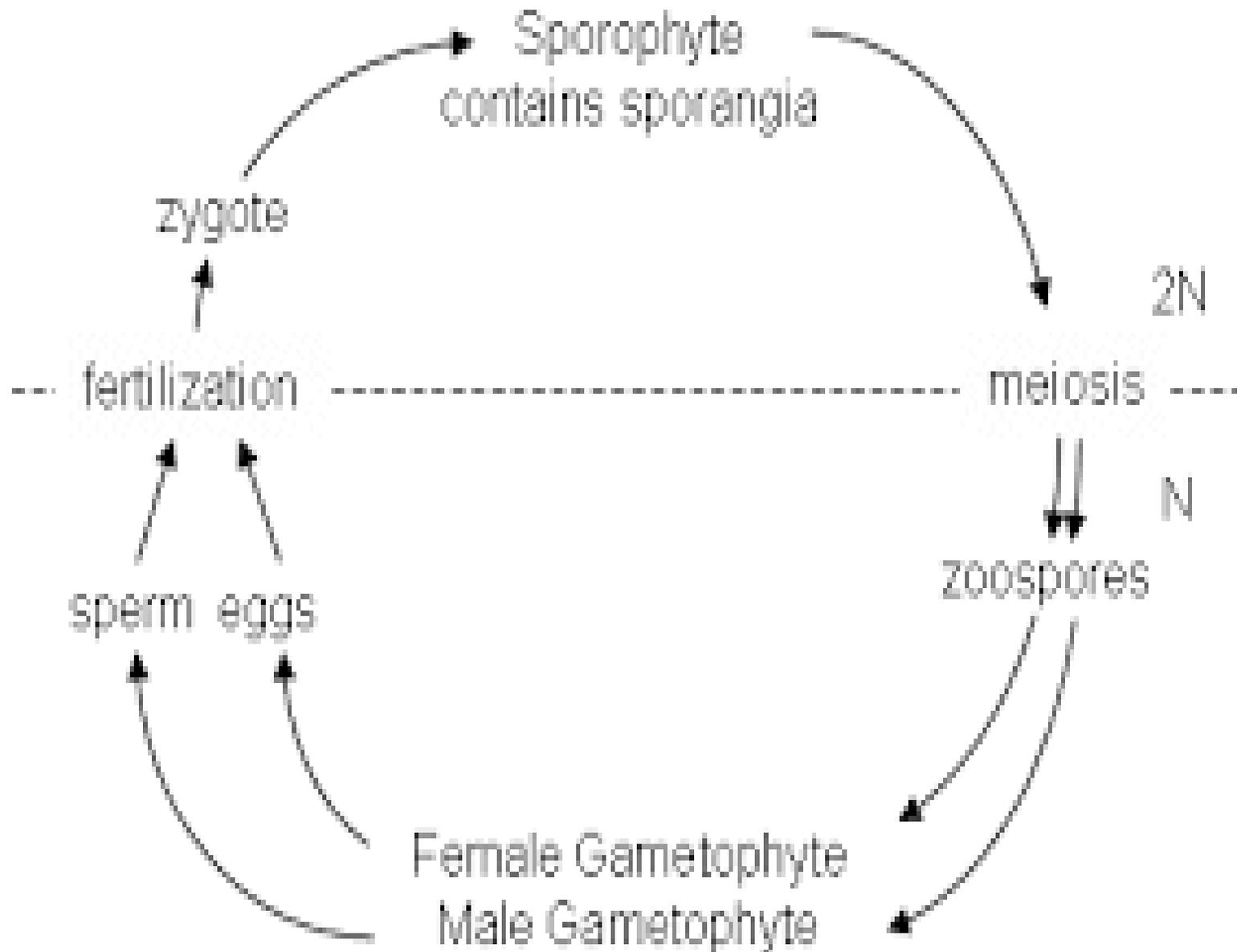
# B- Anisogamy



# C- Oogamy



# Alternation of Generation in green algae



**The alternation of generations allows algae to reproduce both sexually and asexually.**

### **1- Sporophyte** (2n.

- It is characterized by the **diploid number** of chromosomes in the nuclei of its cells.
- The diploid sporophyte is concerned with the production of **haploid spores called the meiospores.**

### **2- Gametophyte** (1n.

- It is characterised by the **haploid number** of chromosomes in the nuclei of its cells.

