TOPIC: CLASSIFICATION OF LIVING ORGANISMS

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Biological classification

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Biological classification is defined as the process of grouping the organisms according to certain similarities

Linnaeus proposed the **two kingdoms of classification**. He classified organism into animal kingdom as **Animalia** and plant kingdom as **Plantae**. There were certain limitations associated with two kingdom classification such as- it does not differentiate between eukaryotes and prokaryotes, unicellular and multicellular organisms, and photosynthetic and non-photosynthetic organisms.

Five kingdom classifications

R.H. Whittaker proposed the five kingdoms of classification. The five kingdoms classification is as follows-**Monera, Protista, Fungi, Plantae, and Animalia**. The classification was based on thallus organization, cell structure, mode of nutrition, phylogenetic relationship, and reproduction.

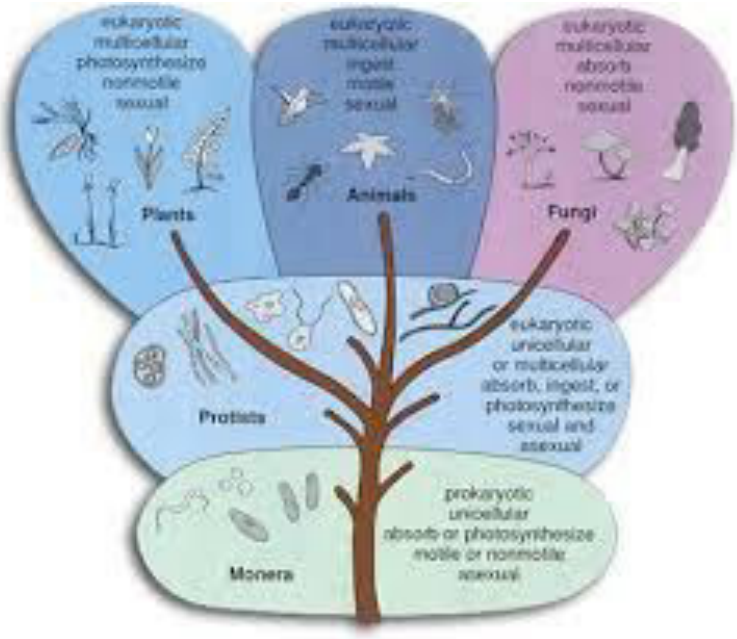

Fig. 1. :5 Classification

Kingdom Monera

The most important members of Monera are Bacteria. All organisms present in this kingdom are prokaryotes. It includes bacteria as well as blue-green algae. They can be present in extreme habitats such as hot springs, deserts, snow as well as deep oceans. Certain organisms act as parasites also. All monerans are prokaryotes. They do not have the true nucleus, that is, nucleus not surrounded by nuclear membrane. They can be autotrophs, heterotrophs as well as parasites. They do have cell wall. Their respiration can be aerobic as well as anaerobic.

The movement occurs through flagella. Exchange of nutrients or gases occurs by diffusion.

Fig.2. Examples of Kingdom Monera

They are divided into *Archaebacteria* and *Eubacteria*.

Archaebacteria

Archaebacteria can be thermoacidophiles (hot springs), halophiles (survive in high salt concentration), and methanogens (marshy areas). There structure of cell wall is different from other monerans. Methanogens are found in the gut of some ruminants such as buffaloes and cows. This helps in production of biogas from the dung of the animal.

Eubacteria

They are referred as **"True bacteria".** The presence of motile flagellum and a rigid cell wall characterize them. It includes cyanobacteria (blue-green algae). They are like plants in having chlorophyll a. So, known as **photosynthetic autotrophs**.

Cyanobacteria are unicellular, filamentous algae. They form colonies which are surrounded by gelatinous sheath.

Some have specialized structures known as heterocyst which helps in fixing nitrogen. For example, *Nostoc*.

