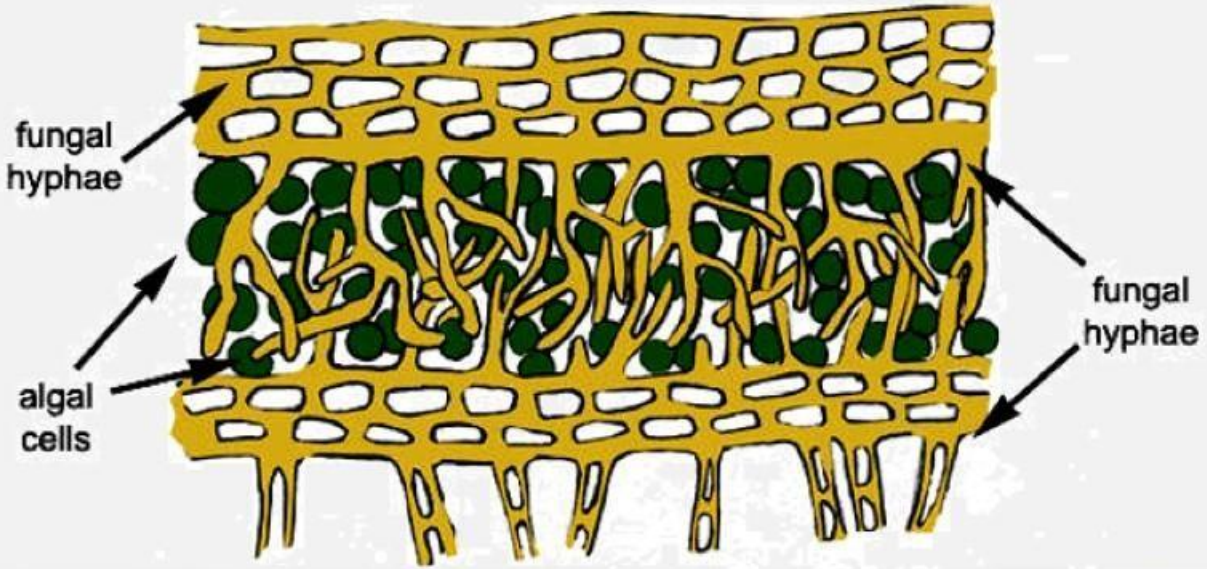
VIRUSES, VIROIDS, PRIONS AND LICHENS

LICHENS

- Algae prepare food for fungi and fungi provide shelter and absorb mineral nutrients and water for its partner.
- Lichens are very good Pollution indicators. They do not grow in polluted areas.




BIOLOGICAL CLASSIFICATION
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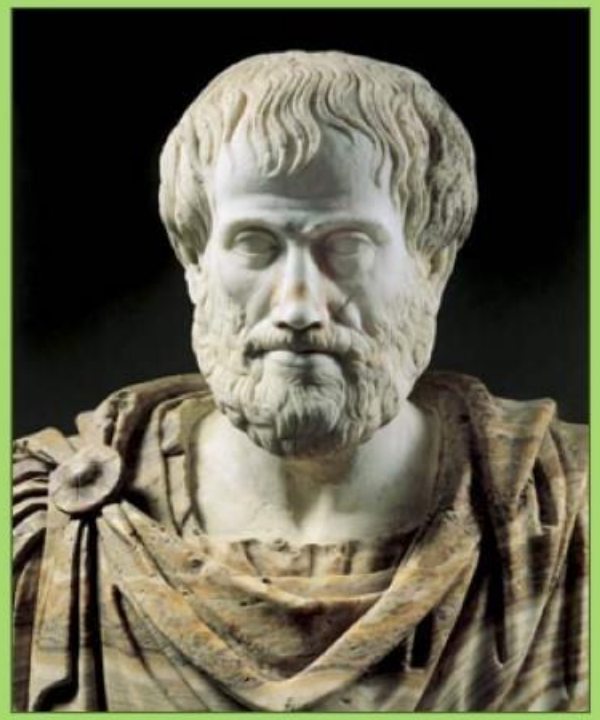
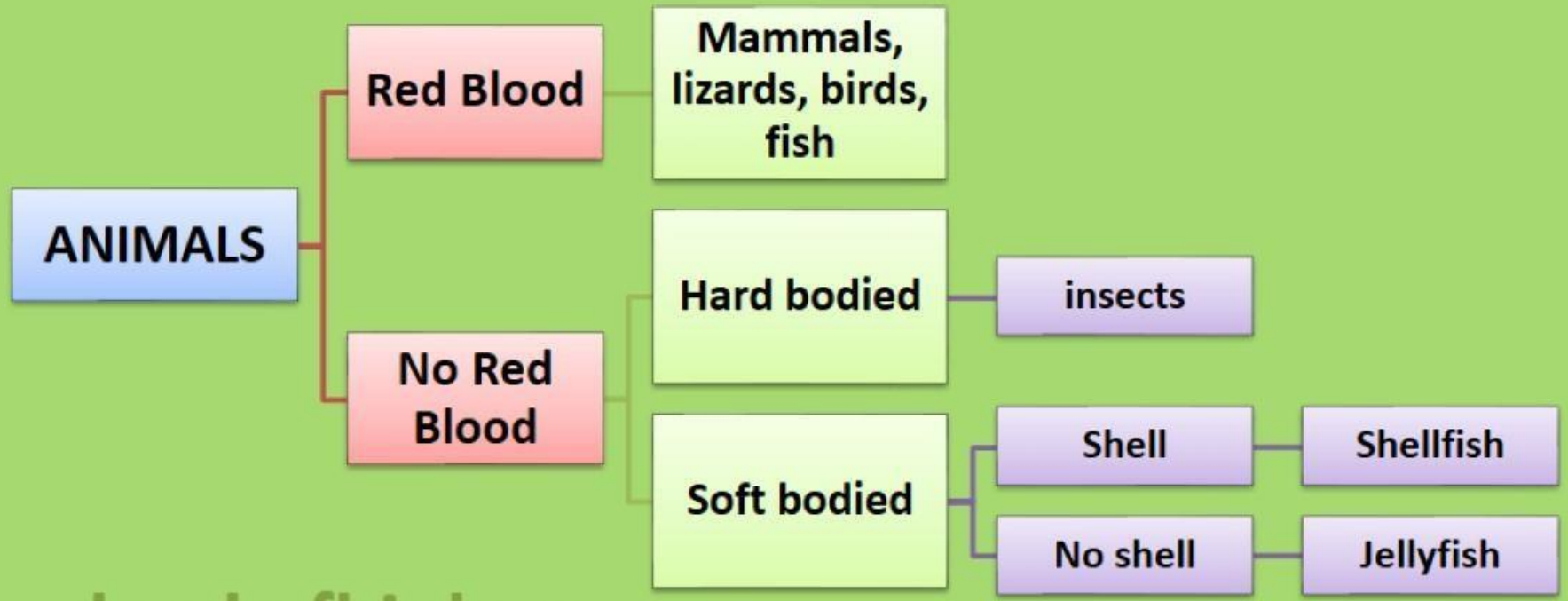
Aristotle's classification

- **Aristotle** was the earliest to attempt a more scientific basis for classification of organisms.
- He classified plants to **trees, shrubs & herbs** and animals into 2 groups, those with **red blood and without red blood.**





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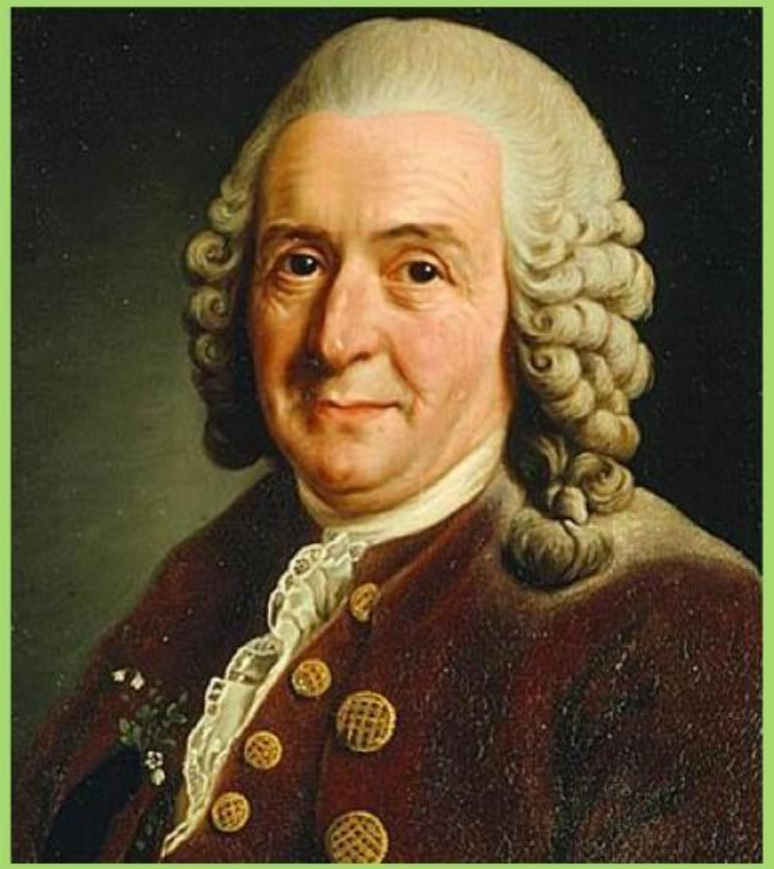
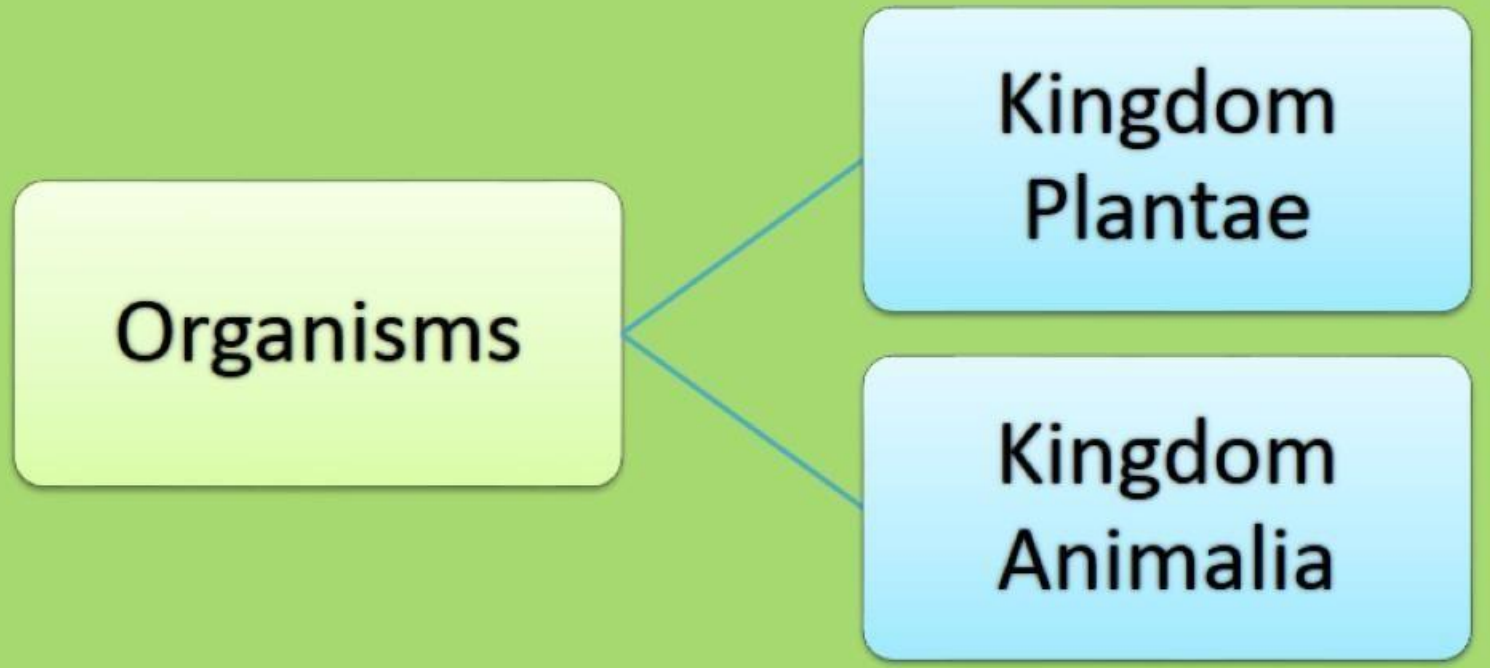
Two-Kingdom classification

- It is proposed by Linnaeus (1758).
- This system classifies organisms into Two Kingdoms- Plantae & Animalia.