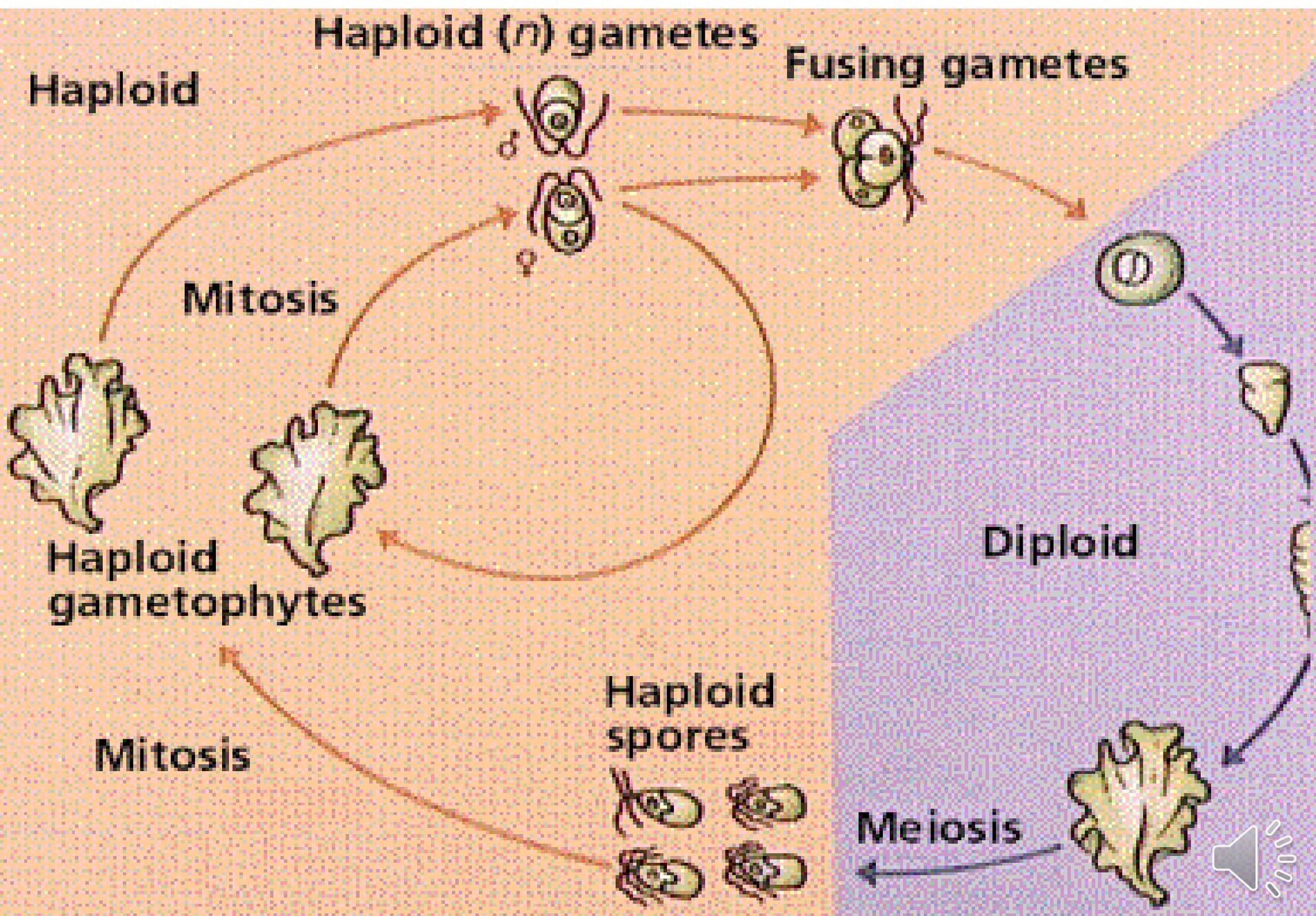
it is responsible for **sexual reproduction.**

