

FYBSC Paper I Semester I

Plant Life And Utilization I

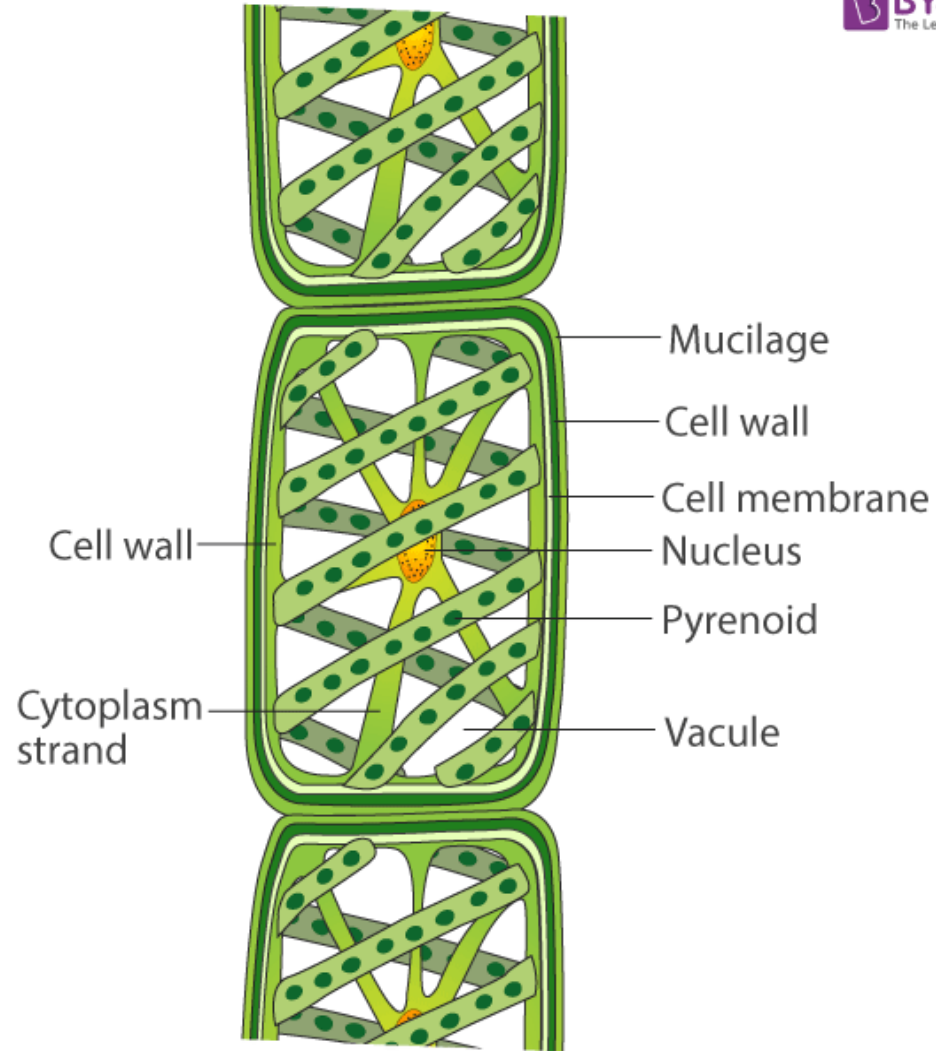
Chapter –II- Algae

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## Life Cycle Of *Spirogyra*:

### Habit:

*Spirogyra* is one of the commonest green alga. The plant body is a multicellular, unbranched filament which is slimy to touch because it is covered with a mucilaginous sheath of pectose. There is no distinction of base and apex and all the cells are alike throughout the filament. Within the stratified cell wall of the cylindrical cells that make up the filaments, there is the primordial utricle. Embedded in this are one or more spirally arranged ribbon-like chloroplasts with undulating edges, which form the most striking feature of the plant.



**Habitat:** It occurs mainly in ponds, pools, ditches, and similar other places it prefers stagnant, rather than running water and is one of the free floating algae known as 'pond scum'. It exists mostly in large quantities.