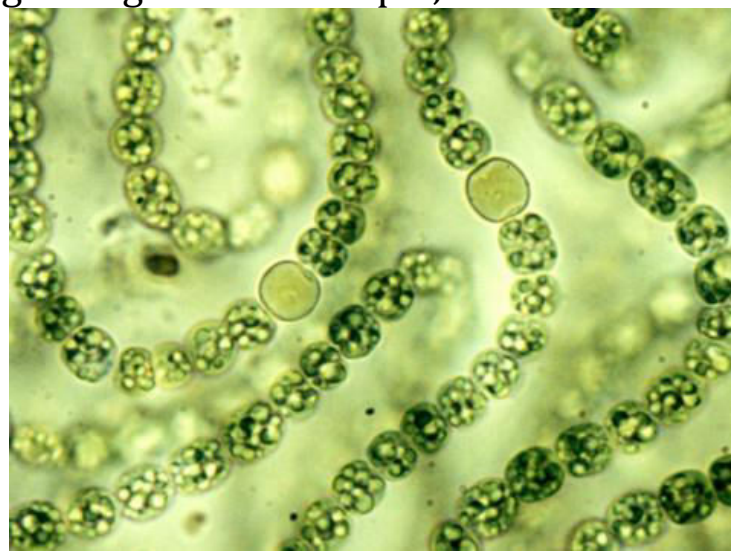

Fig.3. *Nostoc*

There are certain bacteria that can oxidize certain inorganic substances such as nitrites, nitrates, they are known as **chemosynthetic autotrophs**. The energy released during oxidation is used in the production of the ATP.

Bacteria can reproduce asexually by fission. They can also reproduce through spores under unfavorable conditions. Monera also includes **Mycoplasma**. They do not have cell wall and survive

in anaerobic conditions. Mycoplasma are the smallest living organisms known.

Kingdom Protista

Single celled eukaryotes are kept under Protista. They are mostly aquatic in nature. For example, Algae serves as primary producers in aquatic ecosystem. They are unicellular, eukaryotic organisms. They have true nucleus, bounded by nuclear membrane. They can move by cilia as well as via flagella. Respiration can be both aerobic as well as anaerobic. Similarly, reproduction can be sexual as well as asexual.

They are divided into **Chrysophytes, Dinoflagellates, Euglenoids, Slime moulds and Protozoans**.

1. Chrysophytes

It consists of diatoms and golden algae. They can live in freshwater water as well as marine water. Mostly they are photosynthetic. Their cell wall is impregnated with silica. They are the major producers in the oceans. Mostly they are unicellular flagellates. But some are amoeboid.

