

# CH. 2 Biological Classification

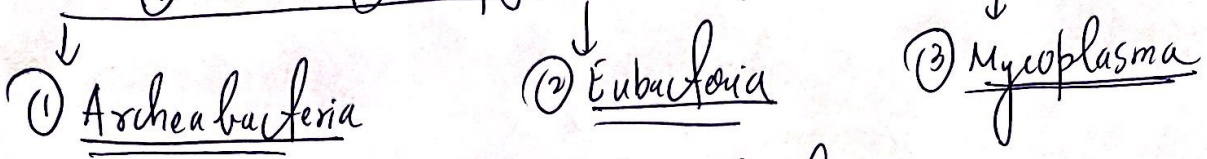
(1)

## Kingdom Classification

Kingdom Classification	Given by	* Basis	Characteristic (main)
i) Earlier	Aristotle	Simple Morphological characters	① <u>Plants</u> (Herb, Shrub & Trees) ② <u>Animals</u> (Anacma & Enacma)
ii) 2 A) <u>Plantae</u> B) <u>Animalia</u>	C. Linnaeus	<u>Outer wall structure</u> (Cell wall)	<del>Plants - CW - nt</del> (Metaphyta) & <u>Animals - CW - nt</u> (Zoophyta)
iii) 3 * <u>Protista</u>	Ernst Haeckel	Neuter Organism	neither plants nor animals
iv) 4 * <u>Monera</u> (Mychota)	H.F. Copeland	Nuclear Structure	All single cell Prokaryotes
v) 5 * <u>Fungi</u>	R.H. Whittaker	C - Cell structure T - Thallus Organisation M - Mode of nutrition R - Reproduction P - Phylogenetic relationship	non-photosynthetic & <u>Saprophytic</u>
vi) 6 * <u>Archaea</u> (* 3 Domains of life)	Carl Woese	<u>16S - rRNA</u> (i.e. Sequence of Ribosomal Gene)	<u>3 Domains</u> ① <u>Archaea</u> ② <u>Eubacteria</u> ③ <u>Eukarya</u>

Kingdom Monera

According to 5 kingdom System classification includes

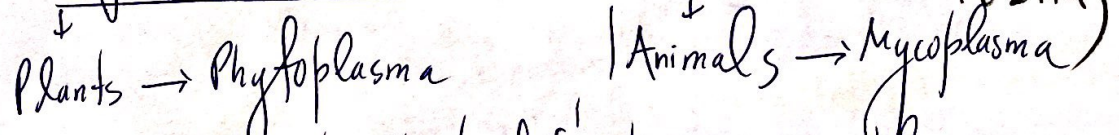
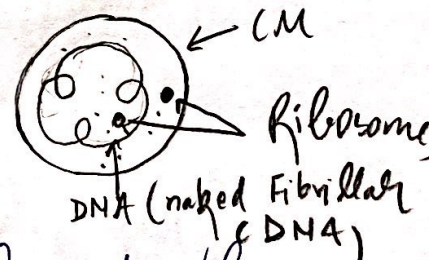


1) ARCHEABACTERIA (Oldest living fossils)

- Cell wall → m/o Polysaccharide & Polypeptide (Pseudomurien)
- PM → Branched lipid chain
- Types (basis → Most harsh habitats)
  - Halophiles → Salty areas
  - Thermoacidophiles → Hot springs
  - Methanogens → Marshy areas (Methane production from Dung of Cattles)
  - Barophiles → High Pressure conditions

2) MYCOPLASMA (Cell wall-less bacteria) → Gram +ve

★ Completely lack cell wall  
→ 1st identified as PPLO (Pathogenic)



- e.g. →
- i) Grasshopper shoot of S'cank
  - ii) Papaya Bunchy Top
  - iii) Egg plant Little leaf
- e.g. → Mycoplasma pneumoniae  
↓  
Walking pneumonia

Characteristics d/t lack of w.c.:

- i) Pleuromorphism
- ii) Resistant to Penicillin

BACTERIA | EUBACTERIA

→ first discovered by A.V. Leeuwenhoek as "Animacules".

→ Term: Ehrenberg (Father of Bacteriology) / (Father of Modern Microbiology)

\* Most Abundant MOs (heterotrophic bacteria)