**Structure of Thallus and Typical Cell:** The most prominent feature of a Spirogyra cell is the ribbon like spirally arranged chloroplasts. Each chloroplast is studded at intervals with several pyrenoids. In every cell there is one nucleus which is, either suspended in the centre by means of cytoplasmic strands, or embedded in the primordial utricle. The nucleus contains a large nucleolus. The cross walls of the filaments are essentially of five types, for example, plane, replicate, semi replicate, colligate and In some species the middle lamella of the cross wall develops ring-like ingrowths on either side to which re the subsequent apposition layers are deposited. Such a septum is known as replicate septum

## Reproduction:

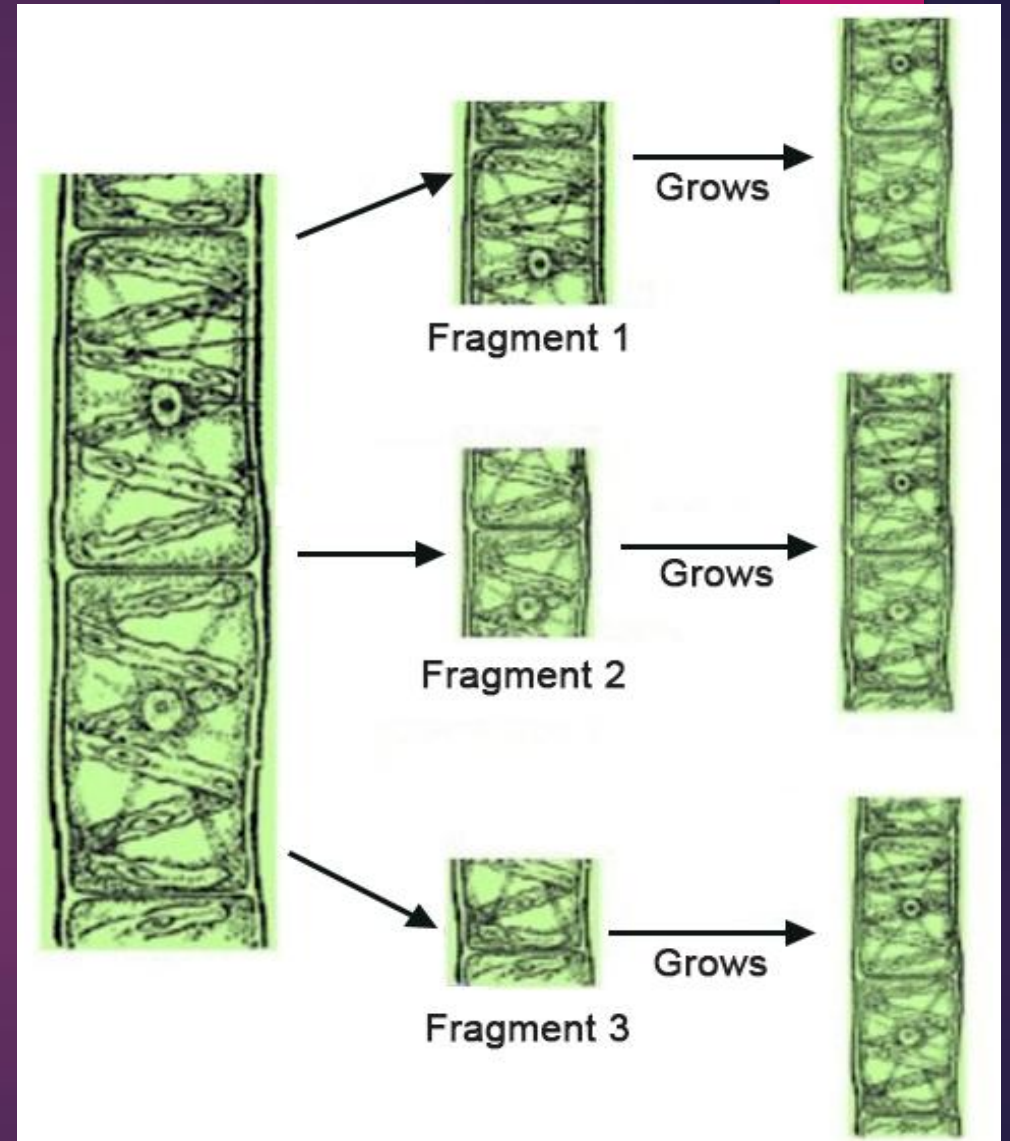
### It Reproduce

- Vegetatively,
- Asexually And
- Sexually.