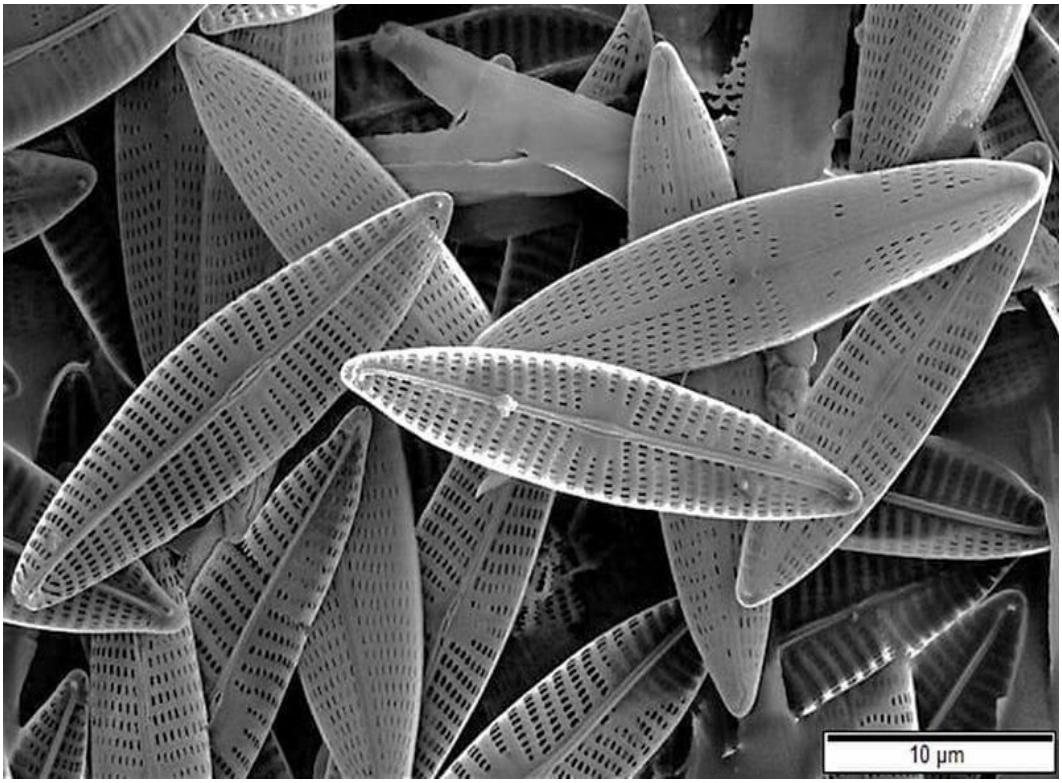

Fig.4. Diatoms

2. Dinoflagellates

Dinoflagellates are marine and photosynthetic organisms. They can be of different colors such as yellow, brown, red, or blue in color. The color is due to the presence of different colored pigments present in the cells of the dinoflagellates. The cell wall is made up of cellulose. They are biflagellate with one flagella placed longitudinally and other flagella placed transversely.

For example, *Gonyaulax catenella*, *Noctiluca scintillans*.

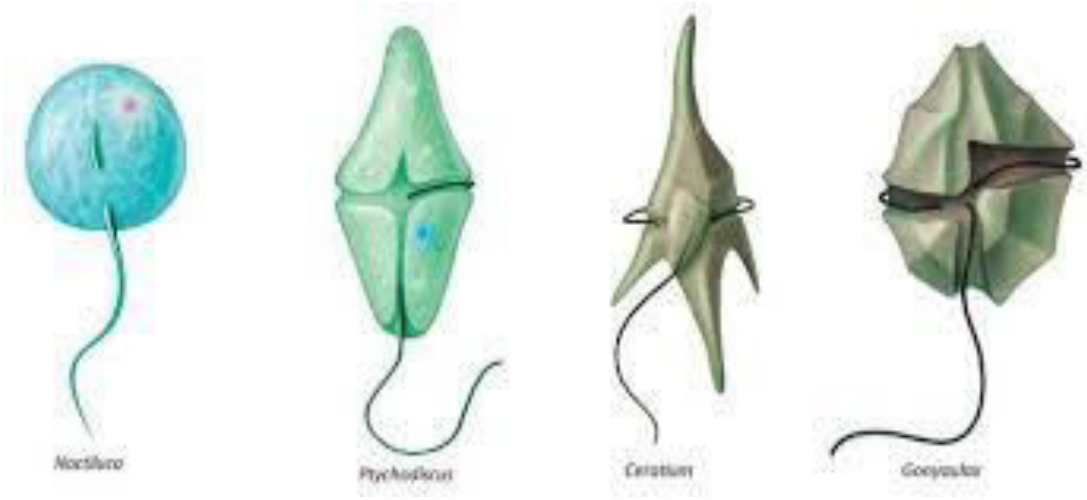

Fig.5*. Example of dinoflagellates*

3. Euglenoids

Euglenoids are freshwater organisms that are found in stagnant water. They are surrounded by a protein rich layer known as pellicle. They have one short flagella and one long flagella. They can behave as autotrophic as well as heterotrophic organisms. For example, *Euglena*.

Most of the euglenoids have chloroplast so they can synthesize their own food. The reserve food material found is euglenoids are Paramylon (carbohydrate).

They are commonly found in freshwater, especially when it is rich in organic materials, with a few marine and endosymbiotic members. Many euglenids feed by phagocytosis, or strictly by diffusion. A monophyletic group consisting of the mixotrophic Rapaza viridis (1 species) and the two groups Eutreptiales (24 species) and Euglenales (983

species) have chloroplasts and produce their own food through photosynthesis. This group is known to contain the carbohydrate paramylon.