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Two-Kingdom classification

Drawbacks of 2-kingdom classification

- **Prokaryotes** (Bacteria, cyanobacteria) & **eukaryotes** (fungi, mosses, ferns, gymnosperms & angiosperms) were included **under 'Plants'** based on the presence of cell wall. But they are widely differed in other features.

- It included **unicellular & multicellular** organisms in **same group.** E.g. *Chlamydomonas* & *Spirogyra* were placed under algae.

- It did **not differentiate** between **heterotrophic fungi** and **autotrophic green plants.** Fungi have chitinous cell wall while the green plants have cellulosic cell wall.

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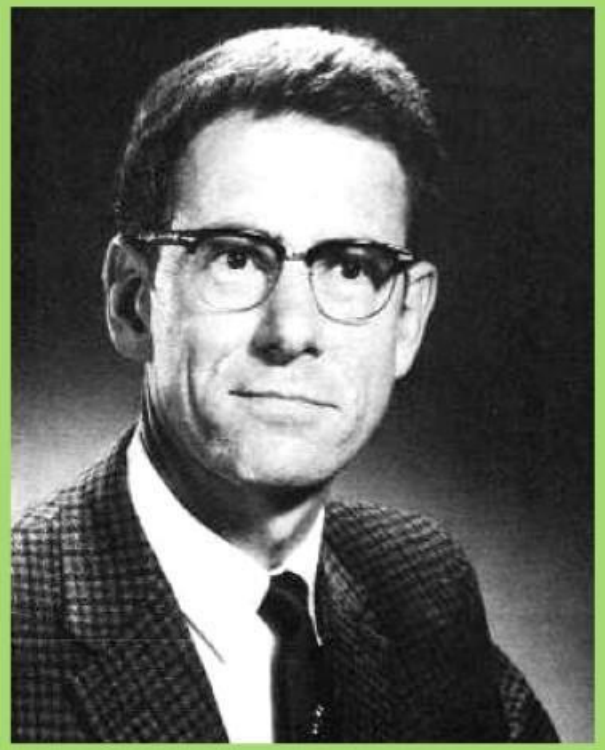
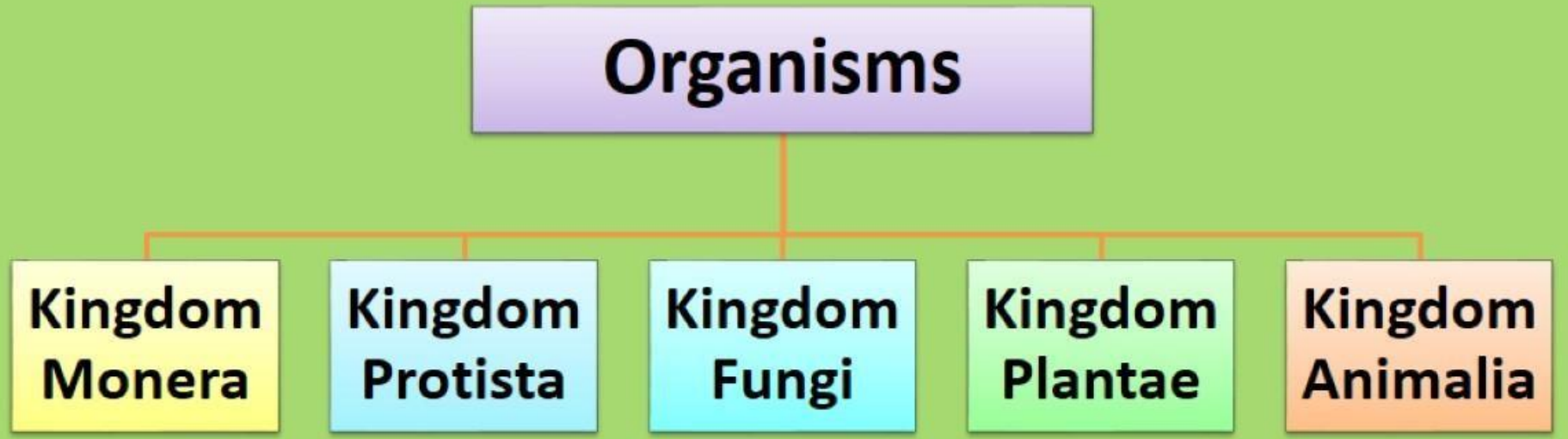
Five-Kingdom classification

- It is proposed by R.H. Whittaker (1969).
- It includes Monera, Protista, Fungi, Plantae & Animalia.
- This classification is based on cell structure, thallus organisation, mode of nutrition, reproduction & phylogenetic relationships.





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Characteristics of the five Kingdom

Characters	Monera	Protista	Fungi	Plantae	Animalia
Cell type	Prokaryotic	Eukaryotic	Eukaryotic	Eukaryotic	Eukaryotic
Cell wall	Non-cellulosic (polysaccharide + amino acid)	Present in some	Present (Chitin & poly-saccharides)	Present (cellulose)	Absent
Nuclear membrane	Absent	Present	Present	Present	Present
Body organization	Cellular	Cellular	Multicellular, loose tissue	Tissue/organ	Tissue/organ/ organ system
Mode of nutrition	Autotrophic (photosynthetic & chemosynthetic) and heterotrophic (saprophyte/ parasite)	Autotrophic (photosynthetic) & heterotrophic	Heterotrophic (saprophytic or parasitic)	Autotrophic (photo-synthetic)	Heterotrophic (holozoic, saprophytic etc)

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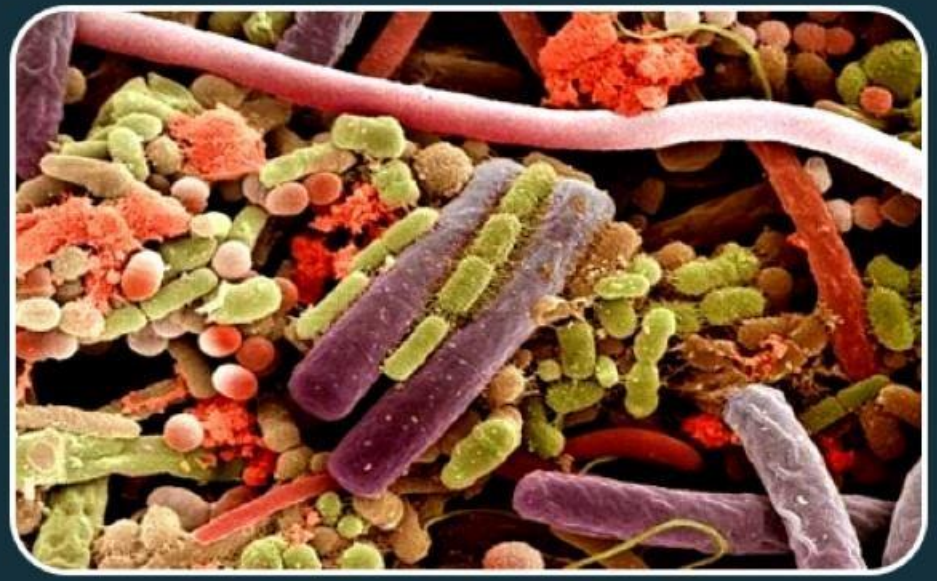
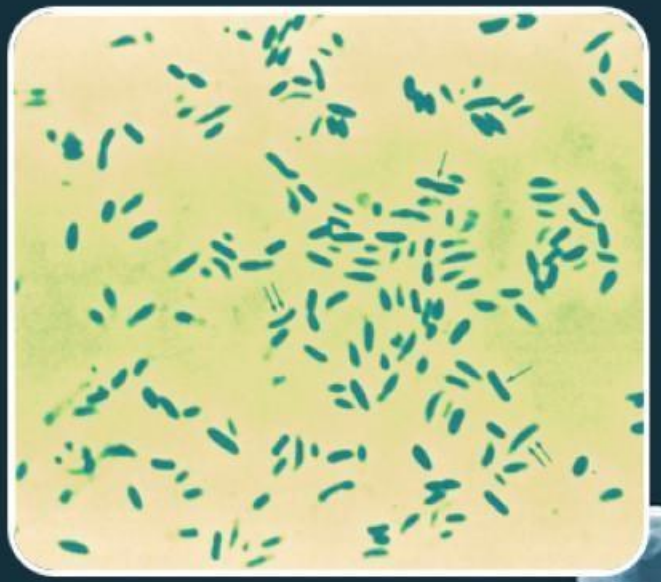
KINGDOM MONERA
(BACTERIA)

1. KINGDOM MONERA (BACTERIA)

- Bacteria are the **most abundant microorganisms.**
- Hundreds of bacteria are present in a handful of soil.
- They also live in extreme habitats such as **hot springs, deserts, snow & deep oceans.**
- Many are parasites.





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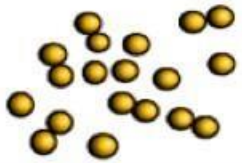
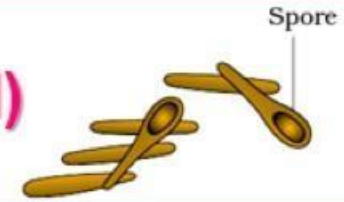
1. KINGDOM MONERA (BACTERIA)

Based on the shape, bacteria are 4 types:

Coccus (Spherical)

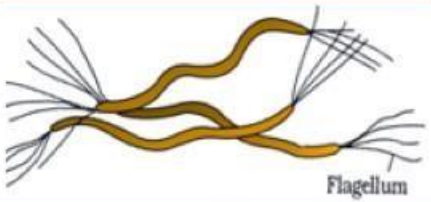


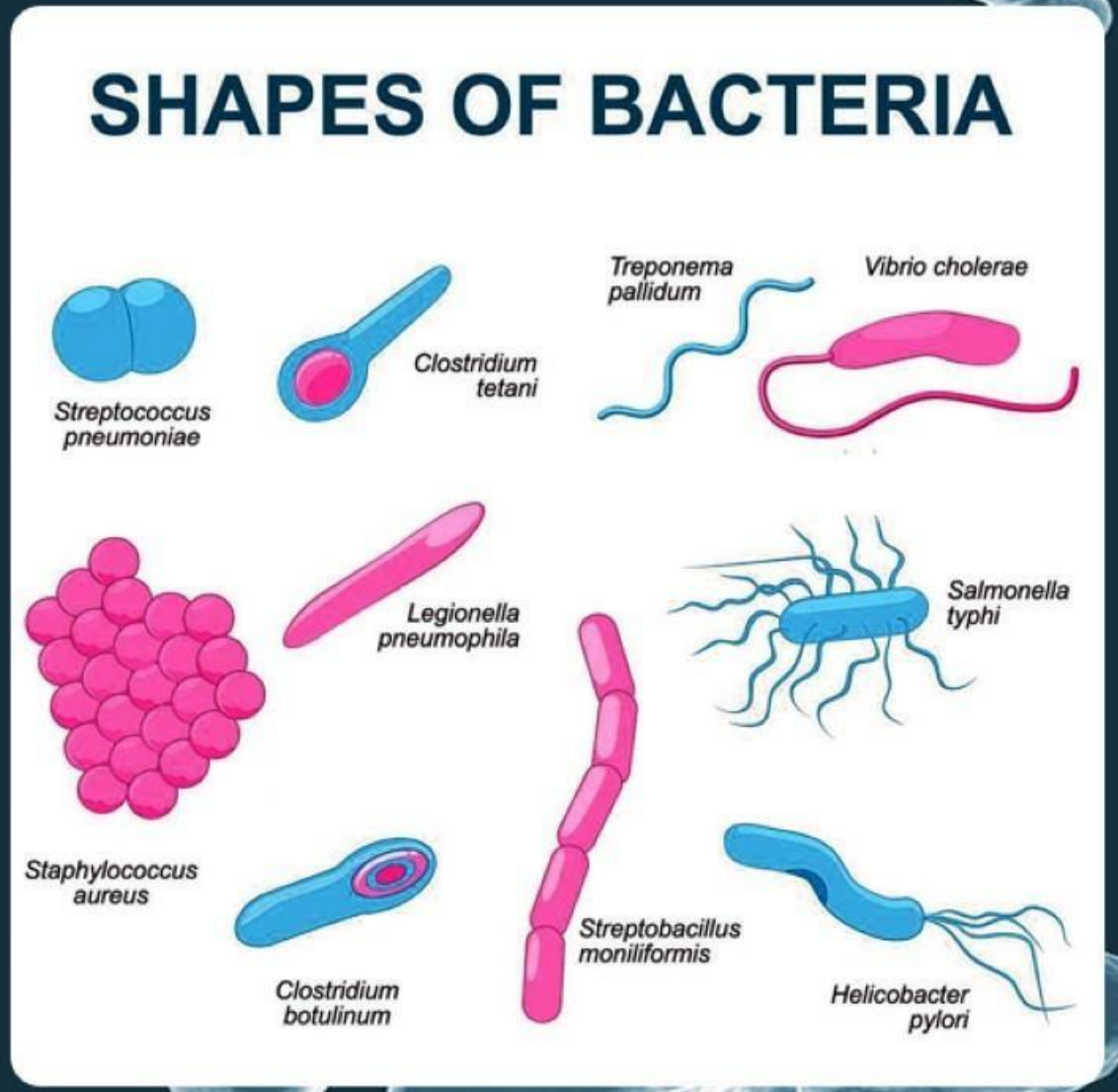
Bacillus (Rod-shaped)