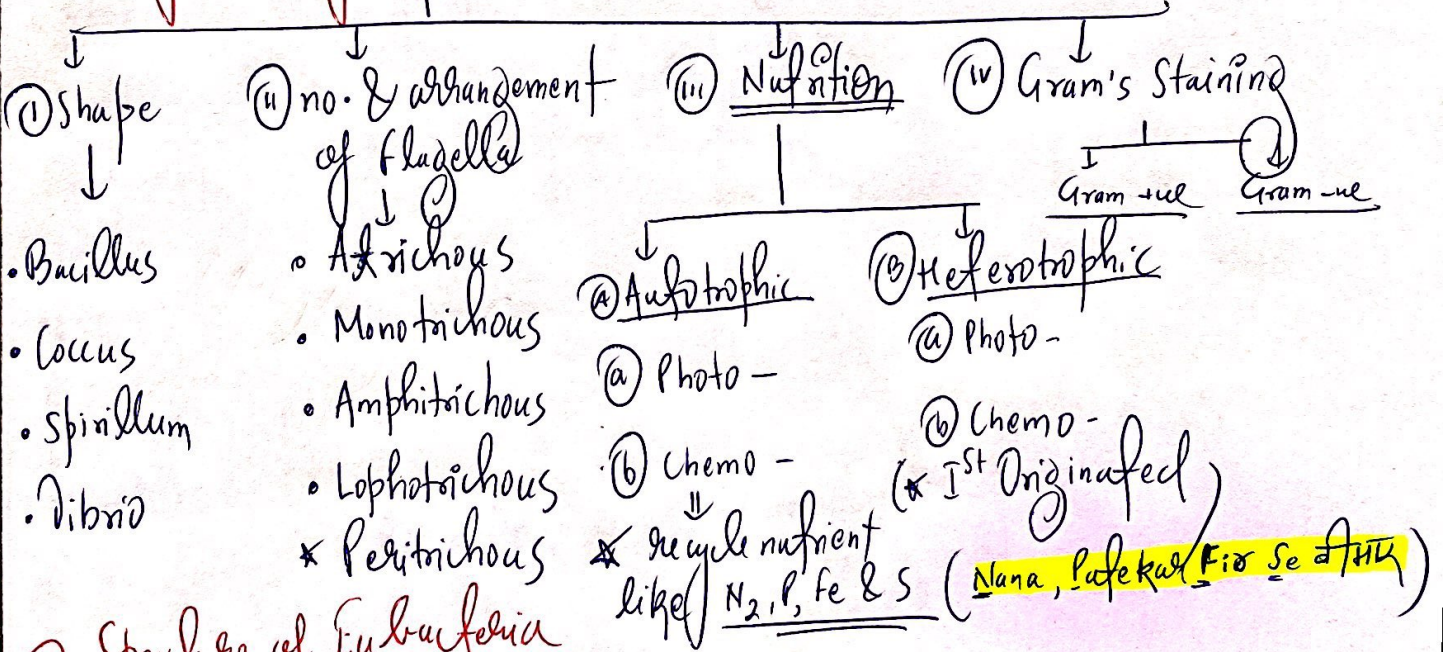
Characteristics

i) Survive in variety of Extreme Habitats (HDSO)

ii) Very Simple in Structure & Complex in Behavior

iii) Bacteria show most extensive Metabolic Diversity

Classification of Eubacteria



Structure of Eubacteria

Cell envelope (3 structural layers)



# Examples of Eubacteria (Acc. to NCERT)

## ① BGA (= Cyanobacteria / Cyanophyceae / Myxophyceae)

- First Oxygenic Bacteria
- Surrounded by mucilaginous (gelatinous sheath)
- Gram → +ve -ve
- Have chl-a similar to Green plants (not chl-b)
- May be fresh  $H_2O$ , Terrestrial or Marine
- Also help in  $N_2$ -fixation

Symbiotic

- N → Nostoc
- A → Anabaena
- C → Cyanothrastrum
- O → Oscillatoria

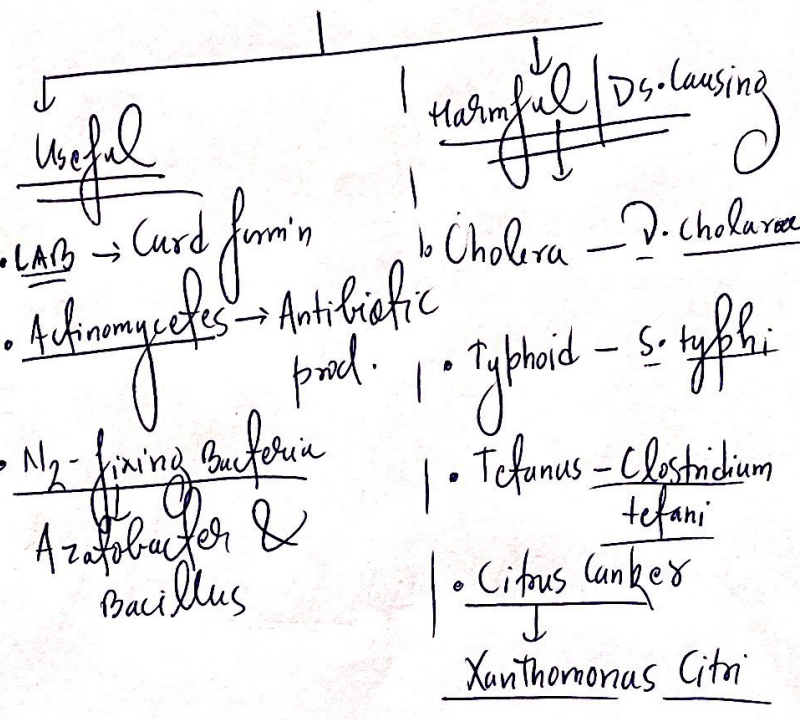
~~Asymbiotic~~  
✓ Aulosira

✗  $N_2$ -fixing BGA have "Heterocyst" (modification of veg. cell)