**Vegetative method** of reproduction is very common in algae including spirogyra when the favorable conditions are available e g food and water  
The spirogyra reproduces vegetatively by fragmentation.

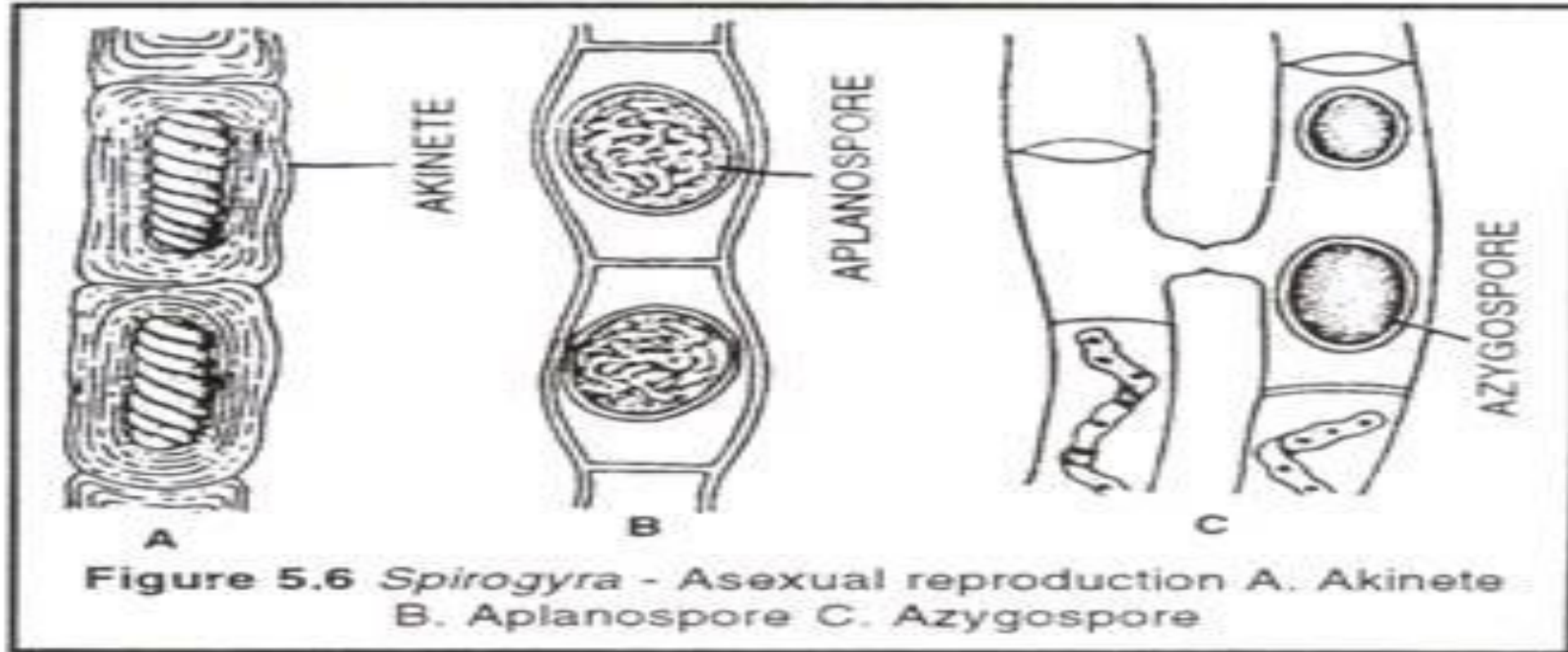
## Fragmentation:

The Filaments of spirogyra may divide into small fragments by mechanical injury or due to the change in temperature and pH or due to other aquatic conditions. The middle lamellae of the end walls of some cells become gelatinous, which lead to breaking of filament. Each broken filament then develops into the new plant simply by the intercalary mitosis. It is a fastest method of reproduction in spirogyra.