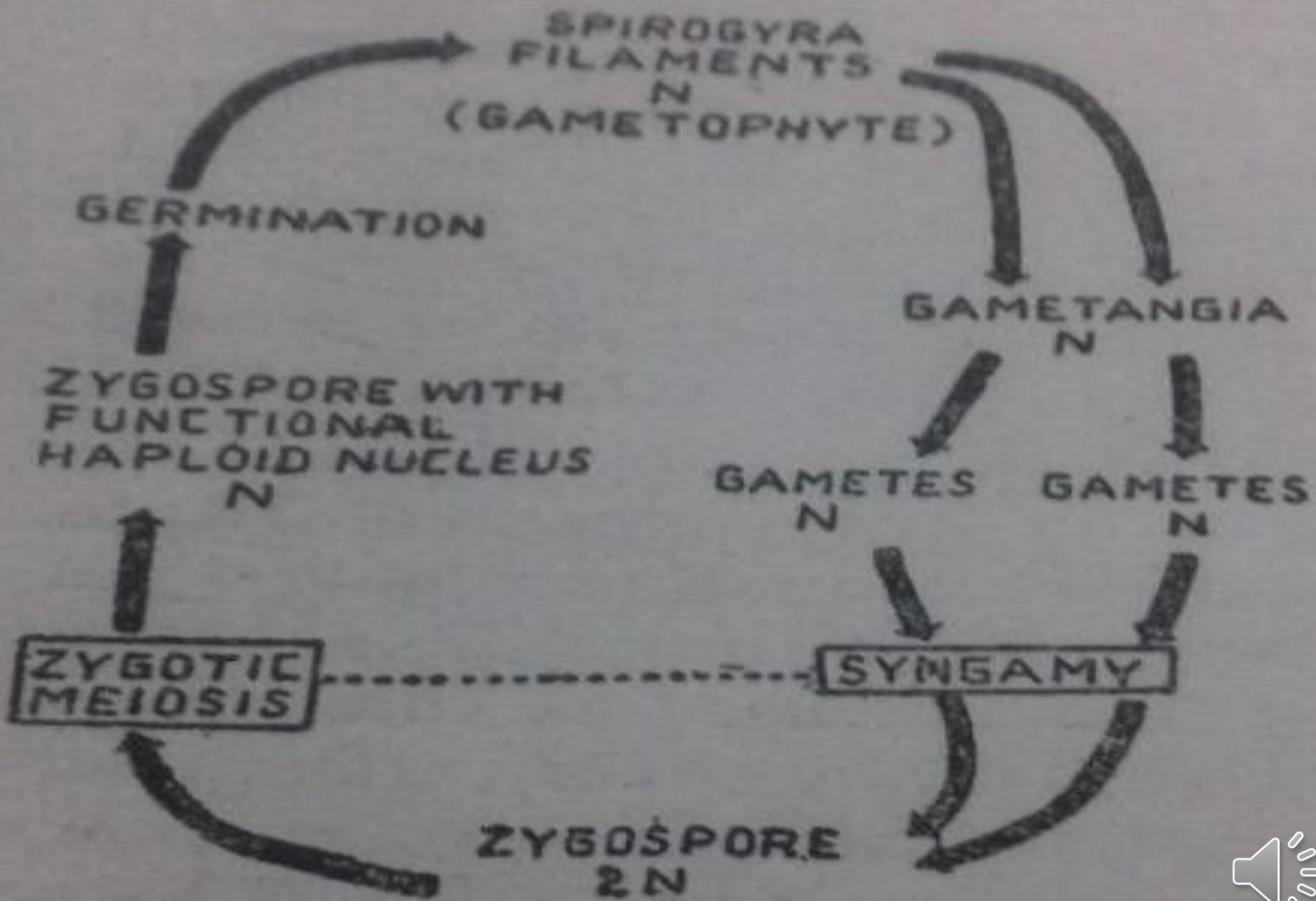
It bears the **haploid gametes.**

These two individuals normal follow each other.