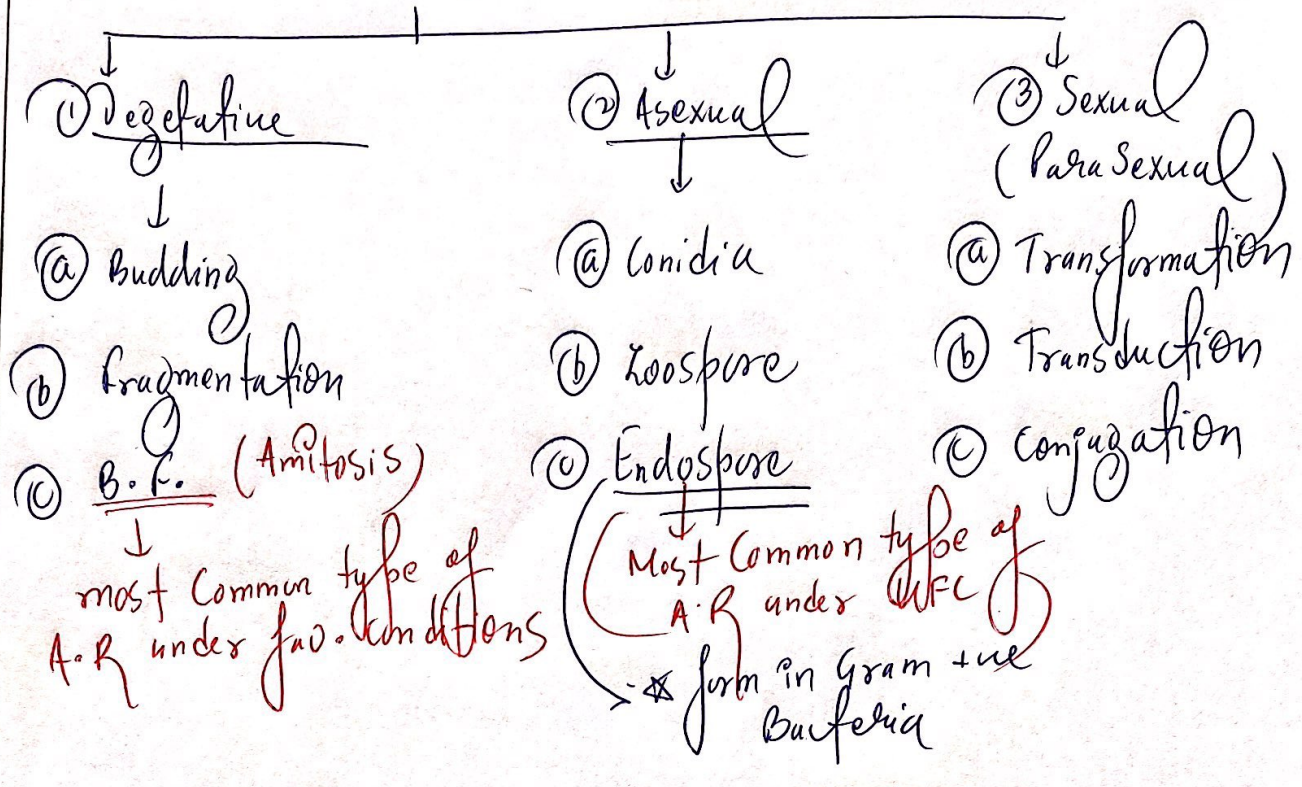
- BGA often forms  $H_2O$  blooms (Death factor)
- Cyanobacteria may be ———— → Protein rich
  - ① Unicellular → Most of BGA (Spirulina)
  - ② Colonial → Anabaena
  - ③ Filamentous → Oscillatoria

Trick: UnSe CA ho file Oscillate or 3!

## ② Heterotrophic Bacteria



# Reproduction in Bacteria



# Kingdom : PROTISTA

## Characteristics

- (1) consists of all 'single celled Eukaryotes' & primarily aquatic
- (2) The boundaries of this kingdom are not well defined.
- (3) This kingdom forms a link with plants, animals & fungi.
- (4) Protists have flagella or cilia for locomotion.
- (5) Protists reproduce asexually & sexually (cell fusion & zygote form)

## \* Main phylums of Protista - 5

### (1) Chrysophytes

This phylum includes Diatoms & Golden algae (Desmids).

I) Habitat : Fresh as well as marine H<sub>2</sub>O.

II) Main nutritional mode : They are microscopic & planktonic (float passively in H<sub>2</sub>O currents) mostly photosynthetic in nature.

### III) Reproduction Structure

The cell walls of Diatoms are form of 'two thin overlapping shells', which fit together as in a soap box.

The cell walls are embedded with silica & thus cells are indestructible.

### IV) Reproduction

Mainly Asexually by : binary fission & sometimes by spore form'n (Akinetes)

Sexually by → Gametic meiosis.

### (2) Special Features

\* Diatomaceous earth (Diatomite / Keiselagush)

A large amount of cell wall deposition of diatoms in their habitat over billions of years.

Being gritty, this soil is used in (i) Polishing, (ii) Filtration of oils & syrups,

(iii) Steam boilers & sound proofing

(3) Chief producers in the Ocean.

② Dinoflagellates (<sup>→ Pyrophyta</sup> Armoured Algae) / Whirling Whips / Night light

It includes Noctiluca & Gonyaulax.

① Habitat (Sea Ghost)

mostly marine

② main nutritional way : photosynthetic

They appear yellow, green, brown, blue or red depending upon main pigments present in their cells.

③ Structure

Cell wall of dinoflagellates divided into plates i.e. plated cell wall. That's why appear like 'Armour' so called 'Armoured Algae'.

→ most of dinoflagellates have two flagella : one lies longitudinally & the other transversely in a furrow b/w wall plates

Due to presence of these flagella, they show a specific movement that is similar to whirling whips. So they also called Whirling Whips.

④ Reproduction

• mainly asexual by 'Binary fission'

& sexually by 'zygotic meiosis'

⑤ Special features

① dinoflagellates Noctiluca & Gonyaulax show bioluminescence due to the presence of 'photogenic granules' in cytoplasm. So, called 'Night light'

② Gonyaulax → Red tides (by rapid multiplication)

③ Gymnodinium & Gonyaulax produce toxins (Saxitoxins) that can kill marine organisms

### ③ Euglenoids

main members - Amoeba, Flase, Paramecium & Euglena

① Habitat : majority of them are fresh H<sub>2</sub>O organisms found in Stagnant H<sub>2</sub>O.