- (2) Asexual reproduction:
- Generally, spirogyra does not undergo the asexual method of reproduction. But during unfavourable conditions e.g. Drought. Shortage of food or any other environmental stress it forms specific types of spores e.g.
- (A) aplanospores
- (B) parthenospores
- (C) akinetes.
- These spores helps the plant to tolerate and sustain/survive under unfavourable conditions. After the return of favourable conditions these spores germinate and give rise to new plant.
- Spirogyra reproduce asexually by producing:

- **(A) aplanospores:** these are non-motile, rounded enveloped by new cellulose walls. The outermost of which may sometimes be coloured and sculptured. These spores when liberated outside from Parents filament germinates into A new filament.





**(B) parthenospores/azygospores:** under the failure of normal gametic union, spirogyra produces parthenospores in some species. After the return of favourable conditions the parthenospores germinates to form new filament.

**(C) akinetes:** in some particular species of spirogyra during highly unfavourable conditions some of the cells of the filamentous plant-body become thickened by additional layers of cellulose or cellulose and pectose. These cells are called as akinetes. After the return of favourable conditions the akinetes develop into individuals.

**But remember that Spirogyra reproduces asexually very rarely.**

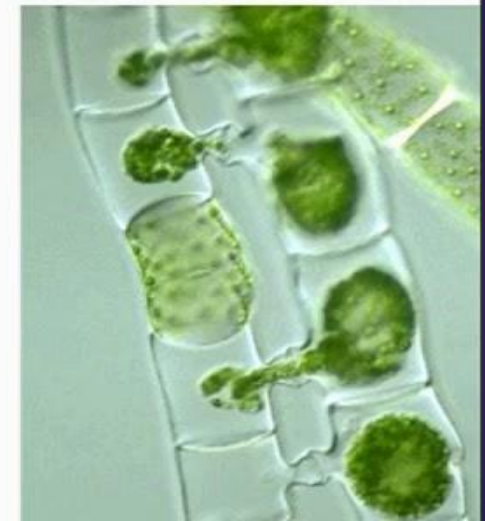
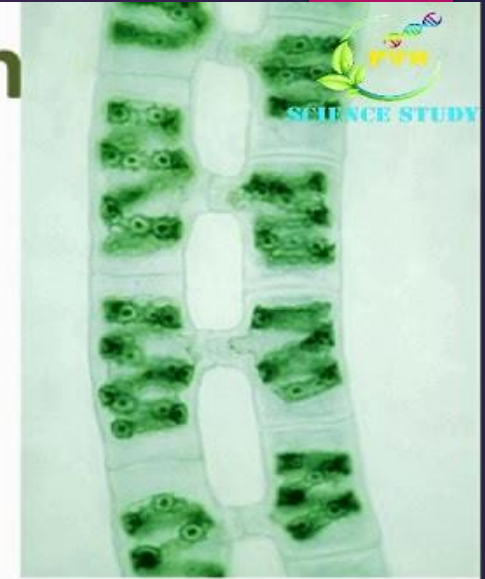
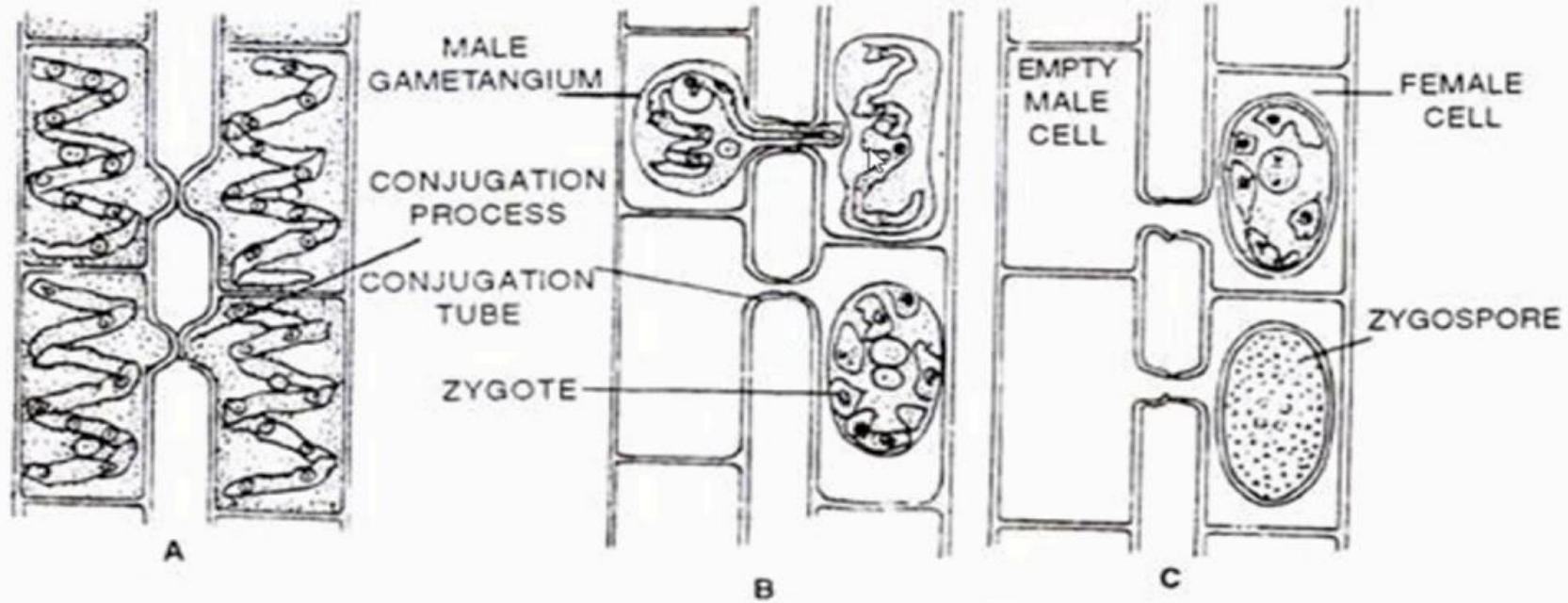
**(3) sexual reproduction:** Its normal reproduction is always sexual, and is accomplished by conjugation - an aplanogametic isogamy. In this process, two vegetative cells combine their contents to form a zygote conjugation is mainly of two types

- (1) scalariform or ladder like and
- (2) lateral conjugation.

**(1) scalariform conjugation:**

Usually, conjugation takes place between the cells of two different filaments, but it may also take place between adjacent cells of the same filament. In scalariform conjugation, the cells in two filaments which are in contact, form protrusions which lie opposite one another and as they elongate, the filaments are pushed apart