Vibrium (Comma-shaped)

Spirillum (Spiral)





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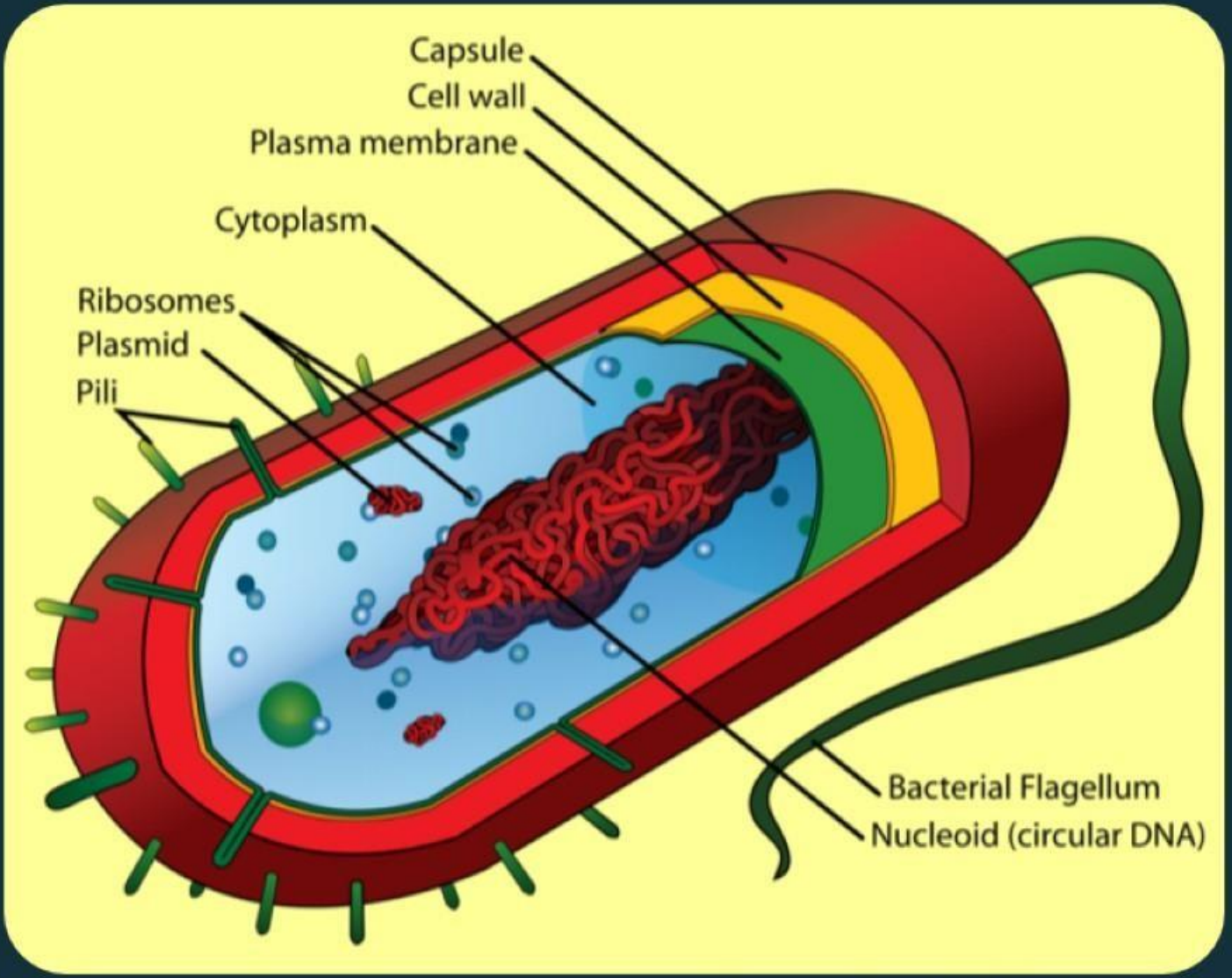
1. KINGDOM MONERA (BACTERIA)



- Bacterial structure is very simple but they are complex in behaviour and show metabolic diversity.
- Some bacteria are **autotrophic** (synthesize food from inorganic substrates).
- Majority are **heterotrophs** (they do not synthesize the food but depend on other organisms or on dead organic matter for food).

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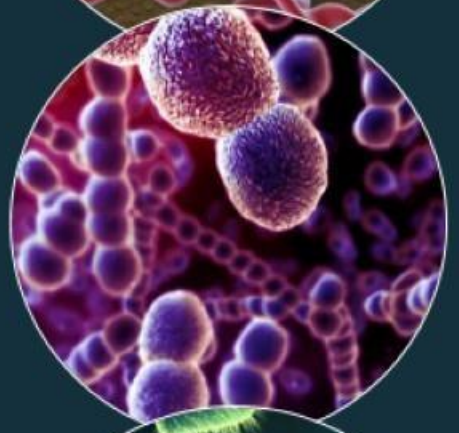
1. KINGDOM MONERA (BACTERIA)

CLASSIFICATION



- Bacteria
  - Archaebacteria
    - Halophiles
    - Thermo-acidophiles
    - Methanogens
  - Eubacteria
    - Autotrophs
      - Photosynthetic autotrophs
      - Chemosynthetic autotrophs
    - Heterotrophs
      - Parasitic
      - Saprophytic

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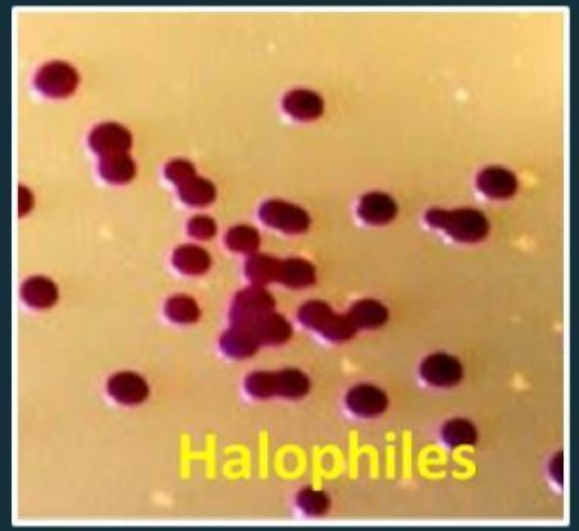
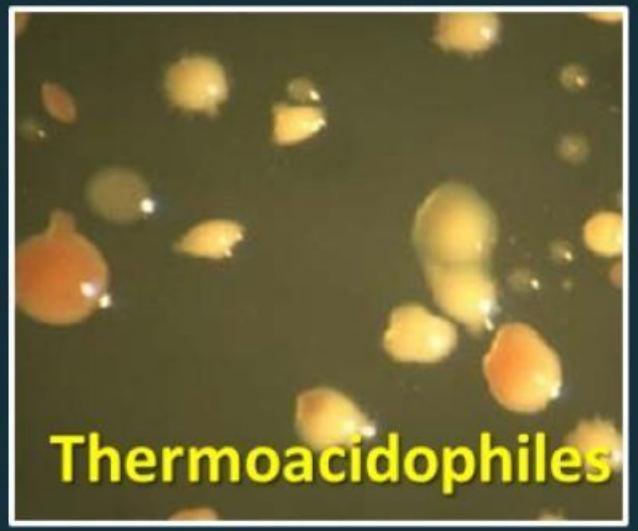
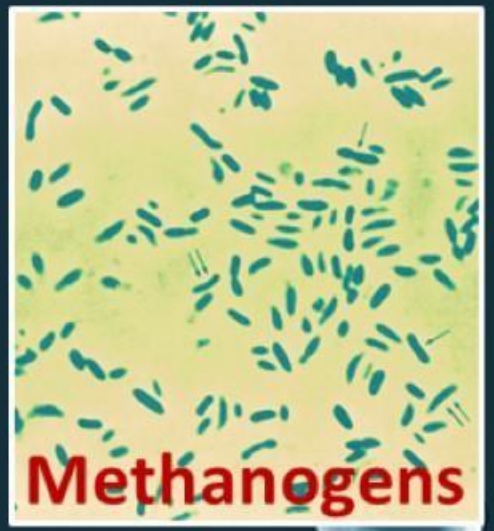
1. KINGDOM MONERA (BACTERIA)

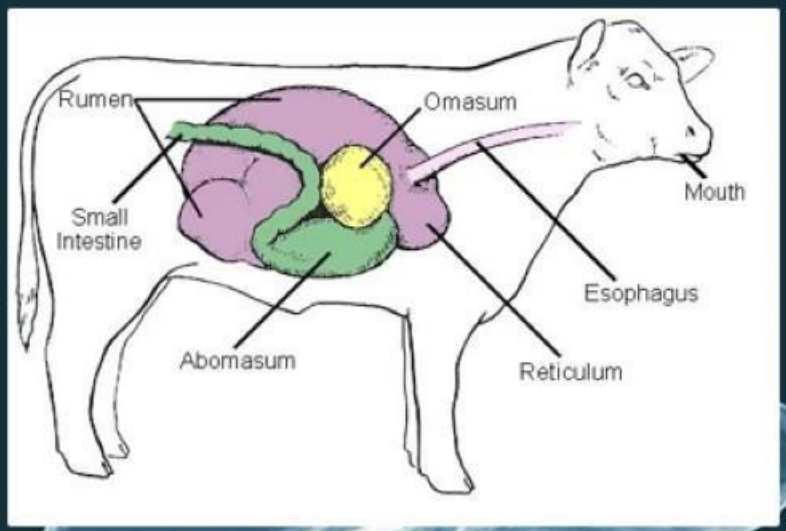
1. ARCHAEBACTERIA

- They live in harshest habitats such as extreme salty areas **(halophiles)**, hot springs **(thermoacidophiles)** and marshy areas **(methanogens)**.
- Archaebacteria have a different cell wall structure for their survival in extreme conditions.
- Methanogens are present in the **guts of ruminant animals** (cows, buffaloes etc). They produce **methane (biogas)** from the dung of these animals.









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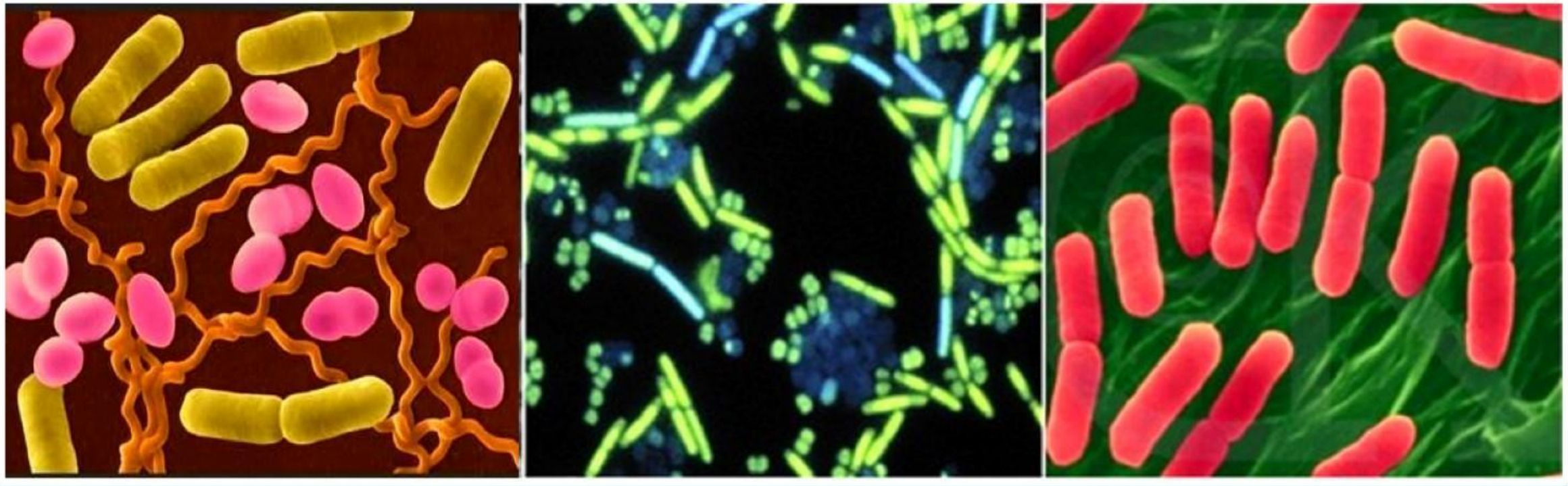
1. KINGDOM MONERA (BACTERIA)

2. EUBACTERIA



- They are True Bacteria having a rigid cell wall and a flagellum (if motile).
- They include Autotrophs (photosynthetic & chemosynthetic) and Heterotrophs.