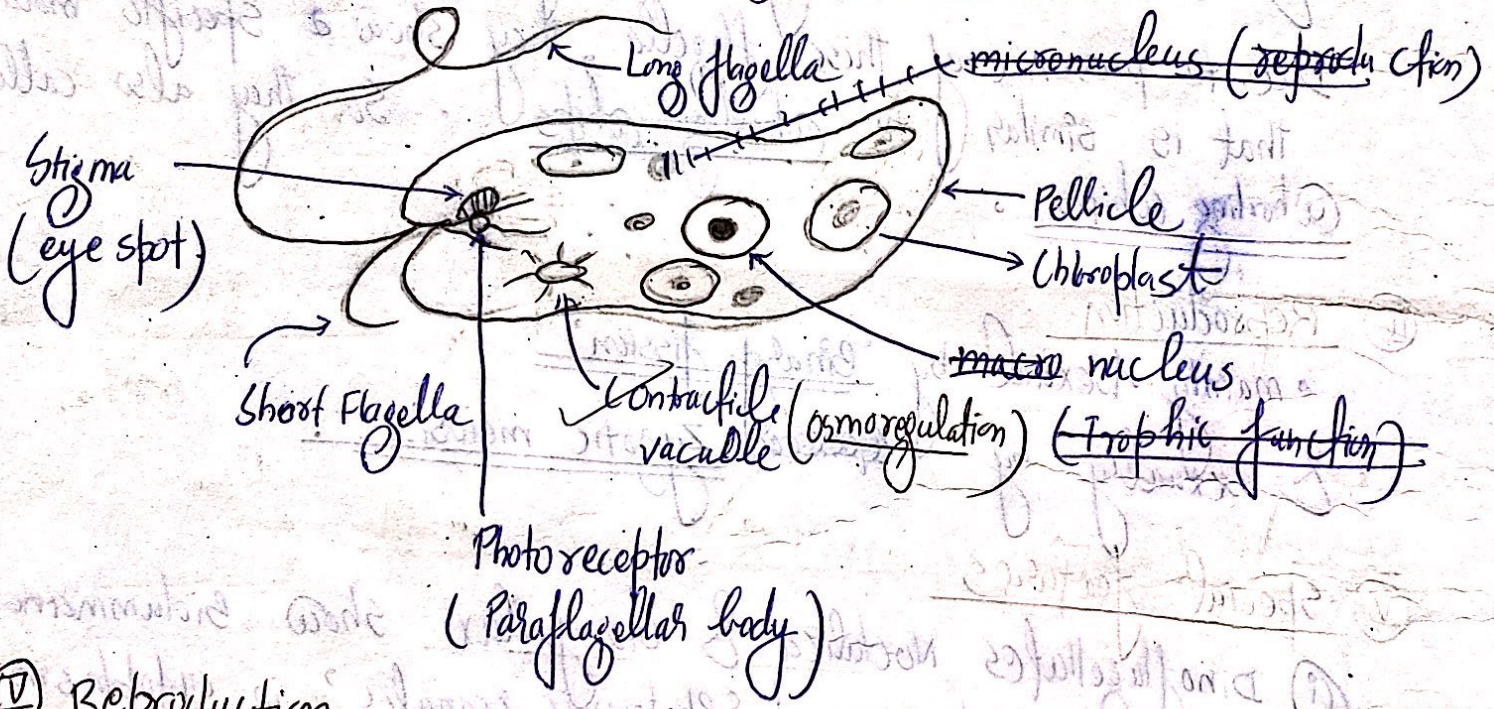
② Main mode of nutrition

① Autotrophic as well as Heterotrophic (so mixotrophic)

③ Structure

→ cell wall absent

- Instead of cell wall, they have Pellicle (protein rich layer) which makes their body flexible.
- They have two flagella : one long (function) & one short (non-functional)



④ Reproduction

Asexually by Longitudinal Binary fission

⑤ Special Feature

Puzzle of biology



④ 'Slime Moulds' (False fungi) → myxomycetes  
① members : ① Physarum & Physarella (acellular slime moulds)  
② Protozelium (cellular slime mould)

④ Nutrition : saprophytic protists.

④ Reproduction : by spore formation → also known as Sporophore

Plasmodium → Fruiting Body (unfav. conditions)

- aggregation form under suitable cond.
- grow & spread over several feet
- bears spores at tip
- spores possess true cell wall
- extremely resistant & survive many years
- spores dispersed by air currents.

④ Special feature

Connecting link b/w Protista & Fungi.

⑤ Protozoans

① All protozoans are heterotrophs & live as predators or paras

② Primitive relatives of animals.

\* Major Groups of Protozoans

① Amoeboid protozoans (Rhizopoda)

- live in fresh, sea H<sub>2</sub>O or moist soil.  
(marine forms have silica shells on their surface)

- Locomotive organ → Pseudopodia

- some of them are parasites (eg Entamoeba histolytica)

② Flagellated protozoans

- either free living or parasitic. (Trypanosoma : sleeping sickness)

- Locomotive organ : Flagella

③ Ciliated protozoan

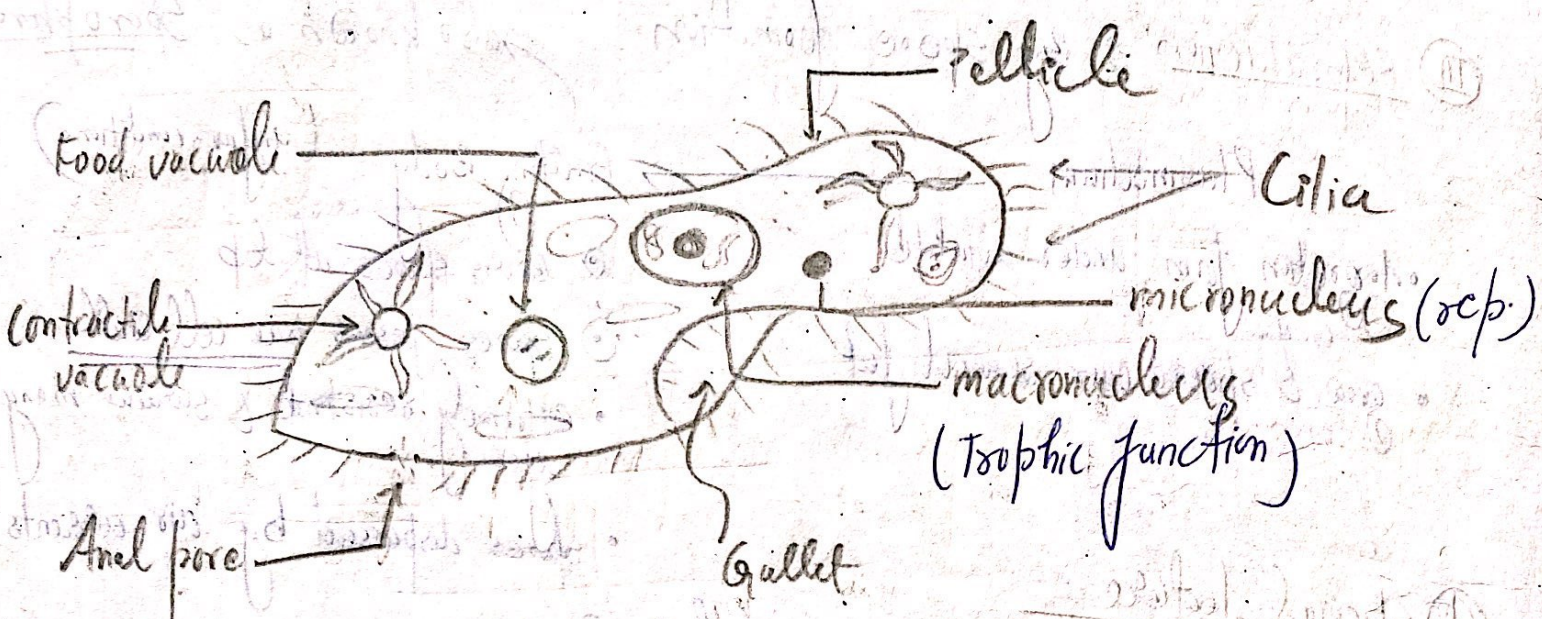
- Aquatic • They have a cavity (Gullet) that opens outside to the surface.

