Euglenoids

Flagellated Eukaryotes

EUGLENOPHYTA

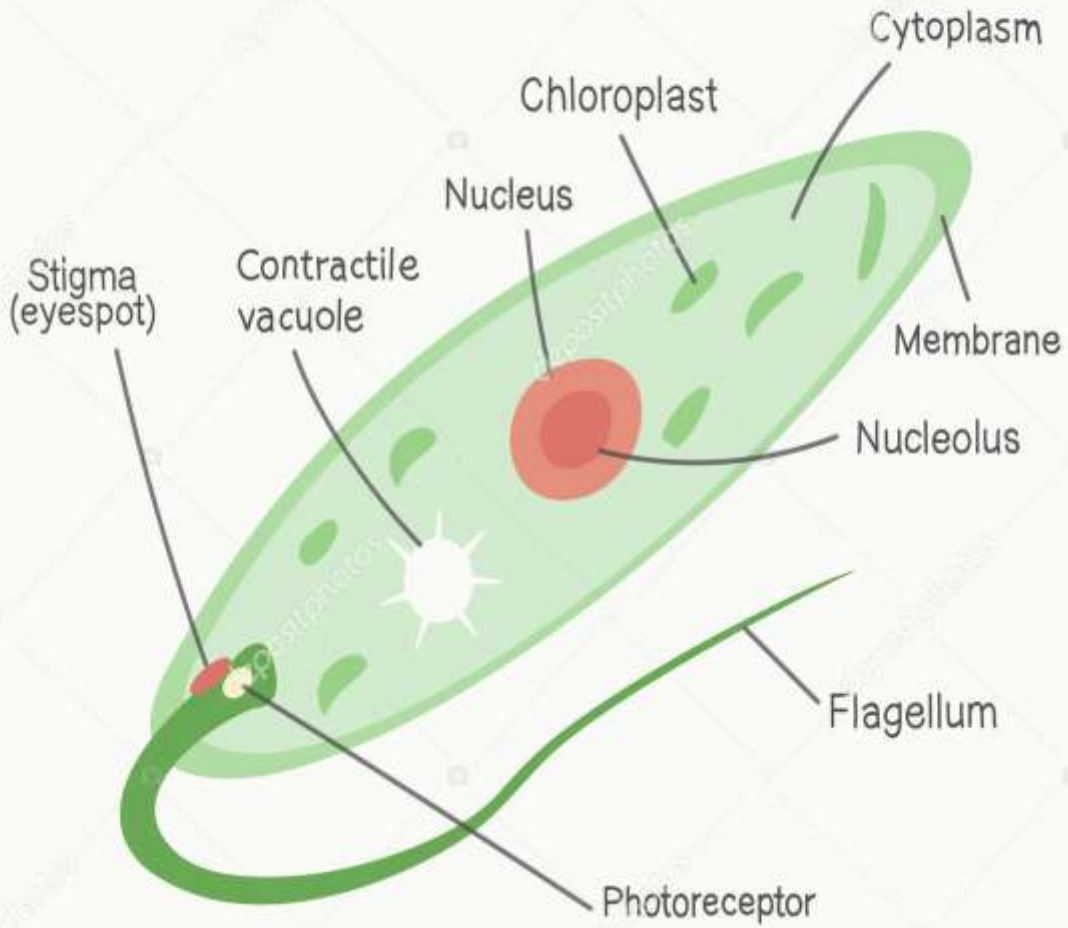
- Euglenophyta include mostly unicellular flagellates although colonial species are also there
- They are widely distributed, occurring in freshwater, brackish and marine waters, most soils, and mud (about 1,000 species)
- The flagella arise from the bottom of a cavity called reservoir, located in the anterior end of the cell
- Euglena lack a cell wall, so, they are flexible and can change their shape