# *Spirogyra*: 1) Scalariform Conjugation

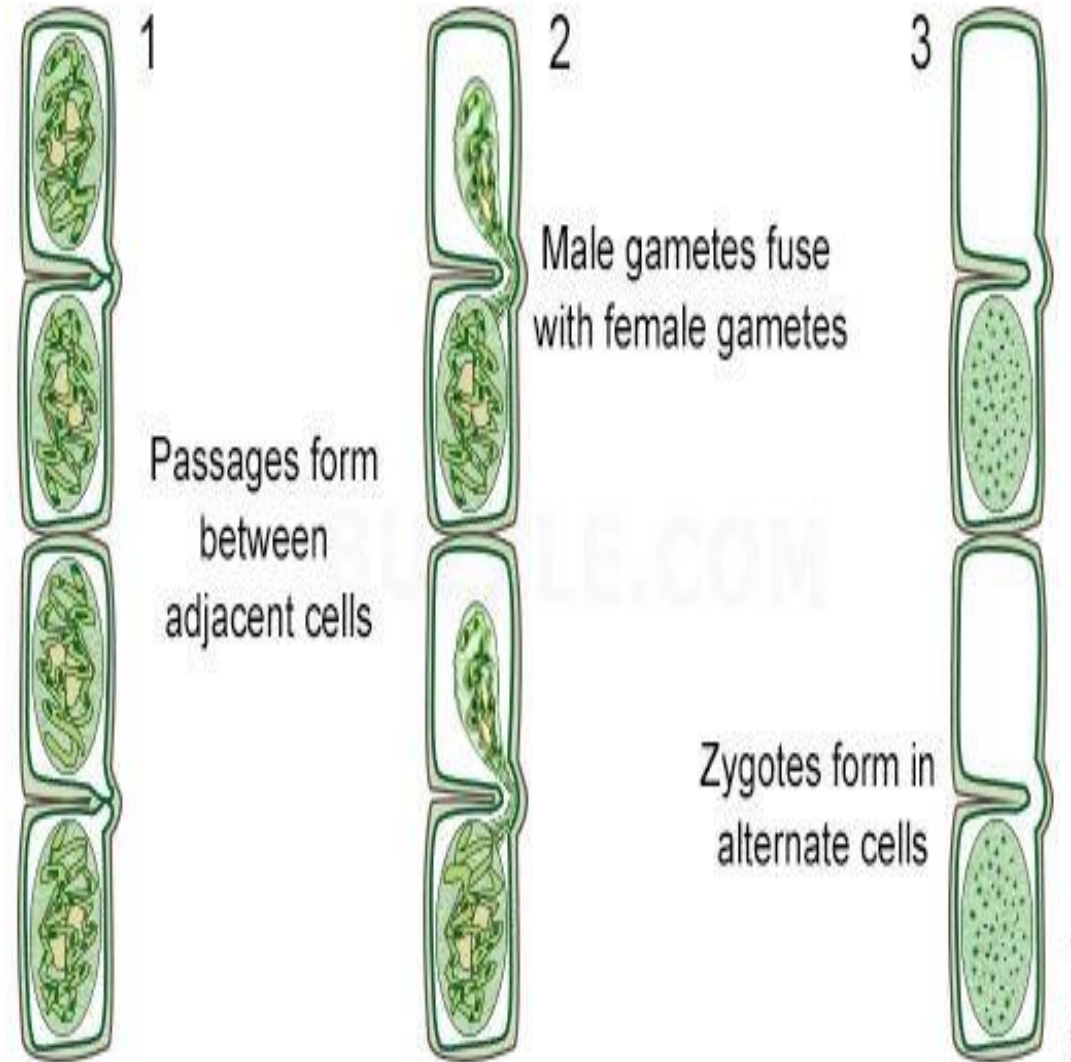


- Finally, the walls separating the protrusions of the conjugating cells are dissolved resulting in an opening called as the **conjugation tube**.
- Meanwhile, the contents of the two participating cells contract. Fusion of the contracted cell contents takes place within one of the two conjugating cells.
- This type of conjugation is known as **scalariform conjugation** .
- The active gamete i.e. the cell whose contents pass through the conjugation tube may be designated as a **male gamete** and the cell where fusion occurs is known as the **female gamete** though they are morphologically similar.

**(B) lateral conjugation:** In a few species, conjugation occurs between the adjacent cells of the same filament. Small protrusions arise as a result of the growth of the lateral wall on either side of the cross-wall of the participating cells. With the growth of the protrusions the cross-wall also becomes stretched. Finally, as the cross wall can not keep pace with the growth of the 'protrusions, the latter loses its contact with the former, a side link is thus established between the it two cells; through which the protoplast of one cell migrates into the Other fusing to form a zygote. This is called as lateral conjugation.