- Locomotive organ : Cilia (coordinated movement of cilia causes the H<sub>2</sub>O laden food storage)

'Sporozoans'

• Includes diverse organisms that have an infectious spore like stage in their life cycle

eg Plasmodium falciparum → most notorious malarial sporozoan



'Paramecium'

Kingdom : Fungi

i) General characteristics of Fungi

• Fungi are eucaryotic, spore bearing, achlorophyllous microorganisms generally reproduce by asexual & sexual meth.

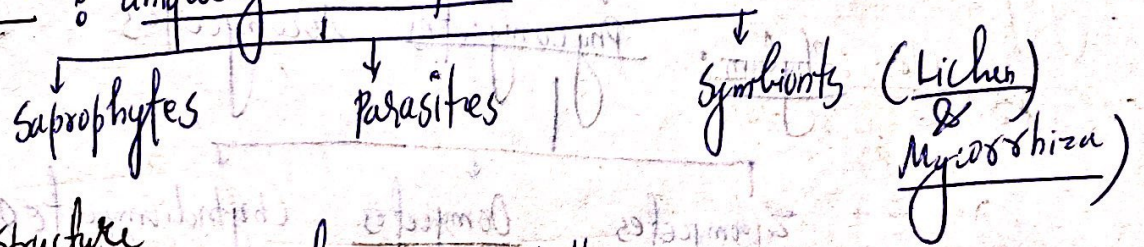
• Fungi show a great diversity in morphology & habitat.

• Fungi are cosmopolitan & occur in air, water, soil & on animals & plants.

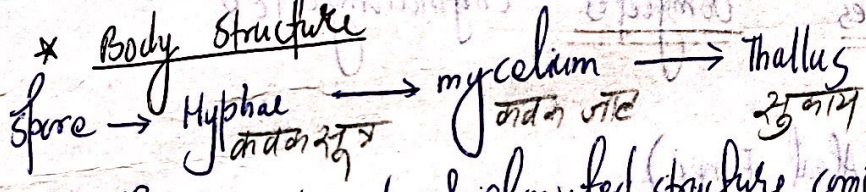
\* Cell wall : composed of chitin & Polysaccharides.

Exceptionally, wall of oomycota group is made up of cellulose.

\* Nutrition : uniquely heterotrophic



\* Body structure



• Hyphae : Filamentous & elongated structure coming out of spore

Aseptate hyphae / non-septate  
Hyphae having continuous tubes filled with multinucleated cytoplasm.

Septate / coenocytic  
Hyphae having septal cross-wall

• mycelium : is the mass of hyphae constituting body of a fungus i.e. Thallus.

• Thallus - relatively simple plant body of fungus devoid of stems, roots & leaves.