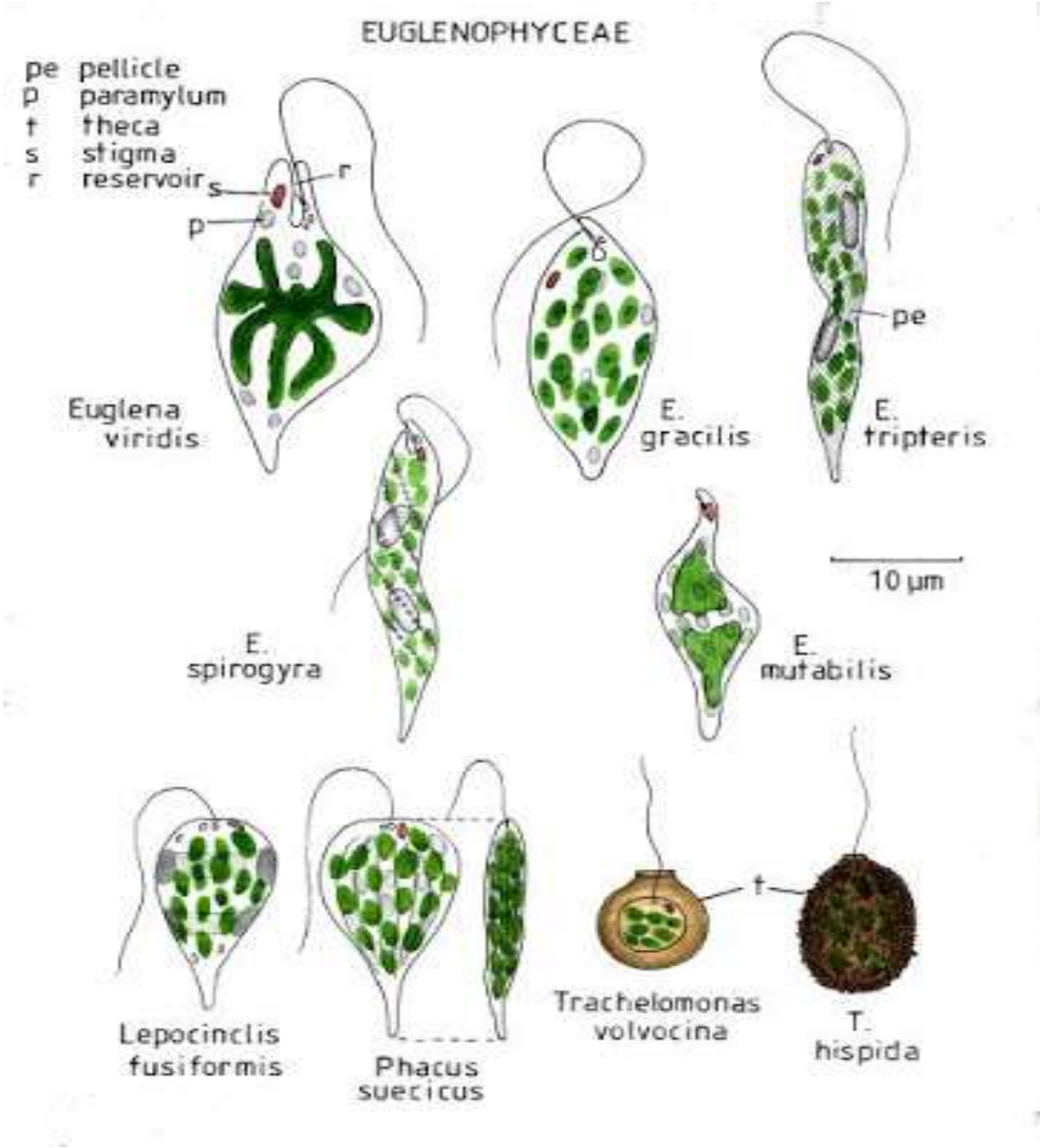
- Cells can ooze their way through mud or sand grains by a process known as metaboly, a series of flexible or flowing movements cause change of cell shape and made possible by the presence of the pellicle, a proteinaceous wall which lies inside the cytoplasm, just beneath their cell membrane
- The pellicle can have a spiral construction and can be ornamented
- The members of this division share their pigmentation with prochlorophytes, green algae, and land plants, because they have chlorophylls a and b, β- and γcarotenes, and xanthins. However, plastids could be colorless or absent in some species
- As in the dinophyta the chloroplast envelope consists of three membranes