- **In algae, the dominant phase is gametophyte (1n).**







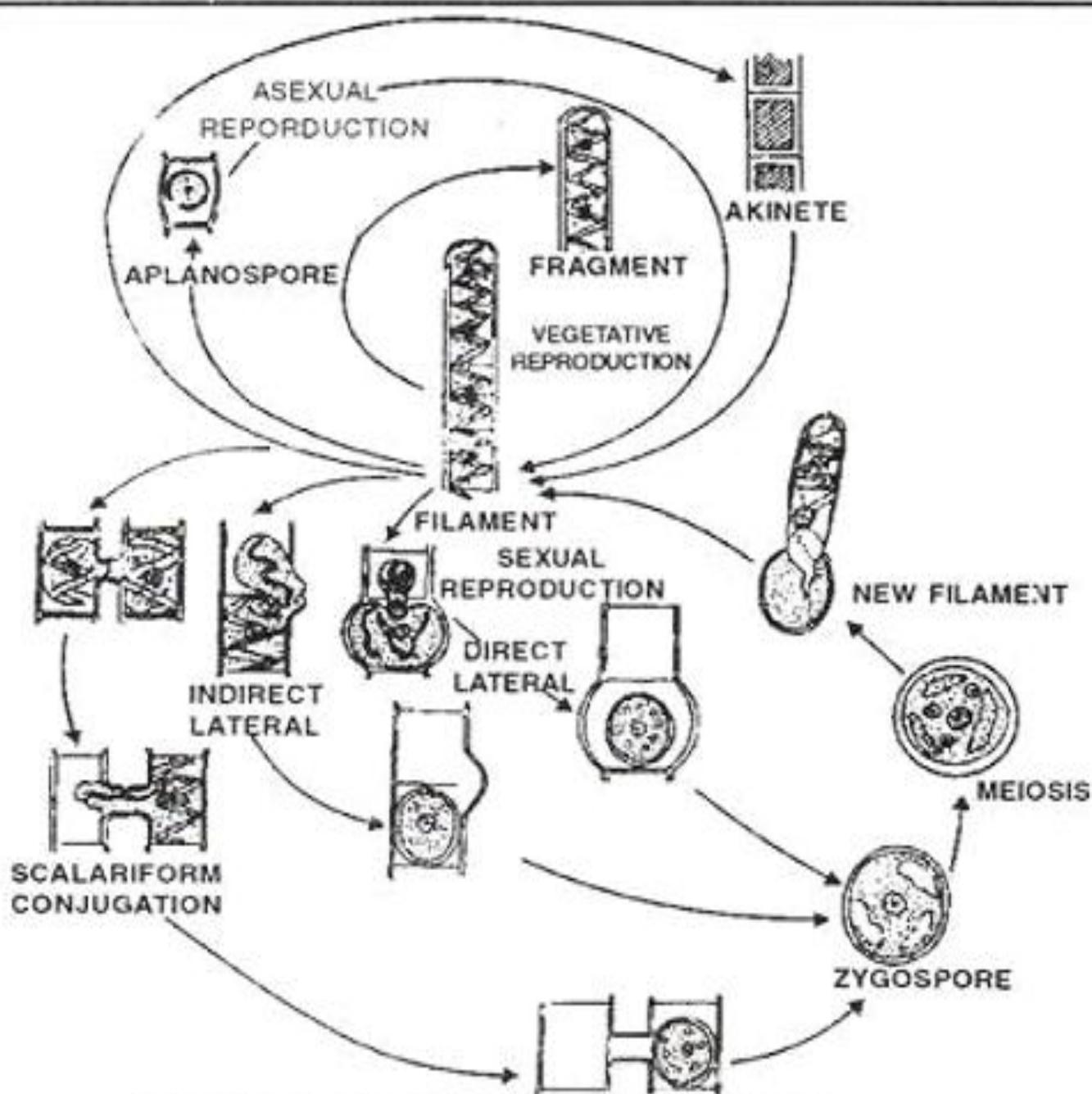


Figure 5.11 Diagrammatic life cycle of *Spirogyra*.