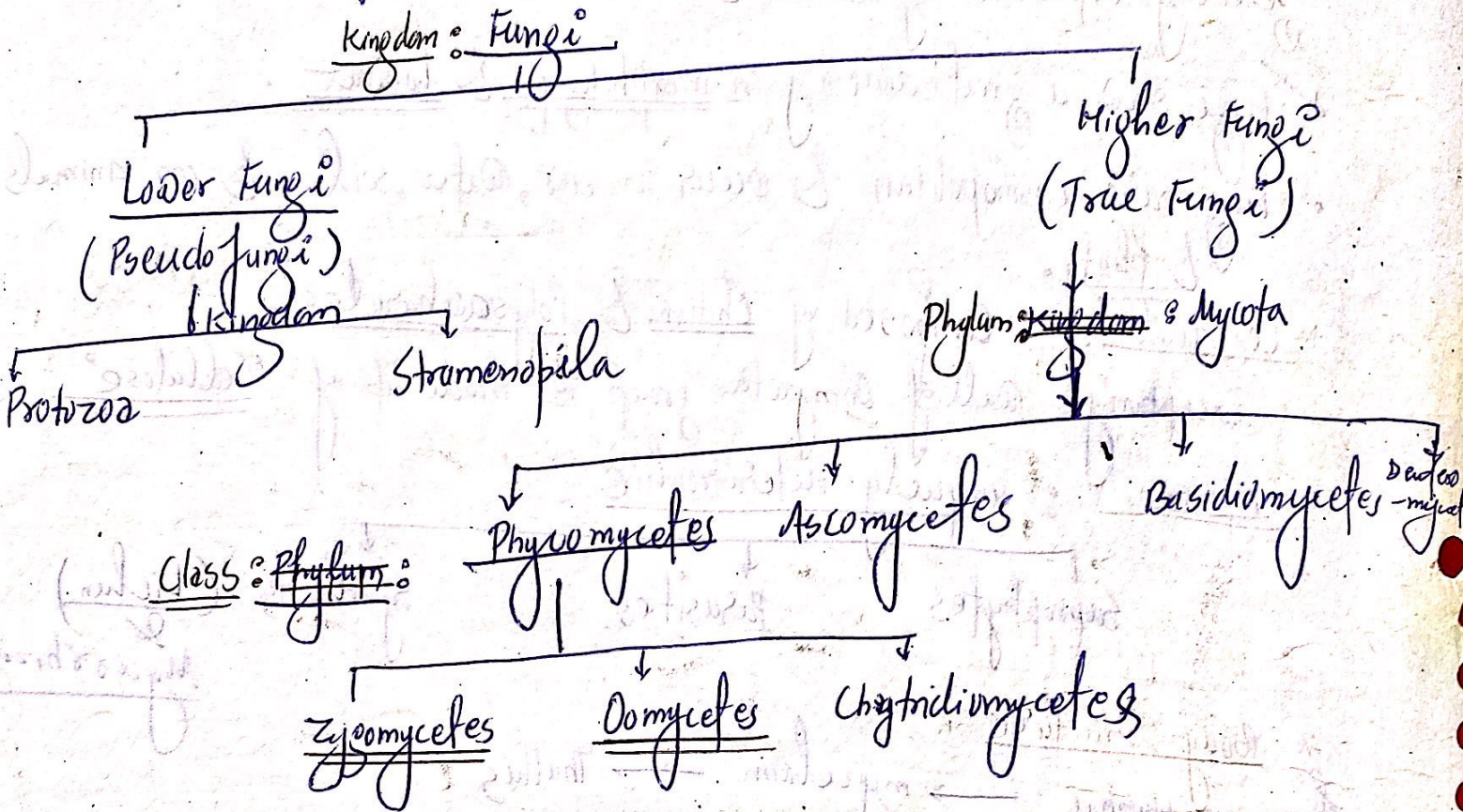
\* Fungi stores food in the form of Glycogen & oil.

Aseptate = Coenocytic

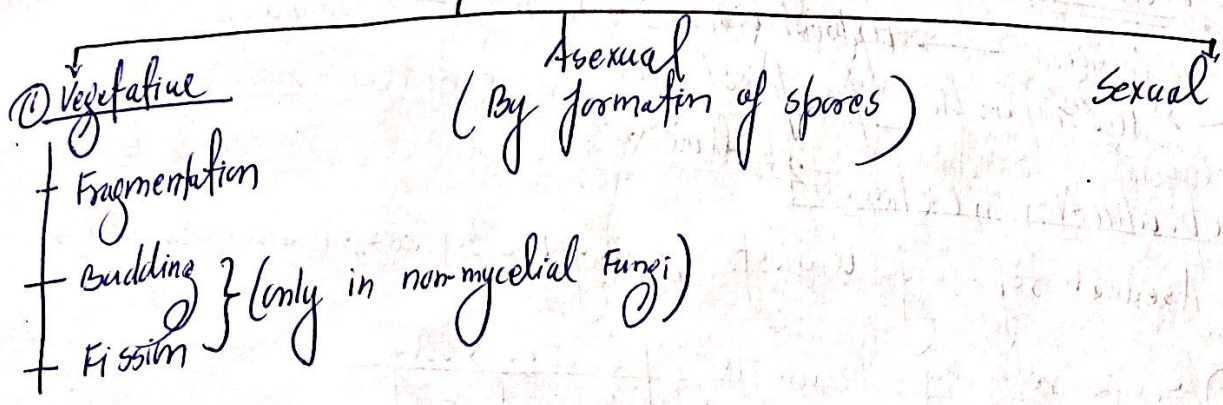
Septate = Acoenocytic

# Classification of fungi

Fungi are classified on the basis of i) morphology of mycelium  
ii) mode of spore formation iii) Fruiting bodies

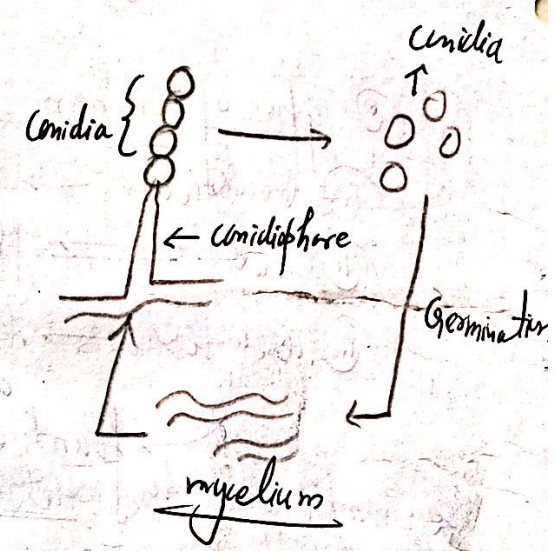
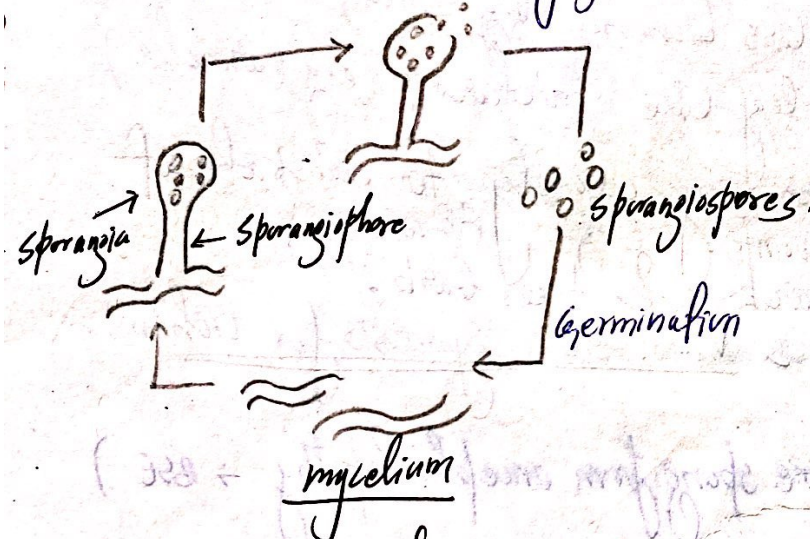