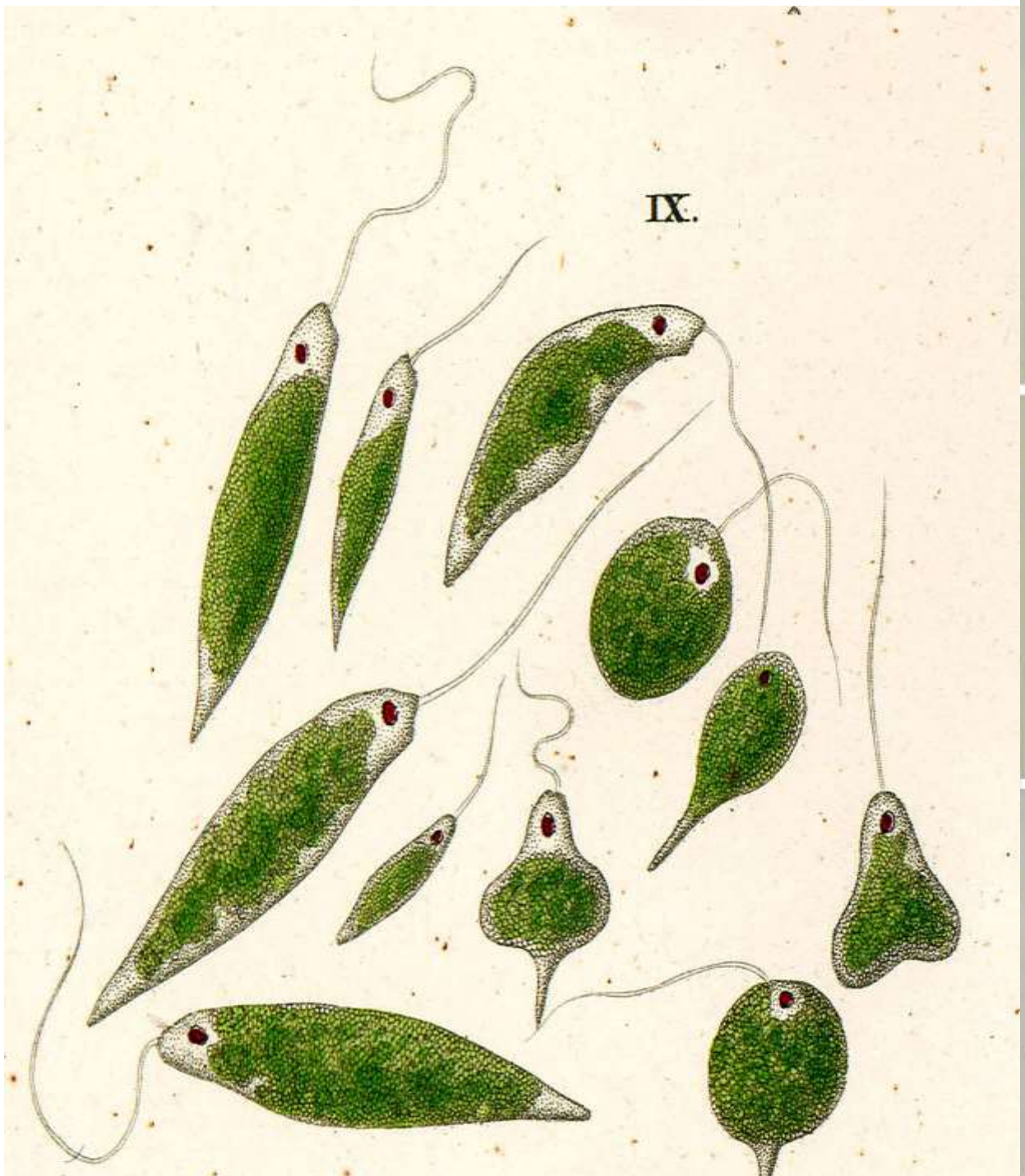
- Within the chloroplasts, the thylakoids are usually in groups of three, without a girdle lamella and pyrenoids may be present
- The chloroplast DNA occurs as tiny granules
- The photoreceptive system consisting of an orange eyespot located free in the cytoplasm and the true photoreceptor located at the base of the flagellum can be considered unique among unicellular algae
- Positive phototaxis, i.e. swimm towards the light source
- The reserve polysaccaccharide is paramylon, β-1,3-glucan, stored in the granules scattered inside the cytoplasm and not in the chloroplasts like the starch of the Chlorophyta

- They are not photoautotrophic but rather obligate mixotrophic, because they require one or more vitamins of the B group
- Some colorless genera are phagotrophic, with specialized cellular organelle for capture and ingestion of prey; some others are osmotrophic
- Some of the pigmented genera are facultatively heterotrophic
- Only asexual reproduction is known in this division