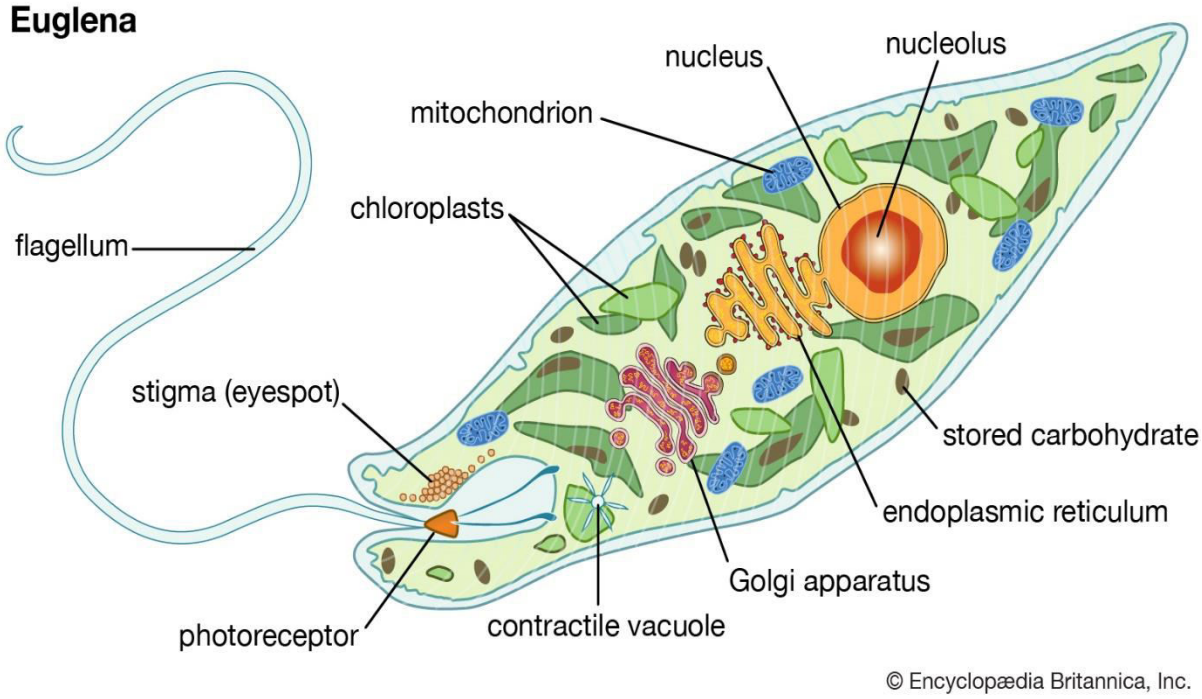

Fig.6. Euglena

4. Slime moulds

They are saprophytic in nature. Under favorable conditions, they form aggregates which are known as *Plasmodium*. During unfavorable condition, they form fruiting bodies with spores. They possess true cell walls. They are extremely resistant to adverse conditions.

5. Protozoan like protists

They are heterotrophs. They can live as predators as well as parasites. There are four major types of protozoans found-

- **Amoeboid protozoans** are found in fresh water, moist soil, or sea water. They possess pseudopodia for engulfing the food particles, such as *Amoeba*.
- **Flagellated protozoans** can be free-living or parasitic. This group of organisms are responsible for different parasitic diseases. For example, *Trypanosoma* causes sleeping sickness.
- **Ciliated protozoans** possess thousands of cilia. The movement of cilia helps in propelling forward or backward. It also helps in obtaining food from the outside. For example, *Paramecium*.