# 'REPRODUCTION IN FUNGI'



## Types of spores

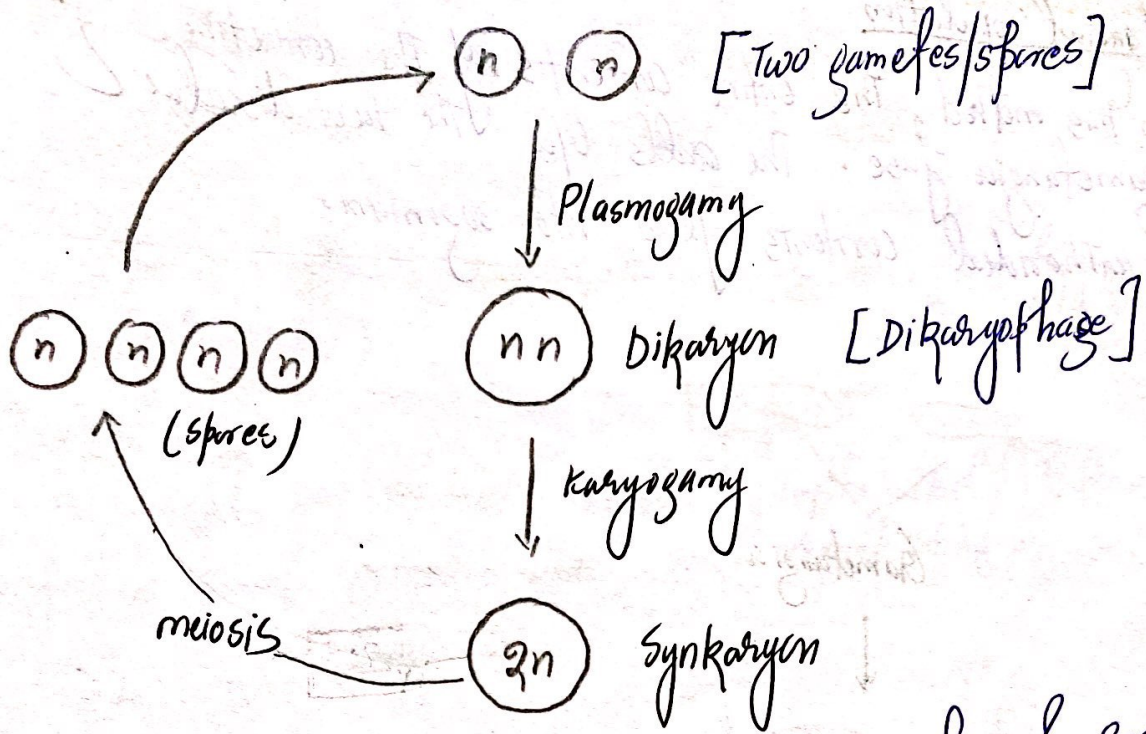
- ① Sporangiospores [endogenous] → Heterokont
- ② Zoospore [motile & flagellated]
- ③ Aplanospore [non motile & non-flagellated]
- ④ Conidia [exogenously produced] (or chlamydospores)



## ⑤ Sexual reproduction Structures in which sexual spores develop called gametangia. (Oospores, Ascospores, Basidiospores)

→ The sexual cycle involve 3 stages —

- ① Plasmogamy → Fusion of protoplasm b/w two motile or non-motile gametes.
- ② Karyogamy - Fusion of two nuclei.
- ③ meiosis → takes place in zygote & give rise to haploid spores.