Euglena


Cytoplasm
Chloroplast
Nucleus
Stigma
(eyespot)
Contractile
vacuole
Membrane
Nucleolus
Flagellum
Photoreceptor


EUGLENOPHYCEAE
pe pellicle
p paramylum
t theca
s stigma
r reservoir
Euglena viridis
E. gracilis
E. tripteris
E. spirogyra
E. mutabilis
10 µm
Lepocinclis fusiformis
Phacus suecicus
Trachelomonas volvocina
T. hispida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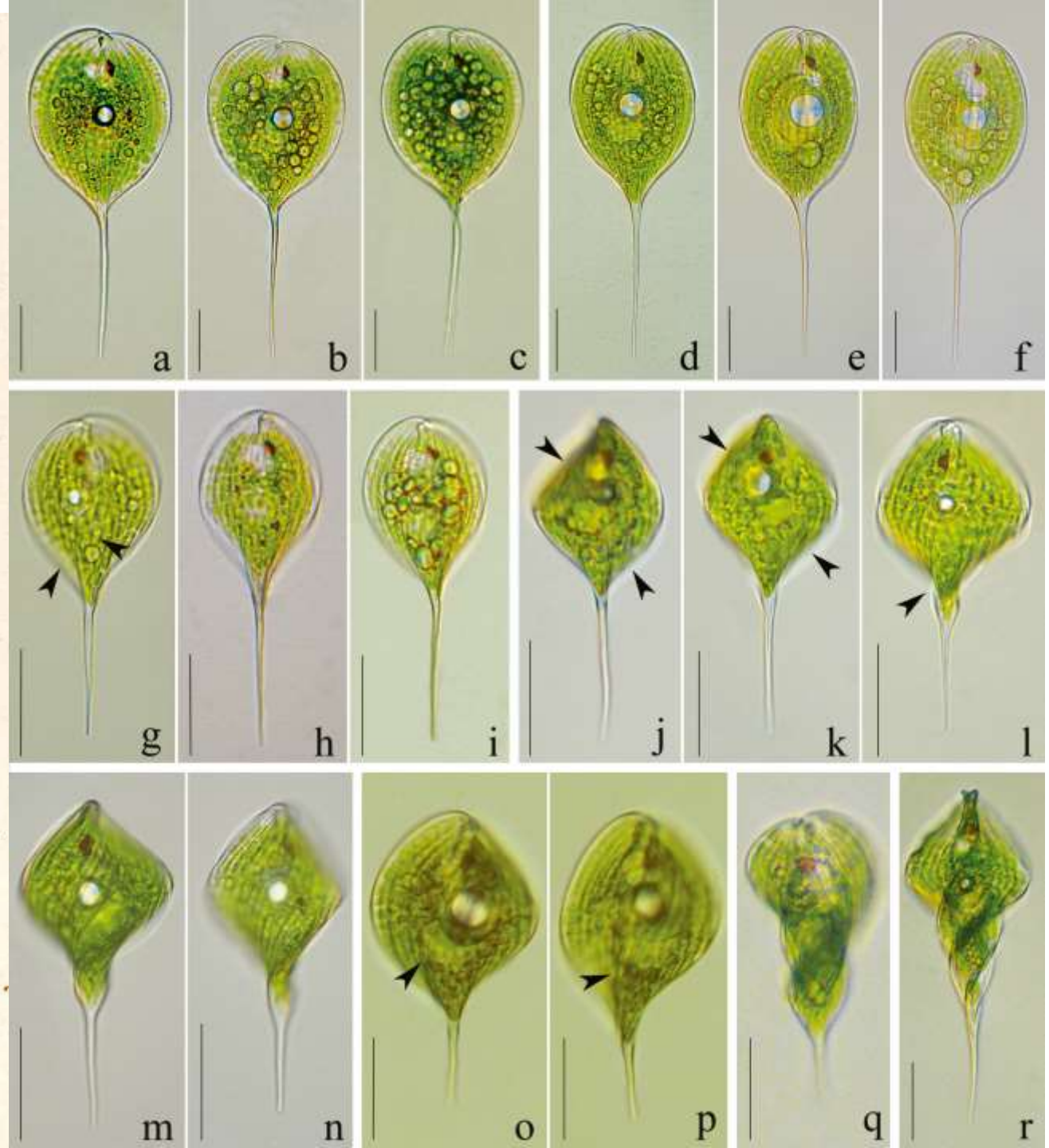
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DIATOMS