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1. KINGDOM MONERA (BACTERIA)

2. EUBACTERIA

A. Photosynthetic autotrophs (E.g. Cyanobacteria)

- They have **chlorophyll *a*** similar to that of green plants.

  Cyanobacteria (blue-green algae)
- Unicellular, colonial or filamentous, marine or terrestrial algae.
- The colonies are generally surrounded by **gelatinous sheath.**
- They often form blooms in polluted water bodies.
- Some of them fix atmospheric N_2 in specialized cells called **heterocysts.**
- E.g. ***Nostoc* & *Anabaena*.**

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1. KINGDOM MONERA (BACTERIA)

2. EUBACTERIA

B. Chemosynthetic autotrophs

- They oxidize inorganic substances such as **nitrates, nitrites & ammonia** and use the released energy for **ATP production.**
- They help in recycling nutrients like **nitrogen, phosphorous, iron & sulphur.**

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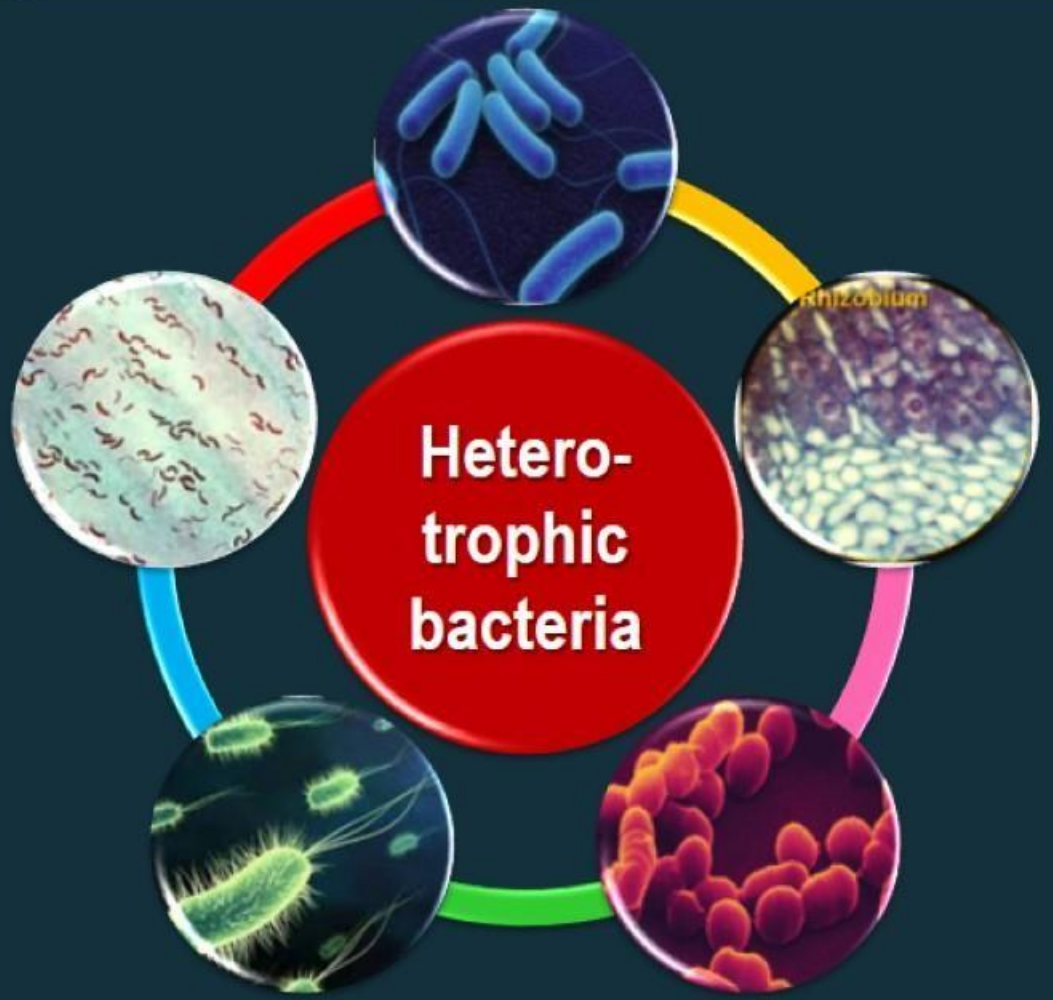
C. Heterotrophic bacteria

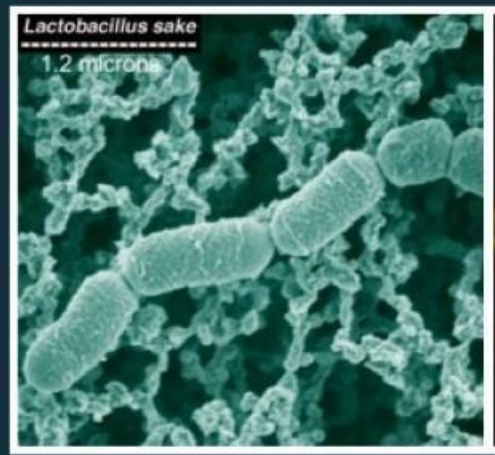


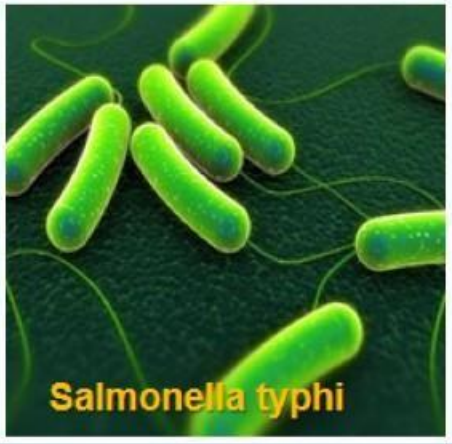
- They are the most abundant in nature.
- The majority are important decomposers.

1. KINGDOM MONERA (BACTERIA)

2. EUBACTERIA

C. Heterotrophic bacteria: Impacts on Human affairs



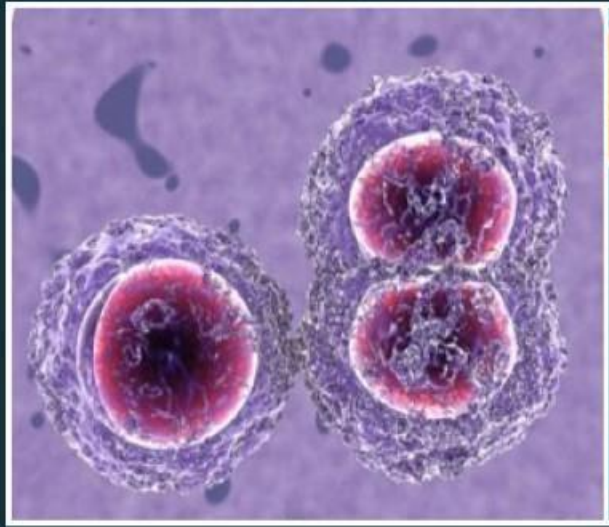


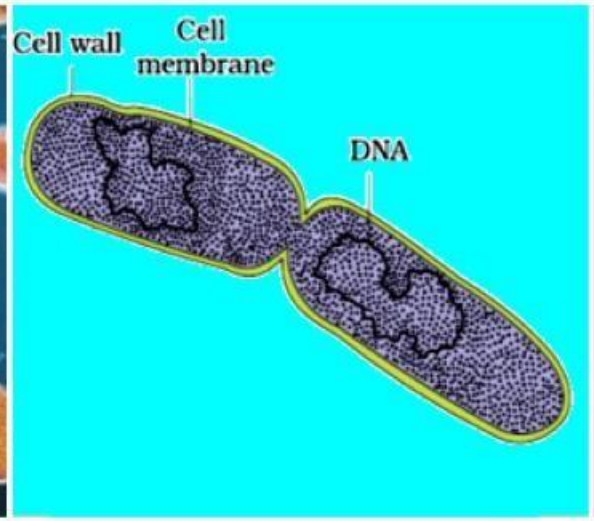
- ✓ They are used to make **curd** from milk.
- ✓ Production of **antibiotics.**
- ✓ **Fixing nitrogen** in legume roots etc.
- ✓ Some are **pathogens** causing diseases.

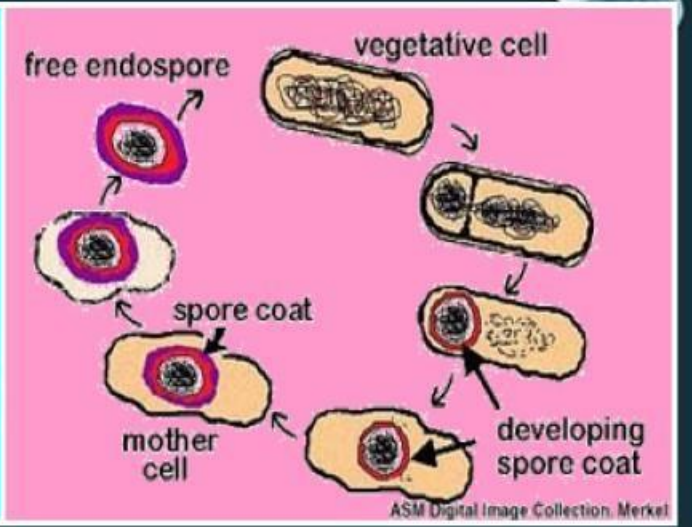
  E.g. Cholera, typhoid, tetanus, and citrus canker.

1. KINGDOM MONERA (BACTERIA)

REPRODUCTION







- Bacteria reproduce mainly by **fission.**
- Under unfavourable conditions, they produce **spores.**
- They also reproduce by a sort of sexual reproduction **(DNA transfer** from one bacterium to other).