Lateral conjugation is of three types:

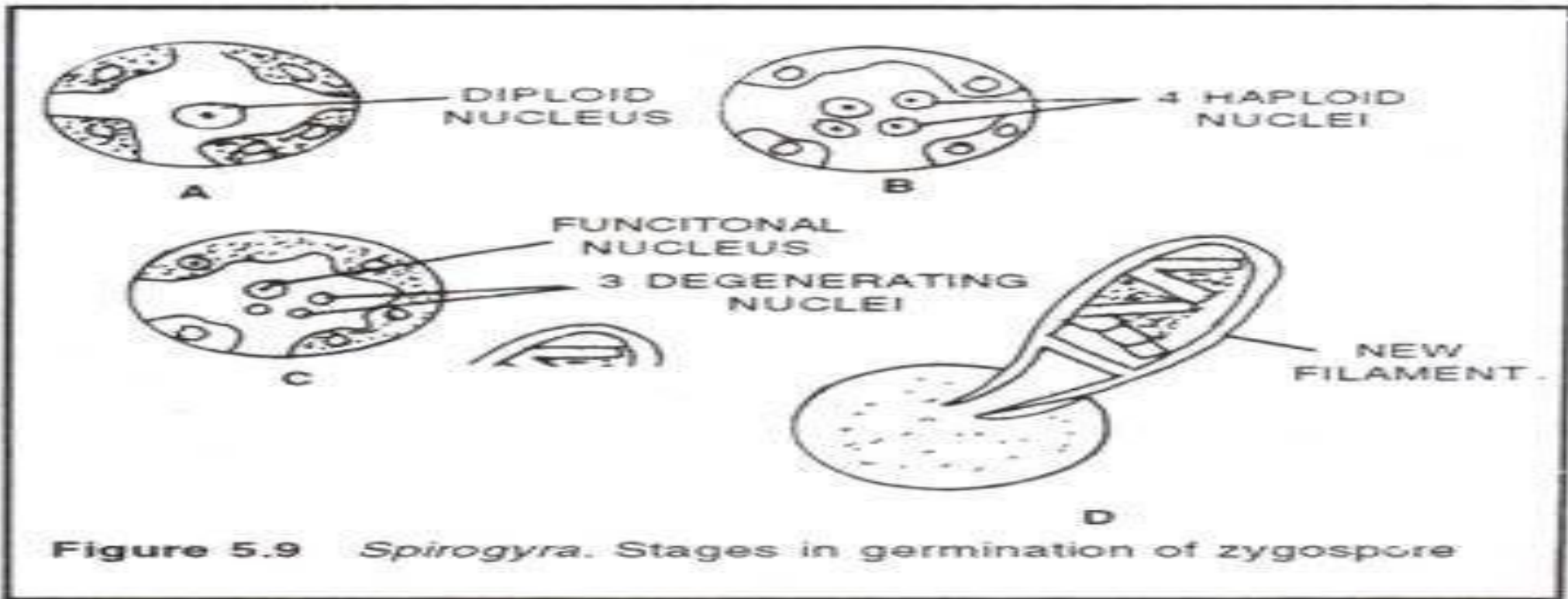
- (I) an isogamous lateral conjugation
- (II) (ii) terminal lateral conjugation
- (III) (iii) direct lateral conjugation.



### (c) Germination of Zygospore:

- The fusion product of conjugation is a zygospore which develops three-layered thick wall and is highly resistant to extreme cold and drought .
- The zygospore generally sinks to the bottom of the pool where it germinates after a period of rest.
- During germination, the two outer layers burst open, the innermost cellulose wall elongates forming a cylindrical germ tube which divides transversely to form a new filament.
- Meiosis usually occurs during germination of the zygospore and thus the new filament is haploid .
- Three of the four haploid nuclei formed in meiosis degenerate, so that each filament is derived from a haploid uninucleate cell.

Sometimes the contents of certain cells of a filament round up and secrete walls to become spores parthenogenetically without any sexual fusion. Such spores are known **parthenospores** or **azygospores**.





- The amoeboid gametes involved in the sexual process do not exhibit any morphological differences.
- Species in which only scalariform conjugation occurs are no doubt in part dioecious with genotypic sex determination.
- The morphologically similar gametes exhibit difference only in their behaviour.
- A situation where one of the fusing gametes is active and moves to the other awaiting gamete, indicates a case of physiological heterogamy. From the behaviour, the active gamete may be known as male and the passive is also as female.



THANK YOU