The source of Diatomaceous earth

- Diatoms are a group of unicellular golden brown pigmented cells that are encased by a unique type of silica wall, composed of two overlapping frustules that fit together like a box and lid
- The diatoms live mostly singly or attached to one another in chains of cells or in colonial aggregations, in aquatic and terrestrial habitats
- There are about 1600 species grouped under 200 genera
- Some of them occur as epiphytes and some are epizoic also
- Diatoms are an abundant component of phytoplankton and important producers in freshwater and marine food webs
- In addition, diatoms release atmospheric oxygen

Habitats for diatom-based water quality monitoring

The four distinct diatom assemblages that occur closely associated with particular microhabitats are generally recognized as the:

- Epipelon that frequents the surface of the sediments
- Epipsammon that occurs on and between the sand particles
- Epilithon that inhabit gravel, stone and bedrock
- Epiphyton that is attached to macrophytic plants

Diatom community structure is governed by substrata associations but there are other important influences on community composition, namely:

- Chemical constituents in the water
- Water turbulence and disturbance (mainly from floods)
- Resource supply (mainly from inorganic nutrients)
- Grazing by micro-organisms Light regime within microhabitats

FIELD PROCEDURES FOR ISOLATION OF DIATOMS

1.Preferred substratum:

- Cobbles and small boulders (rocks) are the preferred substratum for monitoring diatoms in the riverine environment, and almost all diatom indices throughout the world can be applied to the community (i.e. the epilithon) that is found on this substratum.

2 Alternative substrata (in order of preference):

- Man made objects (bricks, pieces of concrete, bridge supports, cannel walls etc.), Emergent macrophytes, such as Typha spp. or Phragmites spp., Submerged macrophytes, such as Potamogeton spp, Ceratophyllum spp. etc.

3 Introduced substrata:

- If pebbles, cobbles, boulders or macrophytes are absent from the sample site, artificial substrata may be introduced into the stream. However sampling should only be attempted if they have been submerged for at least four weeks.

Differentiation

- **Centric Diatoms**

1. Shape and Size varies
2. Radial symmetry
3. Discoid Chloroplast
4. Raphe is absent
5. Striations radially arranged

- **Pennate Diatoms**

1. Boat shaped
2. Bilateral symmetry
3. Elongated chloroplast
4. Raphe present
5. Striation Pinnate

The cell consist of two parts

1. Cell wall 2. Protoplast

Cell wall – It is made up of pectic substrances impregnated with silica

Cells are covered by siliceous wall, the frustula showing different structures and ornamentation, which are used as key features for diatom classification

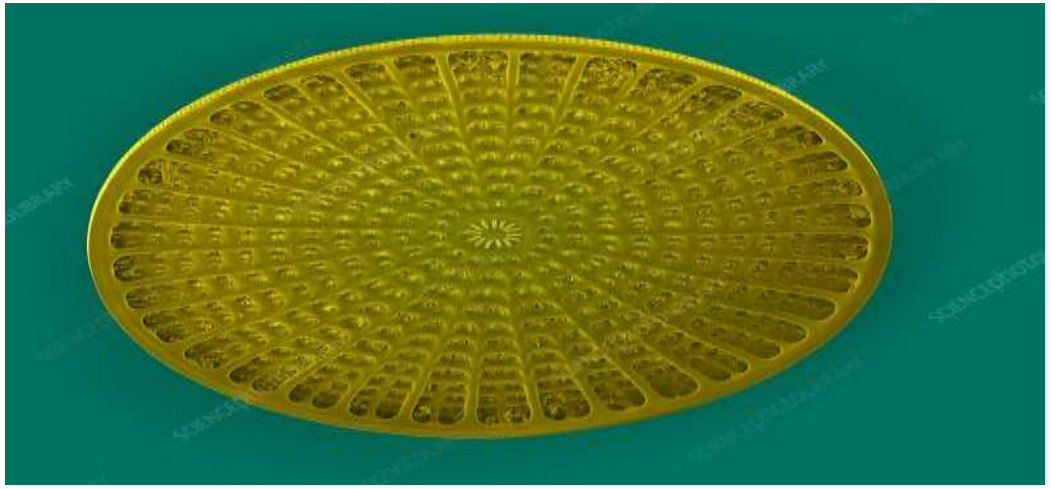
The frustule consists of two overlapping halves (valves) joined by a girdle (both the girdle is formed of epicingulum and hypocingulum)