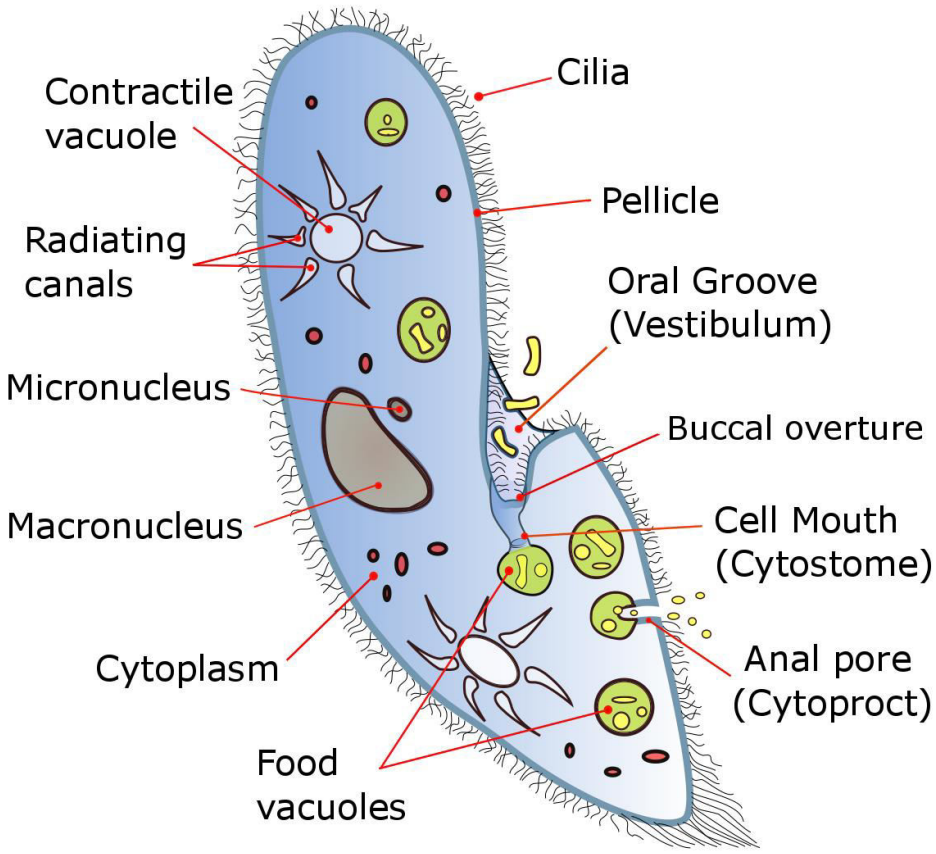

Fig.7. *Paramecium*

Sporozoans form reproductive cells which are known as spores. They are parasitic and pathogenic in nature. For example, *Plasmodium* species causes Malaria. Reproduction can be asexual or sexual.

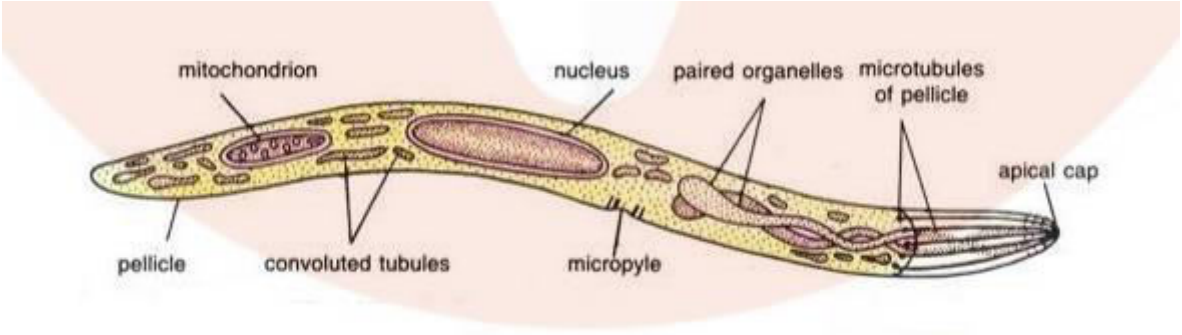

Fig.8. *Plasmodium* species