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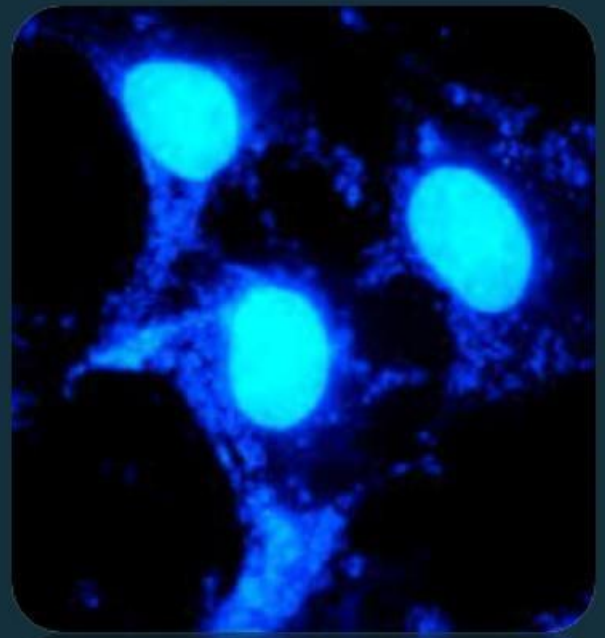
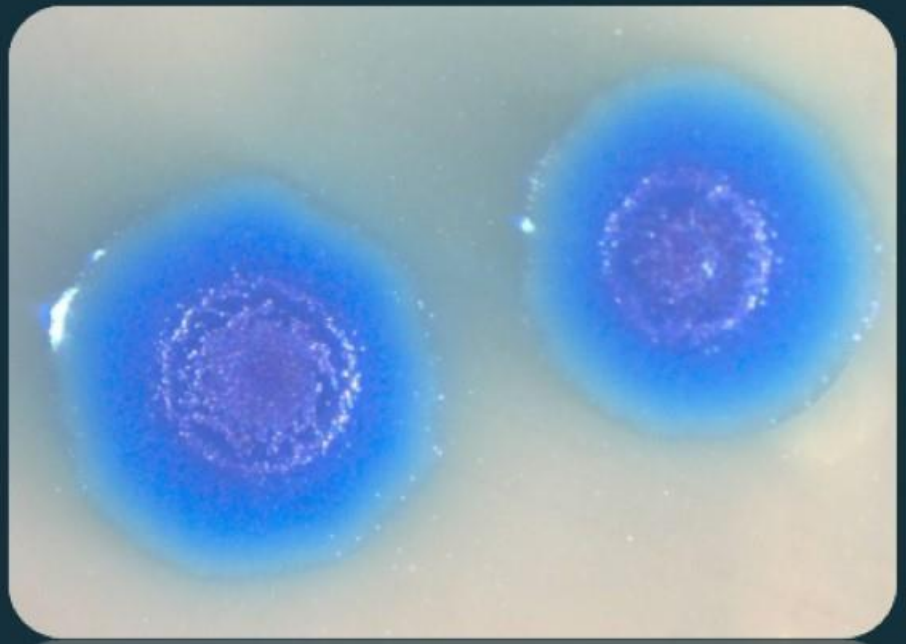
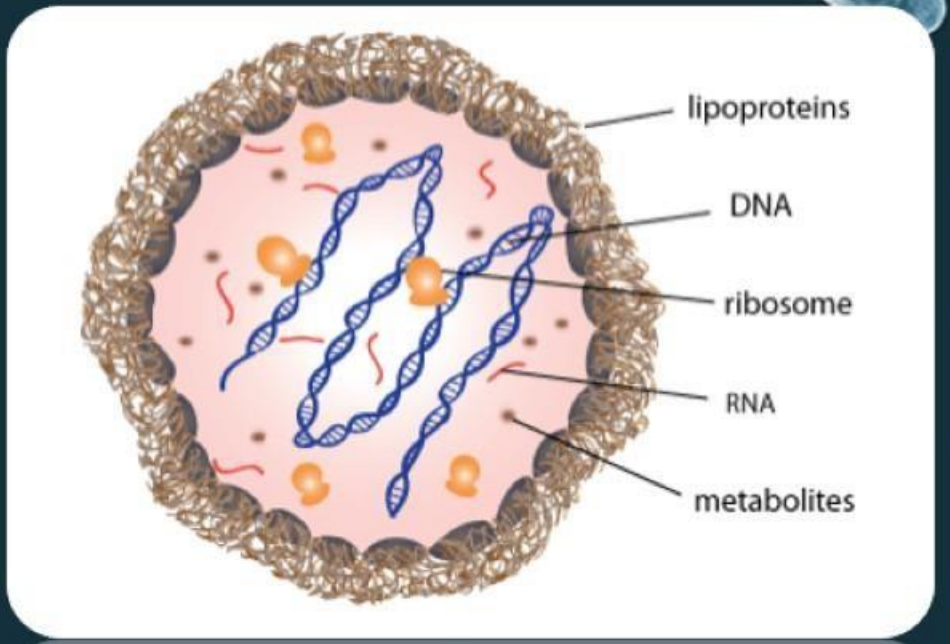
1. KINGDOM MONERA (BACTERIA)

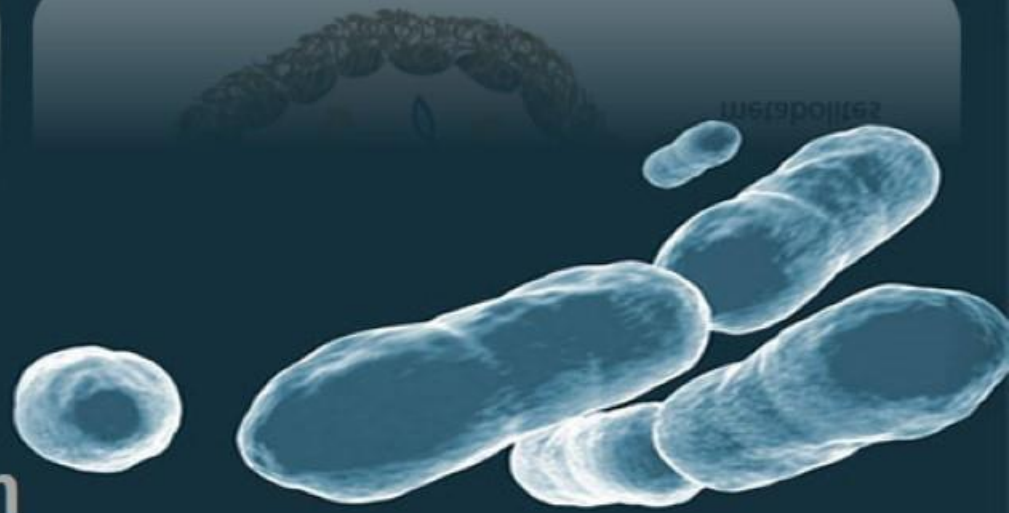
MYCOPLASMAS







- They are organisms **without a cell wall.**
- They are the **smallest living cells** known.
- They can survive **without oxygen.**
- Many are **pathogenic** in animals and plants.



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PART 2

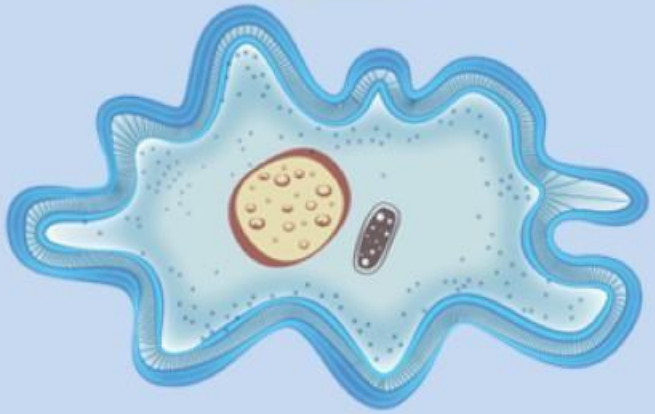
KINGDOM PROTISTA

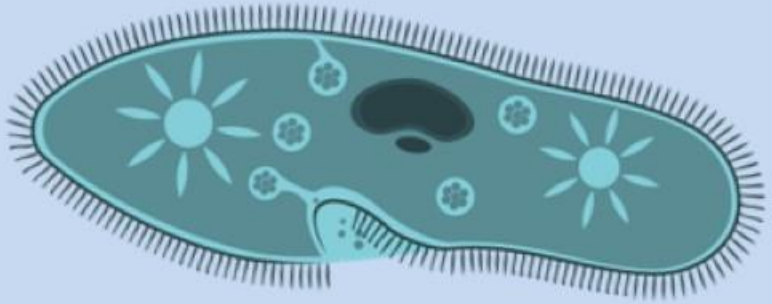
2. KINGDOM PROTISTA

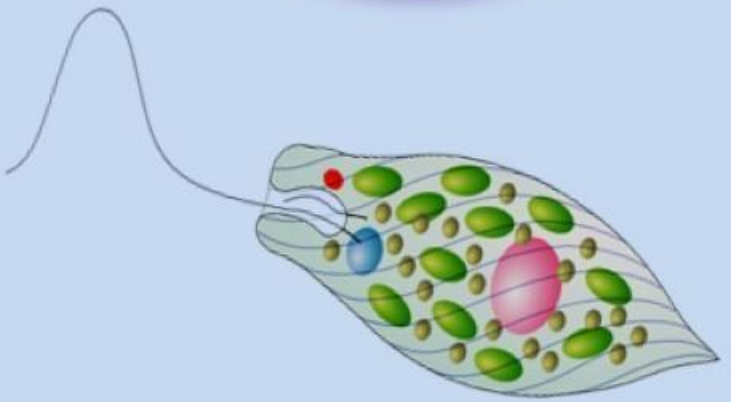
It includes single-celled eukaryotes.

Well defined nucleus & other membrane-bound organelles.

Some have flagella or cilia.







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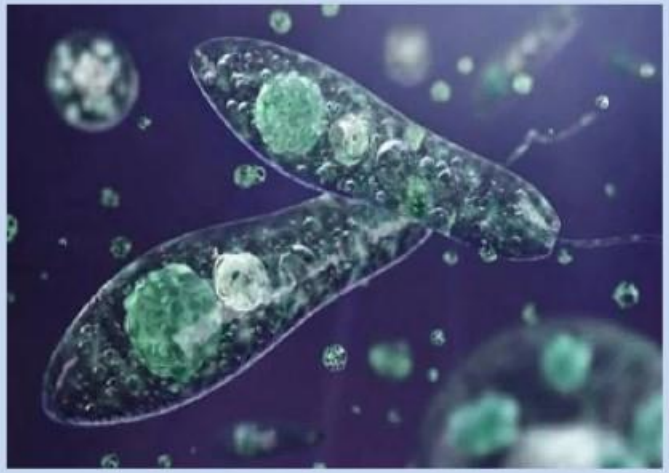
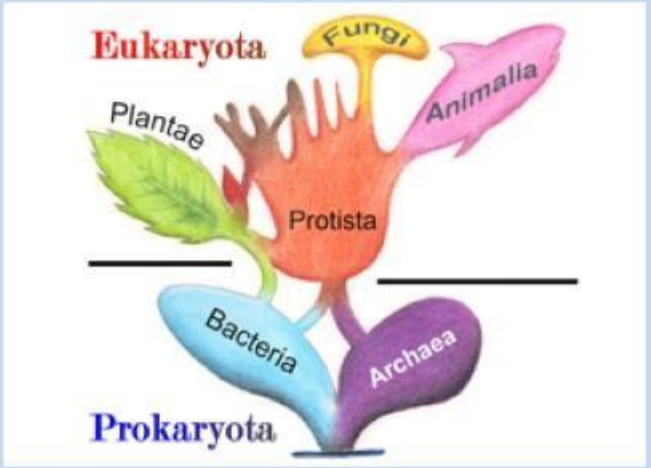
2. KINGDOM PROTISTA

Protists are primarily **aquatic.**

It is a **link** with plants, animals and fungi.

Reproduce **asexually** and **sexually** (cell fusion & zygote formation).





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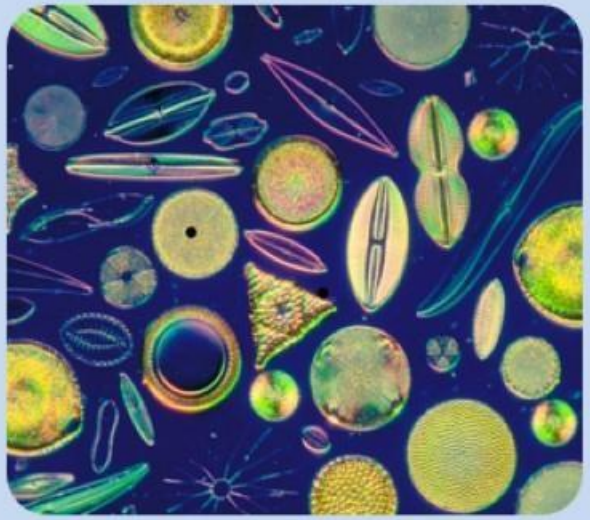
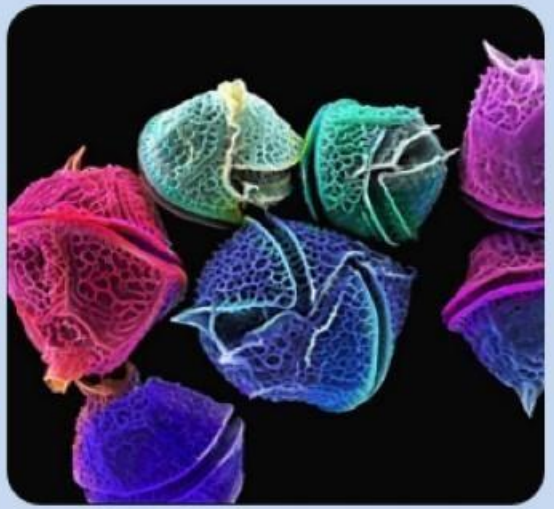
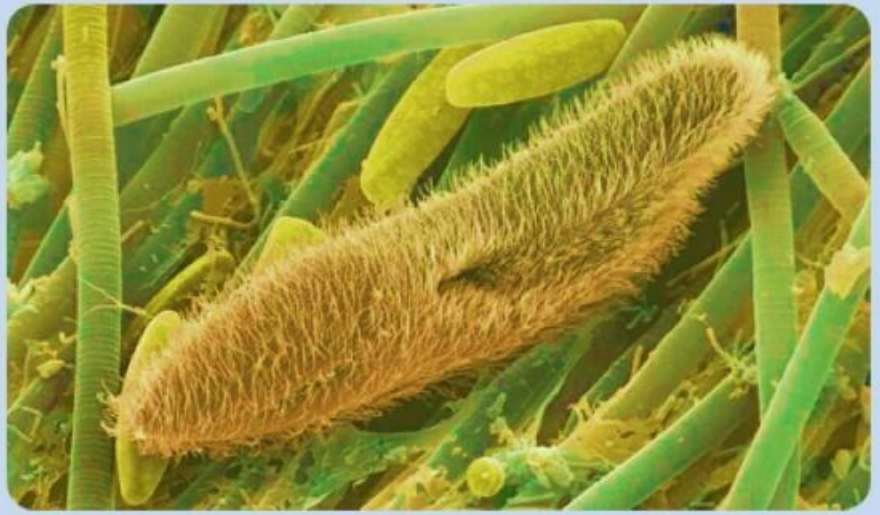
2. KINGDOM PROTISTA