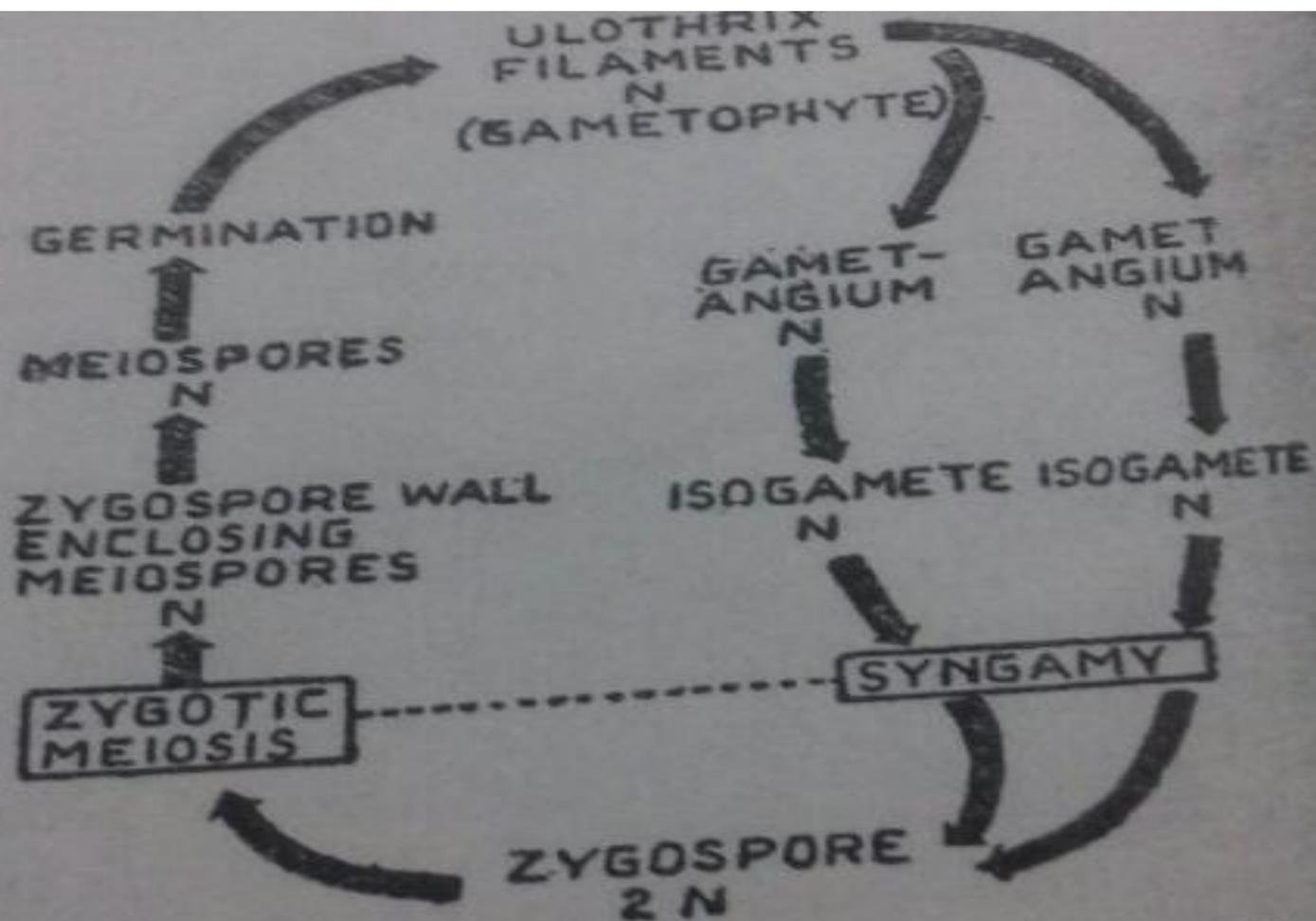
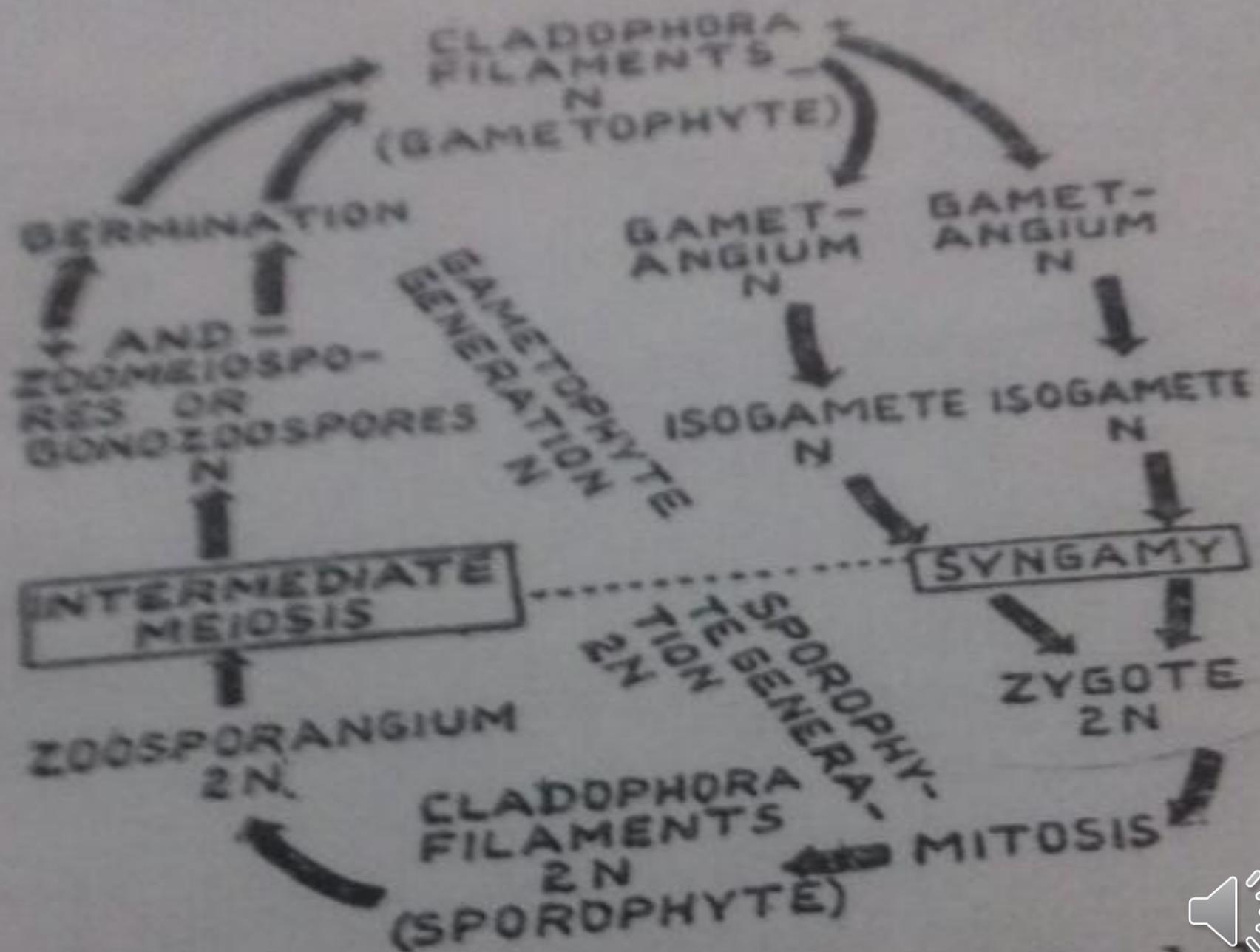


Fig. 3.24. Chlorophyceae. Word diagram of the haplontic life cycle of *Ulothrix*.





**WITH MY BEST WISHES**

Dr. Abla A. M. Farghl