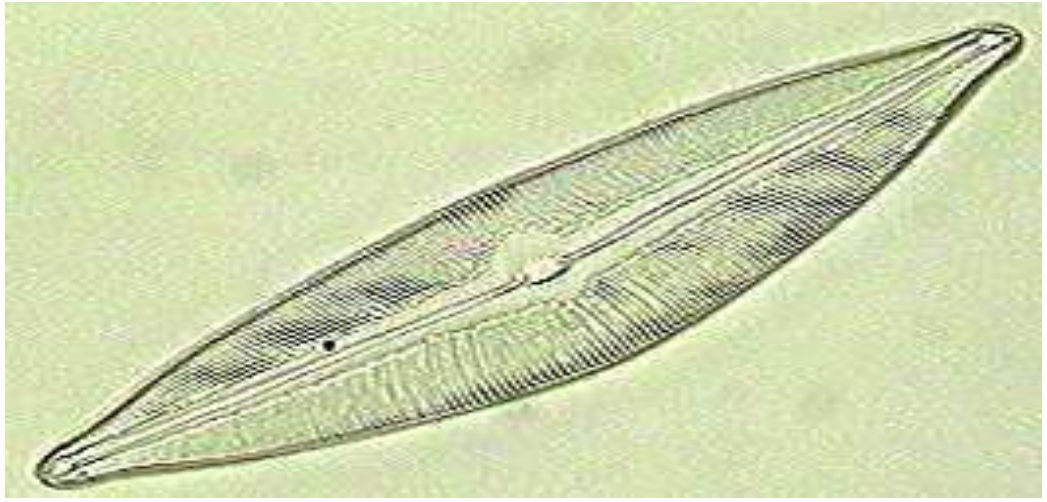
The upper longer and wider half (epitheca) fits on the lower half (hypotheca) as the cover of a box. The nucleus is laterally or centrally placed and suspended by protoplasmic threads

- The Protoplast including cytoplasm consists of a single nucleus and other cell organelles
- The chloroplasts contain chlorophylls a, c1, and c2. Fucoxanthin, Diatoxanthene and Diadinoxanthene is the principal carotenoid, giving the cells their golden-brown color.
- The thylakoids within the chloroplast are grouped three to a band, and in most chloroplasts there is a more or less central pyrenoid
- The storage product is chrysolaminarin (β-1,3-linked glucan). Lipids are also present

- Some diatoms are able to glide over the surface of a substrate. Gliding is restricted to those pennate diatoms with a raphe (a longitudinal slot in the theca) and those centric diatoms with labiate processes
- The labiate processes have a pore in the center, and the mucilage is secreted through the pore. Diatoms include photoautotrophic, auxotrophic and colourless heterotrophic species
- Deposits of fossil diatoms, known as diatomaceous earth, have many industrial uses (filtration and absorption processes), while commercial uses of 49 living cells are mainly related to the aquaculture, since some diatoms contain significant amounts of PUFAs, especially eicosapentaenoic acid

Centric and Pennate Diatoms





Reproduction

- There are two types of reproduction in Diatoms
- Reproduction is dependent on sufficient silica in the environment (water); silica depletion stops cell division
- Daughter cells are one of the same size and one of smaller size of the mother cell; mean cell size in the population will decrease over time

1. Vegetative reproduction – Dividing two halves forming a new complete cell on semi conservation manner
2. Sexual reproduction – Conjugation of two cells forming auxospore

Rhythmic phenomena

- Rhythmic phenomena It is possible to synchronize the division of diatom cells in a culture in a couple of different ways
- Removal of silicon from cultures of Navicula pelliculosa stops growth of the cells at a stage prior to cytokinesis. When silica is added to the culture, all of the cells then divide synchronously
- Another way of obtaining synchronized cell divisions is by keeping the diatoms in the dark for a long period followed by exposure to light

Classification

1. Class Bacilariophyceae
    A. Order Centrales
    B. Order Pennales

Economic Importance

- Diatomite – very useful in industries
- Testing of microscopic lenses
- Use as food in aquatic ecosystem
- Petroleum is considered to be diatom origin
- Used as pollution indicators
- Used in tooth paste