CLASSIFICATION

- **Protista**
  - Chrysophytes
  - Dinoflagellates
  - Euglenoids
  - Slime moulds
  - Protozoans







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2. KINGDOM PROTISTA

I. CHRYSOPHYTES

- Found in fresh water and marine environments.
- Microscopic and float passively in water currents (plankton).
- Most of them are **photosynthetic.**
- It includes **diatoms & golden algae (desmids).**

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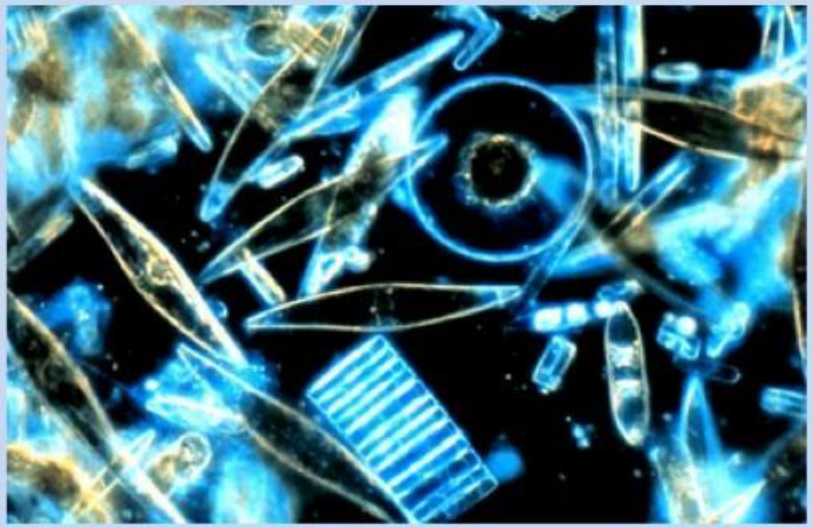
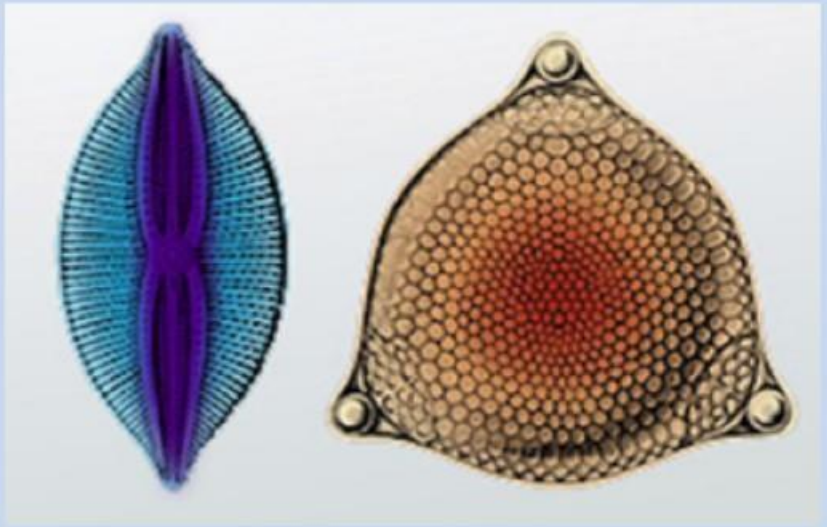
2. KINGDOM PROTISTA

I. CHRYSOPHYTES

DIATOMS

- They have **siliceous cell walls** forming two thin overlapping shells, which fit together as in a soap box.
- Diatoms are the **chief 'producers'** in the oceans.





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2. KINGDOM PROTISTA

I. CHRYSOPHYTES

DIATOMS

- They have **siliceous cell walls** forming two thin overlapping shells, which fit together as in a soap box.

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- Diatoms are the **chief 'producers'** in the oceans.
- The cell wall deposit of diatoms over billions of years in their habitat is known as **'diatomaceous earth'.** This is used in polishing, filtration of oils and syrups.

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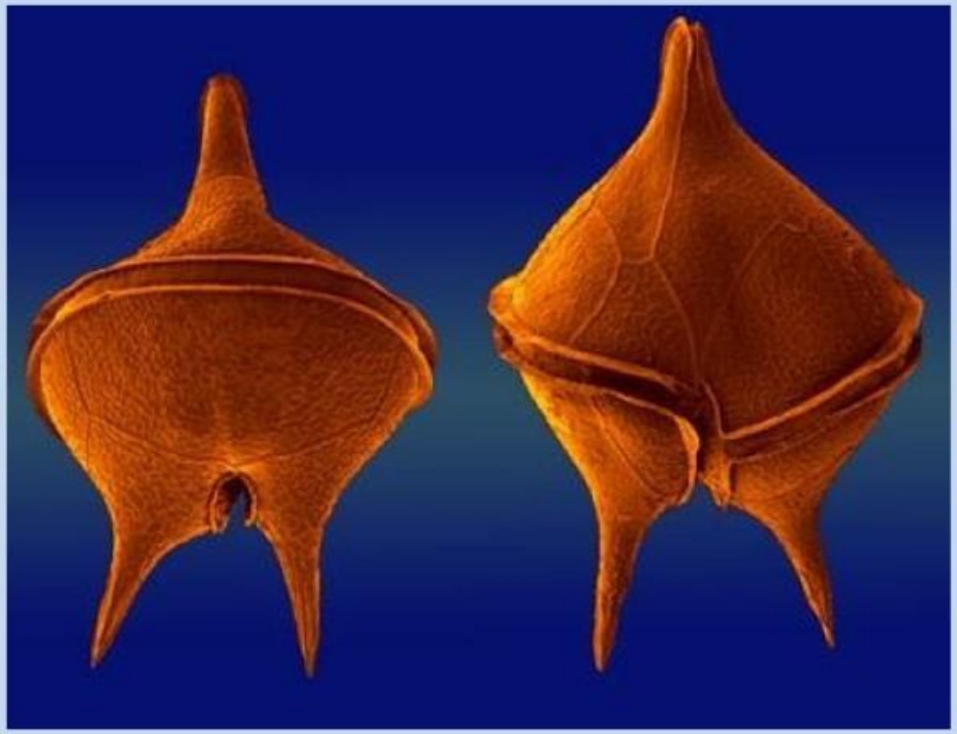
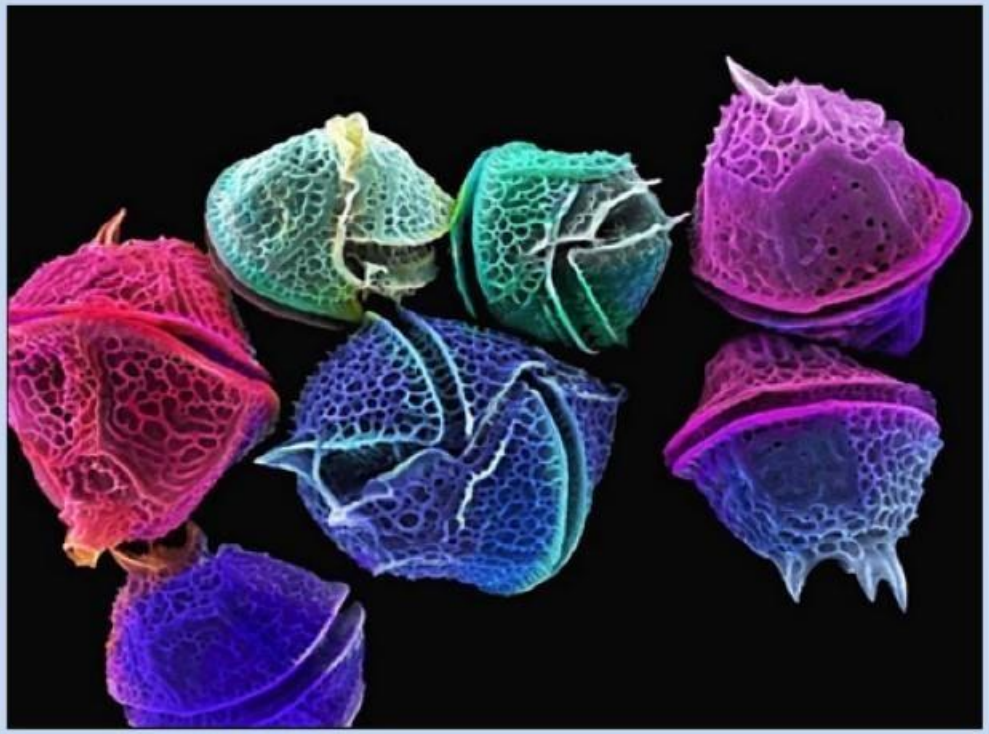
2. KINGDOM PROTISTA

II. DINOFLAGELLATES

- Mostly **marine and photosynthetic.**
- They appear yellow, green, brown, blue or red depending on the main pigments in cells.
- Cell wall has stiff **cellulose plates** on the outer surface.





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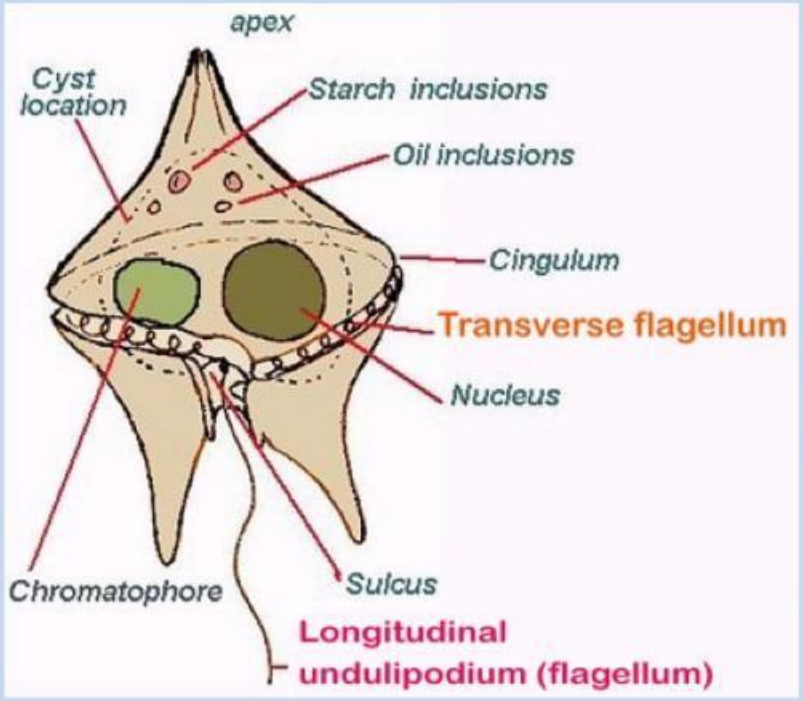
2. KINGDOM PROTISTA

II. DINOFLAGELLATES

- Most of them have **2 flagella;** one lies longitudinally and the other transversely in a furrow between wall plates.
- **Red dinoflagellates (E.g. *Gonyaulax*)** undergo rapid multiplication so that the sea appears red **(red tides).** They release **toxins** that kill marine animals like fishes.