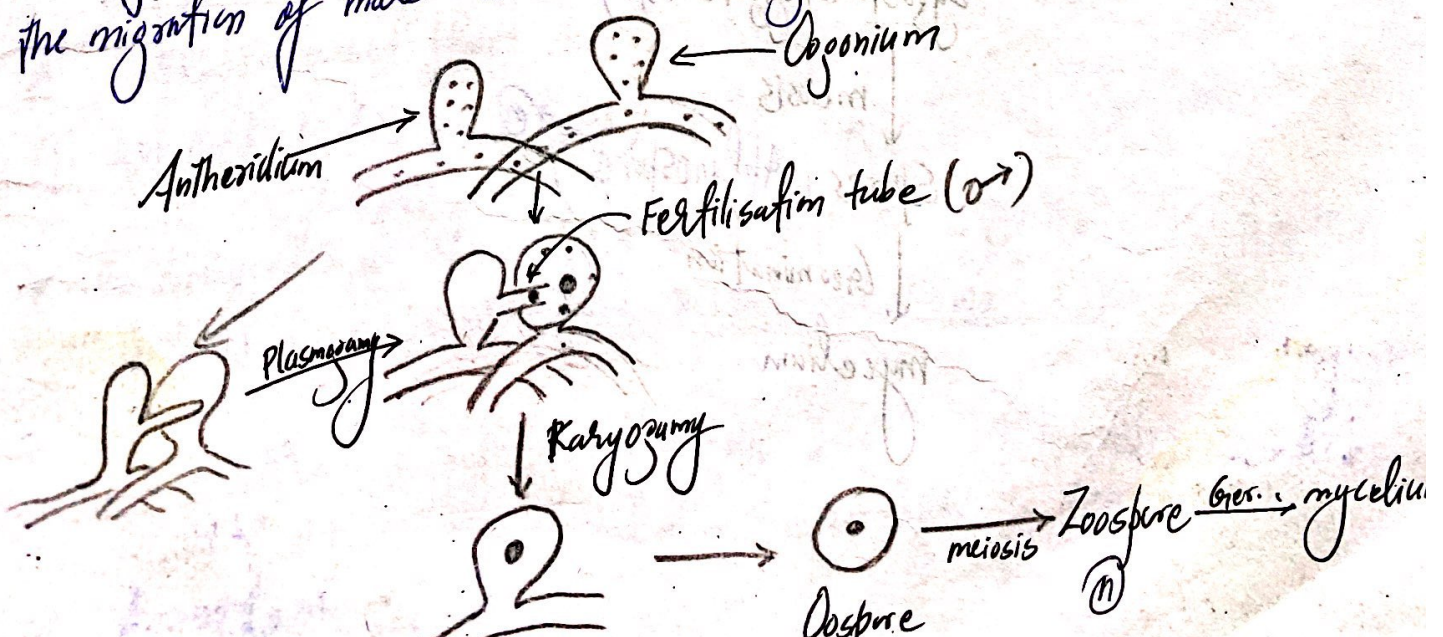


\* Dikaryon phase occurs only in Ascomycetes & Basidiomycetes  
 while not in Phycomycetes & Deuteromycetes.

→ Methods of sexual reproduction

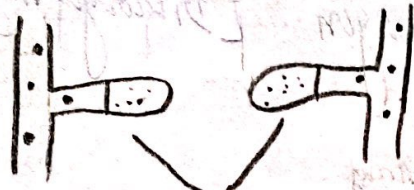
① Craterangial contact

In this method, the two sex organs come in contact with each other. Usually, to effect contact, a conjugation tube or Fertilisation tube is formed from antheridium which penetrates oogonium. This forms passage for the migration of male nuclei into the oogonium.

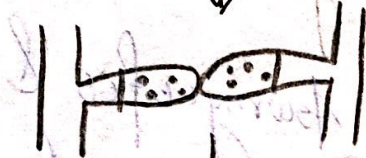


## ② Gametangial copulation

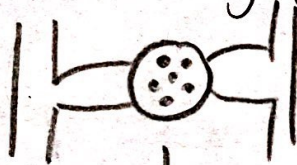
In this method, the entire contents of the contacting gametangia fuse. The walls b/w the two dissolve & the antheridial contents flow into oogonium.



Gametangia



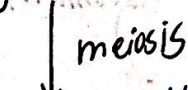
Plasmogamy



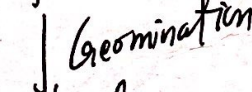
Karyogamy



zygospore/zygote ( $2n$ )



Spores (Aplanospore)



mycelium

### ③ Spermatization

It involves the formation of small spores or seed like structures <sup>called</sup> spermatia.  
e.g. spermatiospores. (Rust fungi)

Spermatiospores (male gamete)  $\xrightarrow{\text{wind/insects}}$  Retentive hypha (Act as female gametangium)

### ④ Somatogamy

no gametes are involved. Vegetative hypha itself acts as a male & female gamete & bring about sexual reproduction.  
e.g. Smut Fungi.

### Note

#### ① Examples of Oomycetes

- ① Saprolegnia — infect fish (or its eggs) — Salmon disease of fish gills.
- ② Synchytrium endobioticum — Potato wart disease (Black Scab).

③ Haplontic life cycle & zygotic meiosis  
\* Embryo is absent, so resting phase also absent.

- A. Ustilago caused plant diseases called Smut
- B. Affected part become completely black.

\* Basidiomycetes are often called club fungi because the cells (Basidia) that bear sexual spores resemble a small club.

• Mould/Mold — a soft, green or grey growth that develops on old food or on objects that have been left for too long in warm, wet air.



## 2. Kingdom Protista

### Characteristics

- i) include all single celled Eukaryotic Organisms
- ii) Boundaries → not well defined
- iii) Connecting link b/w plants, animals & fungi
- iv) Locomotory structures → C, F & P
- v) Rep. → sexual by cell fusion & zygote form'n  
AR → by spore form'n

Sl. No.	Phylum	Members	Habitat	Repro.	Nutrition	Feature
1.	Chrysophytes	<ul style="list-style-type: none"> <li>i) Diatoms (Soup boxes)</li> <li>ii) Desmids (Golden Algae)</li> </ul>	f.w + M.w	<ul style="list-style-type: none"> <li>AR: Binary</li> <li>BF</li> <li>→ Auxospore form'n</li> <li>SR</li> <li>Gametic meiosis</li> </ul>	<ul style="list-style-type: none"> <li>Photosynthetic</li> <li>Photosynthetic</li> </ul>	<ul style="list-style-type: none"> <li>• Diatoms Earth form'n</li> <li>• Chief Producer in Ocean</li> </ul>
2.	Dinoflagellates (Armoured Algae) (Whirling whips)	<ul style="list-style-type: none"> <li>i) Noctiluca</li> <li>ii) Gonyaulax</li> <li>iii) Gymnodium</li> </ul>	<ul style="list-style-type: none"> <li>night light</li> <li>Toxin (Saxitoxin)</li> <li>red tide form'n</li> </ul>	<ul style="list-style-type: none"> <li>AR - BF</li> <li>SR: zygotic Meiosis</li> </ul>		
3.	Euglenoids	Euglena	Stagnant f.w	<ul style="list-style-type: none"> <li>AR: Longitudinal</li> <li>BF</li> </ul>	Mixotrophic	Biological puzzle
4.	Slime Moulds (False fungi) (Myxomycetes)	<ul style="list-style-type: none"> <li>• Physarum &amp; Physarella (Acellular)</li> <li>• Protostelium (Cellular)</li> </ul>	Saprophytic (Dead Decaying matter)	Spore form'n	Saprophytic	Connecting link b/w Protista & Fun
5.	Protozoans	A, F, C, S	f.w + M.w + Terrestrial	AR & SR	Heterotrophic	