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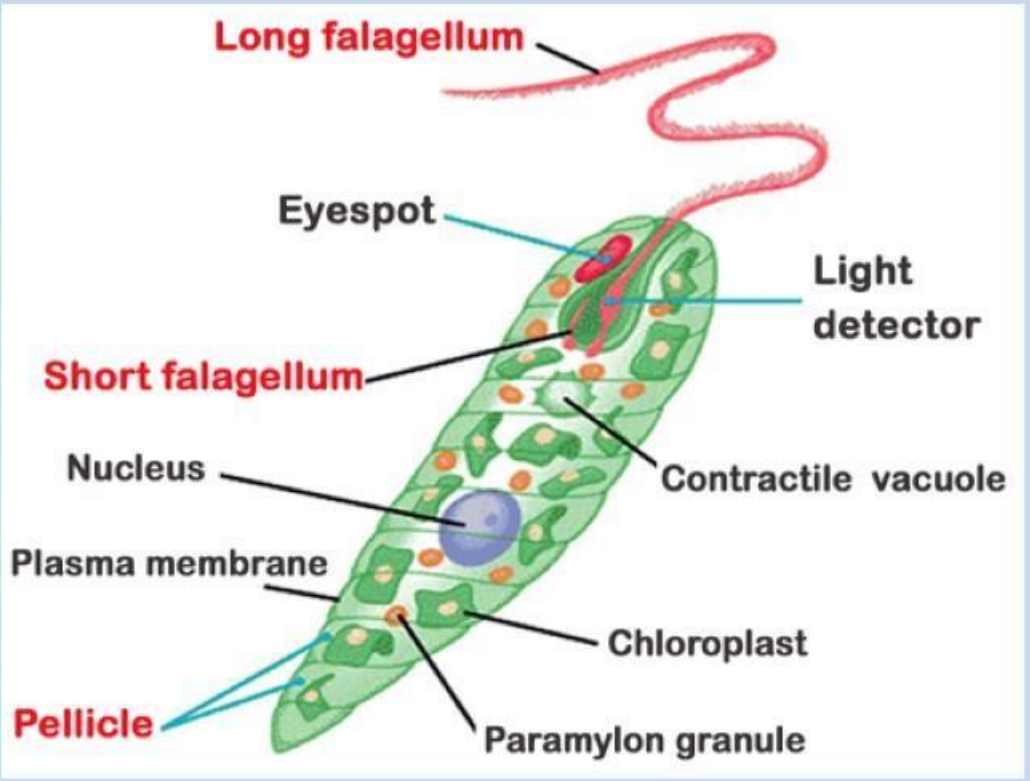
2. KINGDOM PROTISTA

III. EUGLENOIDS

- Mainly fresh water organisms found in stagnant water.
- Instead of cell wall, they have a **protein rich layer** called **pellicle.** It gives flexibility to body.
- They have **2 flagella,** a short and a long one.



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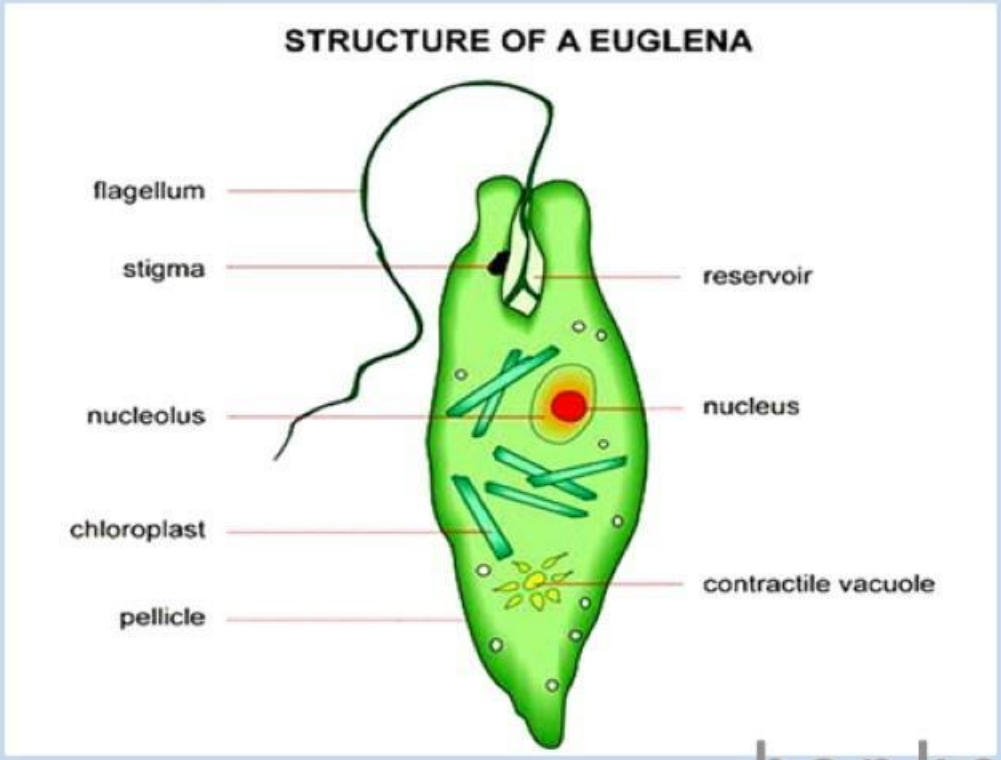
2. KINGDOM PROTISTA

III. EUGLENOIDS

- They are **photosynthetic** in the presence of sunlight.
- In the absence of sunlight, they behave like **heterotrophs** by predating on other organisms.
- The pigments are identical to those of higher plants.
- E.g. ***Euglena.***



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2. KINGDOM PROTISTA

IV. SLIME MOULDS

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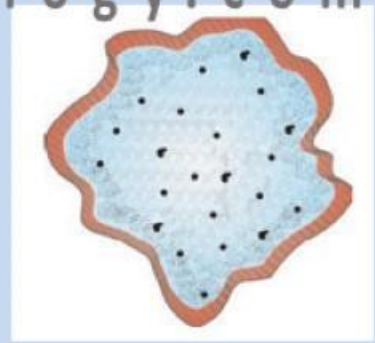
- They are saprophytic protists.
- The body moves along decaying twigs and leaves engulfing organic material.
- Under suitable conditions, they form an aggregation called plasmodium. It may spread over several feet.



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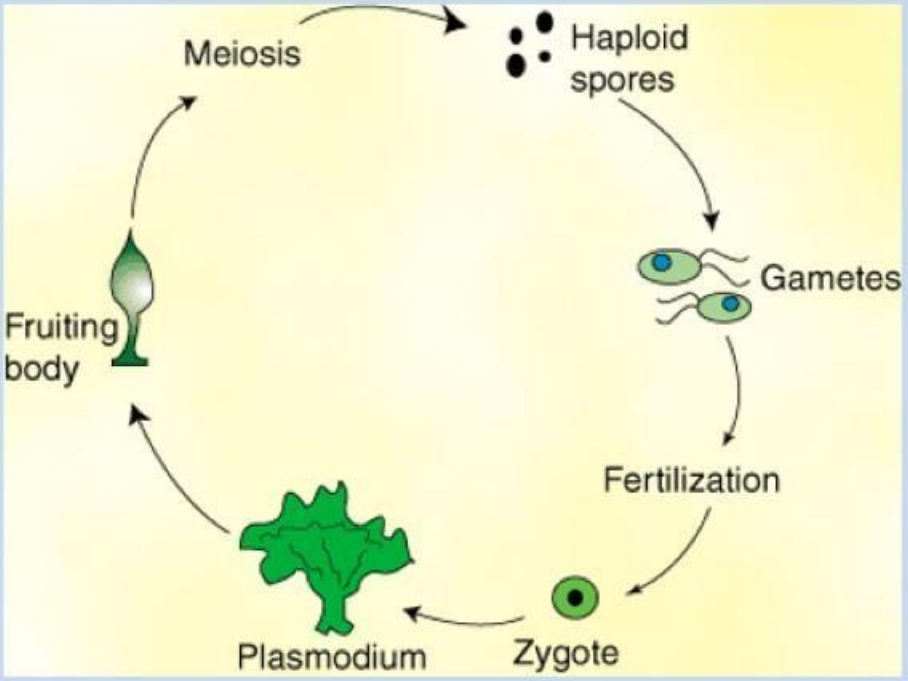
2. KINGDOM PROTISTA

IV. SLIME MOULDS

- Under unfavourable conditions, plasmodium differentiates and forms **fruiting bodies** bearing **spores** at their tips.
- Spores have true walls. They are highly resistant and survive for many years.
- Spores are dispersed by air currents.



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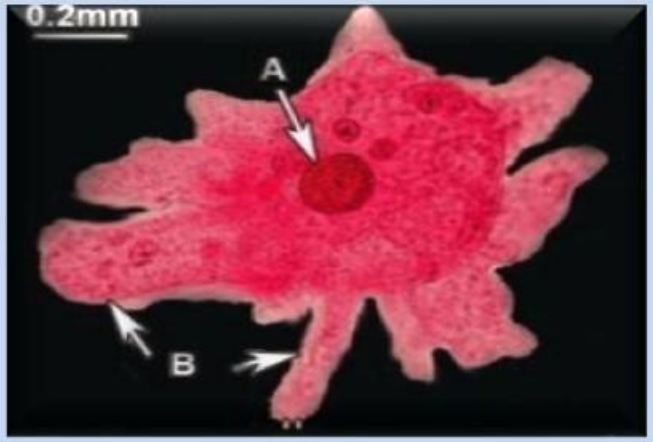
2. KINGDOM PROTISTA

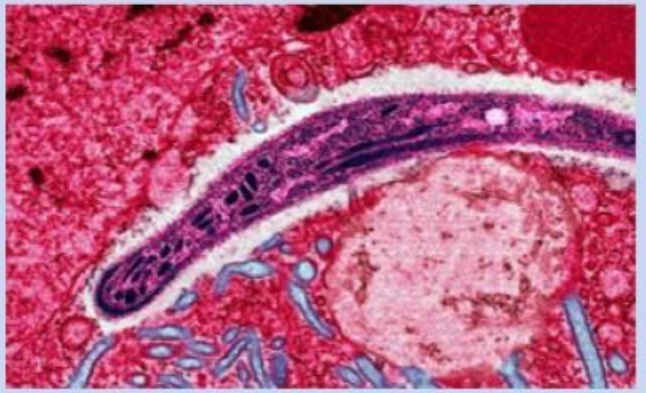
V. PROTOZOANS

- They are **heterotrophs** (predators or parasites).
- They are primitive relatives of animals.

4 groups of Protozoans

- Amoeboid Protozoans
- Flagellated Protozoans
- Ciliated Protozoans
- Sporozoans





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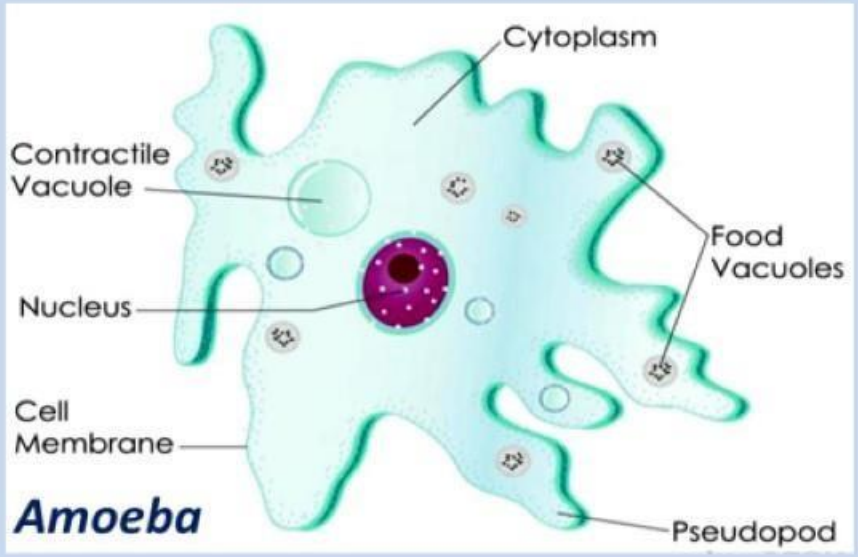
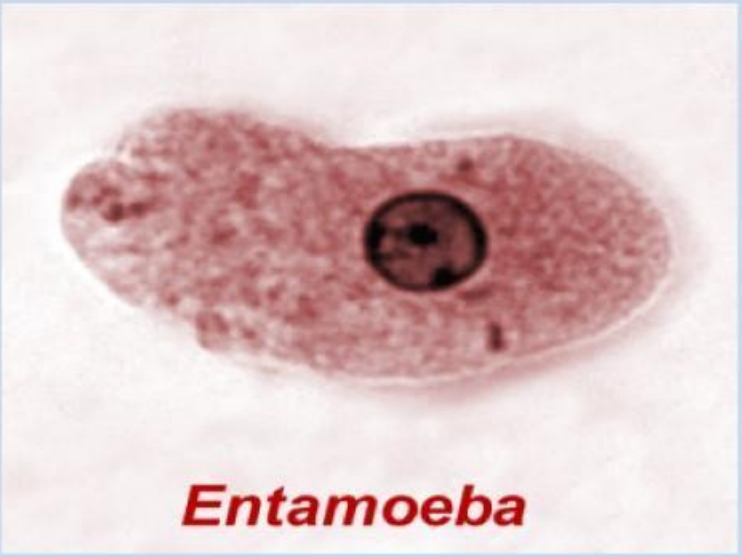
2. KINGDOM PROTISTA

V. PROTOZOANS

A. AMOEBOID PROTOZOANS

- Live in fresh water, sea water or moist soil.
- They move and capture prey by putting out pseudopodia (false feet). E.g. ***Amoeba.***
- Marine forms have **silica shells** on their surface.
- Some are parasites. E.g. ***Entamoeba.***





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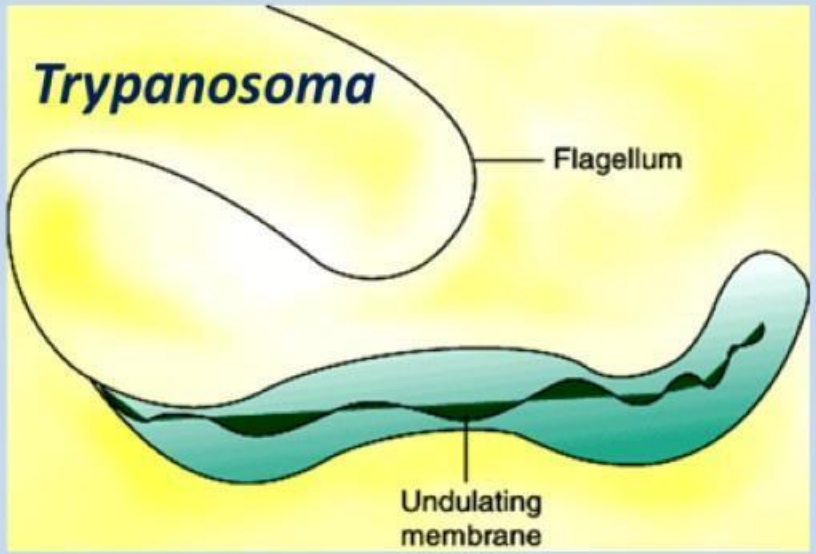
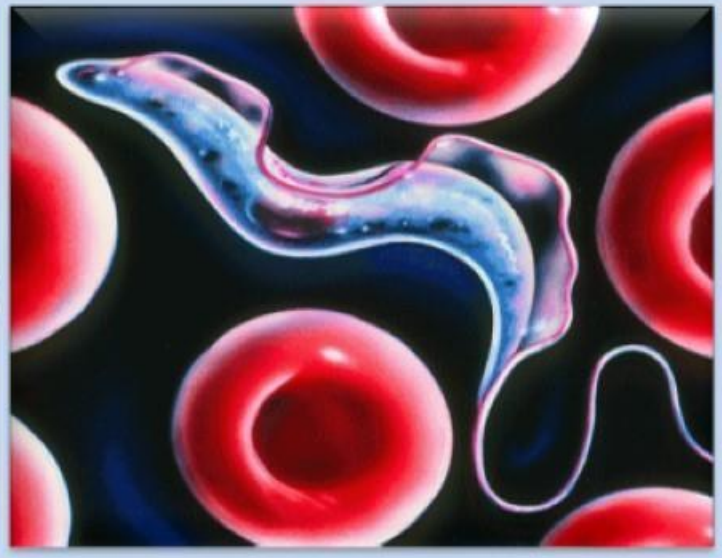
2. KINGDOM PROTISTA

V. PROTOZOANS

B. FLAGELLATED PROTOZOANS

- Free-living or parasitic.
- They have flagella.
- Parasitic forms cause diseases like **sleeping sickness.** E.g. ***Trypanosoma.***





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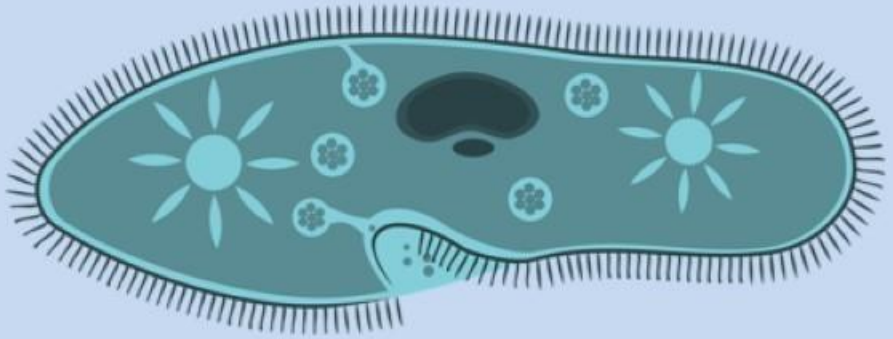
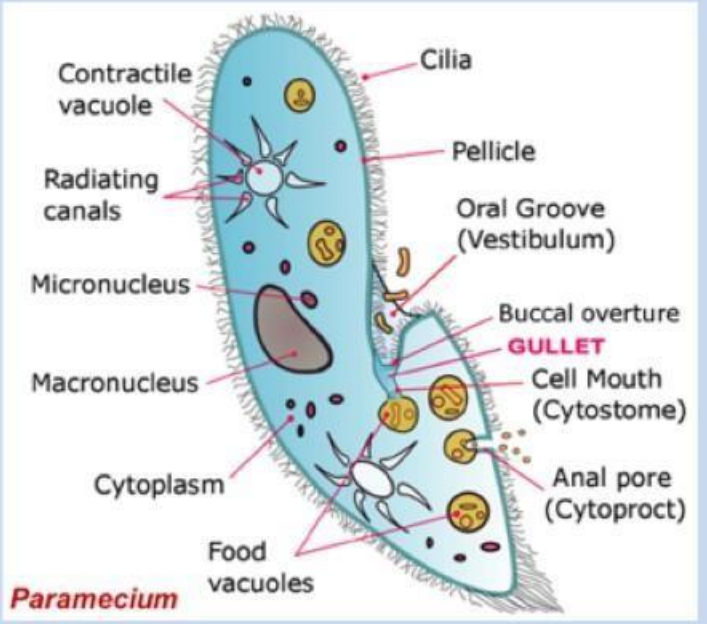
2. KINGDOM PROTISTA

V. PROTOZOANS

C. CILIATED PROTOZOANS

- Aquatic, actively move using **cilia.**
- They have a cavity **(gullet)** that opens to outside.
- Due to the movement of cilia, water with food enters into gullet.
- E.g. ***Paramecium.***





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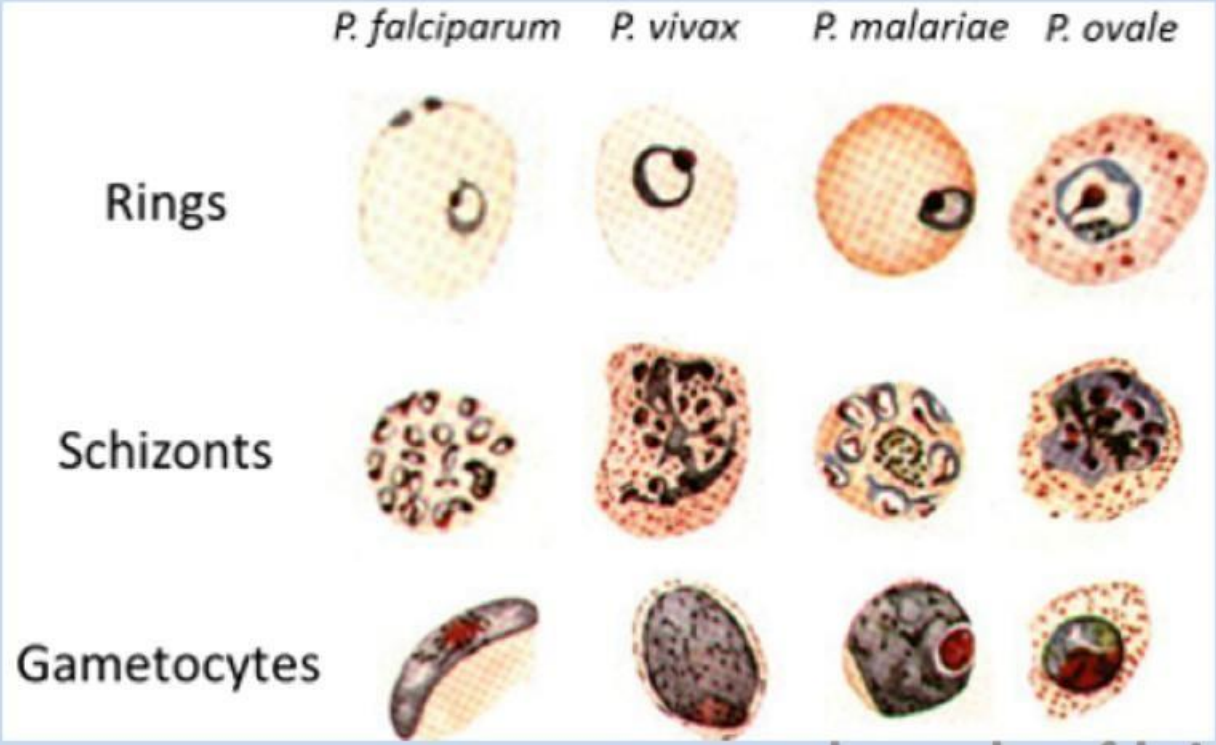
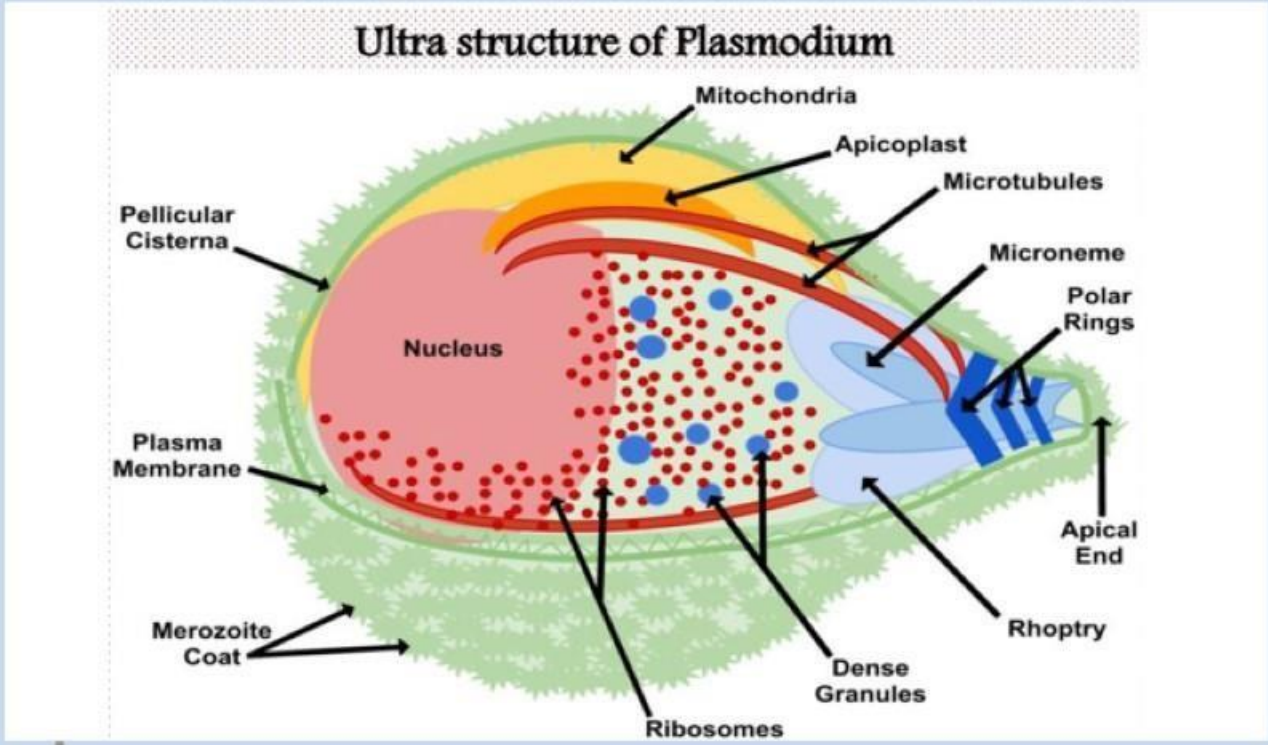
2. KINGDOM PROTISTA

V. PROTOZOANS

D. SPOROZOANS

- They have an infectious **spore-like stage** in their life cycle.
- E.g. ***Plasmodium*** (malarial parasite). It causes **malaria.**





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