

Bacillariophyceae

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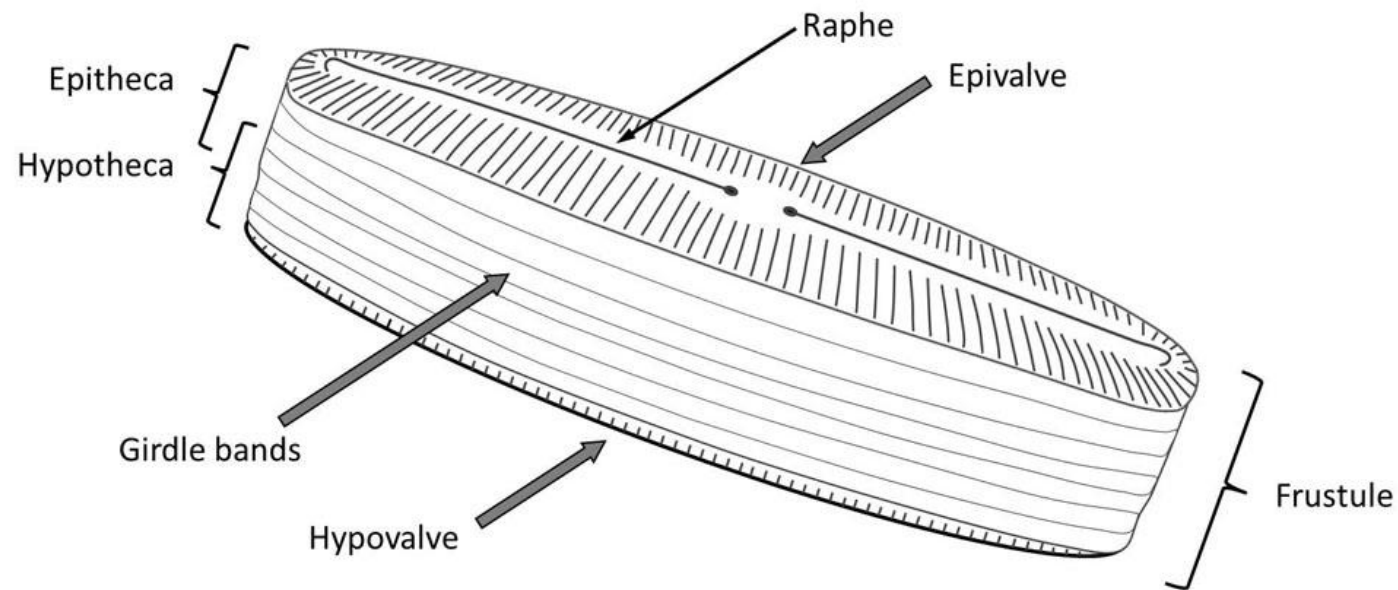
► Features:

- 2n body
- Commonly known as diatoms
- Fresh- and salt water, damp places like old walls, bark of trees, damp soil, etc.
- ‘Jewels of the plant world’ for their designed wall markings and diverse forms
- Slow and irregular movement observed, due to flow of currents of water or circulation of cytoplasm
- diatomaceous earth – large deposit of siliceous cell walls or frustules of dead diatom on the bottom of water body
- Diatomite or Kieselguhr – diatomaceous earth of tertiary and quaternary ages, light weight and melting point 175°C , used in polishes for silverware & metals, preparation of tooth powders, steam pipes and blast furnaces, filter oils, absorbent for the liquid nitroglycerine in dynamite for safety, sugar refineries, brewing industry, remove waste mycelium during manufacturing antibiotics



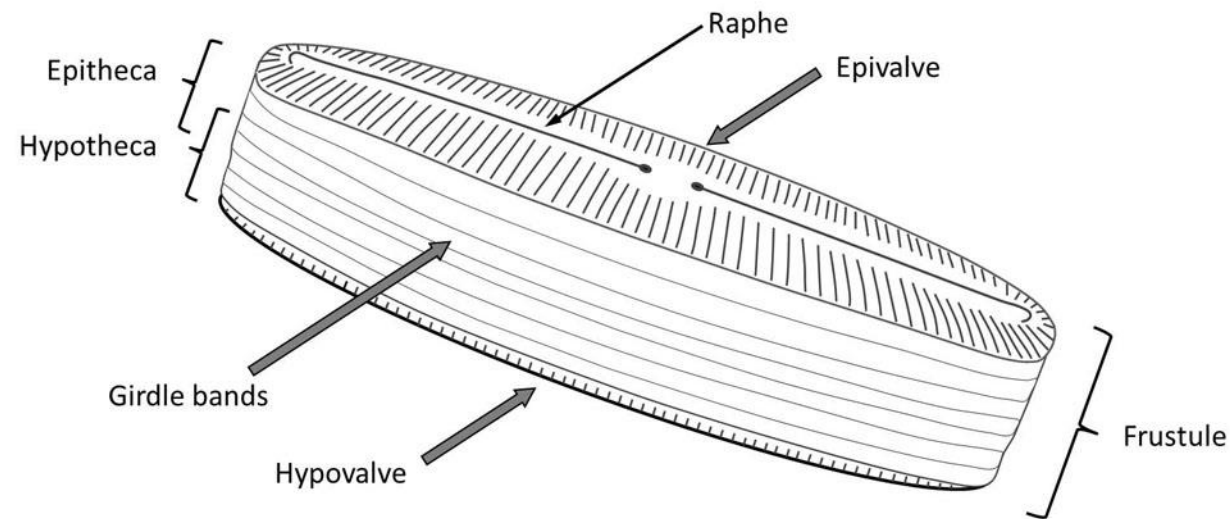
► Cell Wall:

- Composed of pectic substances which are made with silica
- This silicious material forms different ornamentation

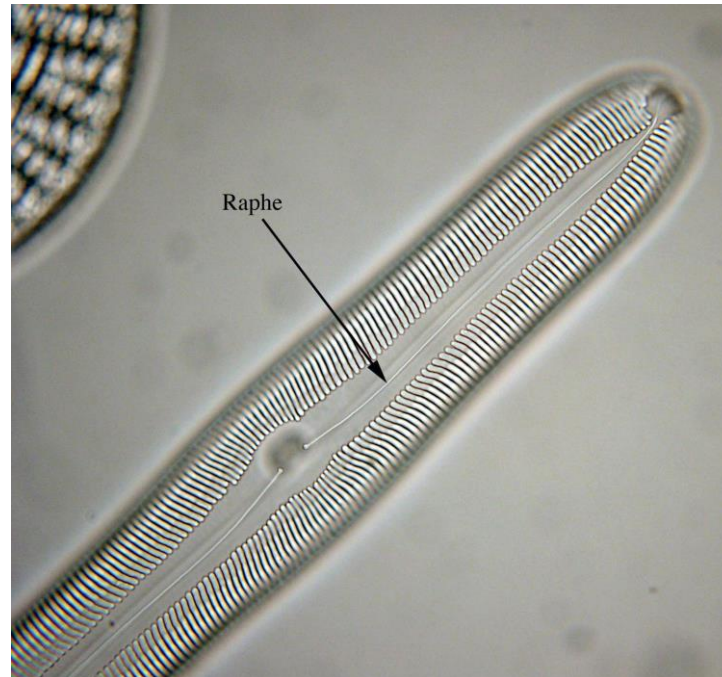
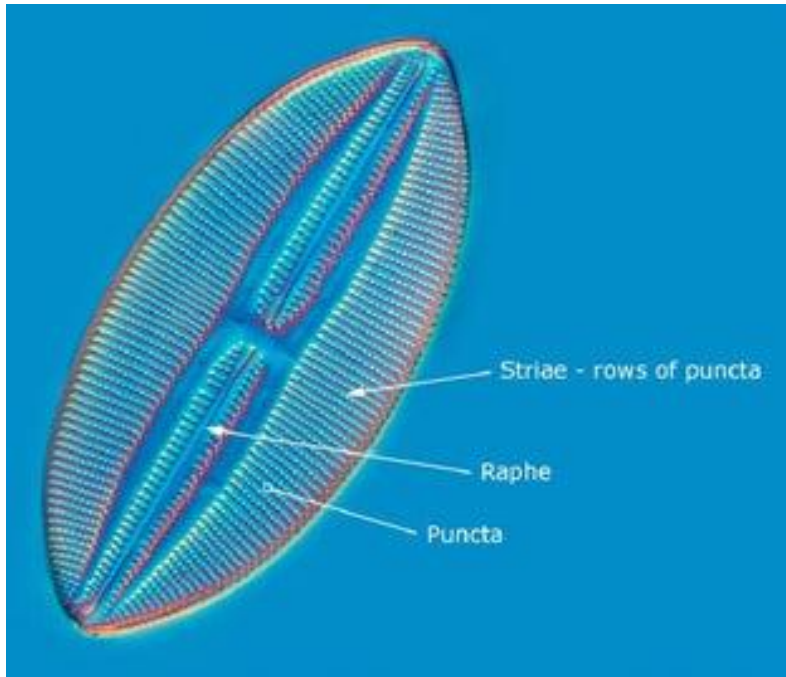


► Cell:

- Unicellular, sometimes colonial
- Shapes varies, like boat, rods, disks, triangles, wedges, etc.
- Diatom cell – frustule, composed two valves or theca like petri dish, outer one epitheca, inner one hypotheca
- Overlapping portion of these two valves known as girdle
- Valve view – when one of the valves seen, girdle view – when gridle seen



- Two types of ornamentation (1) radially symmetry – in the centric diatoms (Centrales) symmetry from central point of valves, (2) bilateral symmetry – in the pennate diatoms (Pennales) symmetry with respect to the long axis of cell
- Raphe – longitudinal linear slit on each valves of most elongated diatoms
- Pseudoraphe – longitudinal scratch that simulate raphe but not forming slit
- Polar nodule – thickening at both ends of raphe, centra nodule – thickening at mid-point of raphe
- Large central vacuole



► Pigments:

- Chlorophyll a, chlorophyll c, fucoxanthin
- Diatomin – a special pigment responsible for golden brown colour in diatom cell

► **Storage Food:**

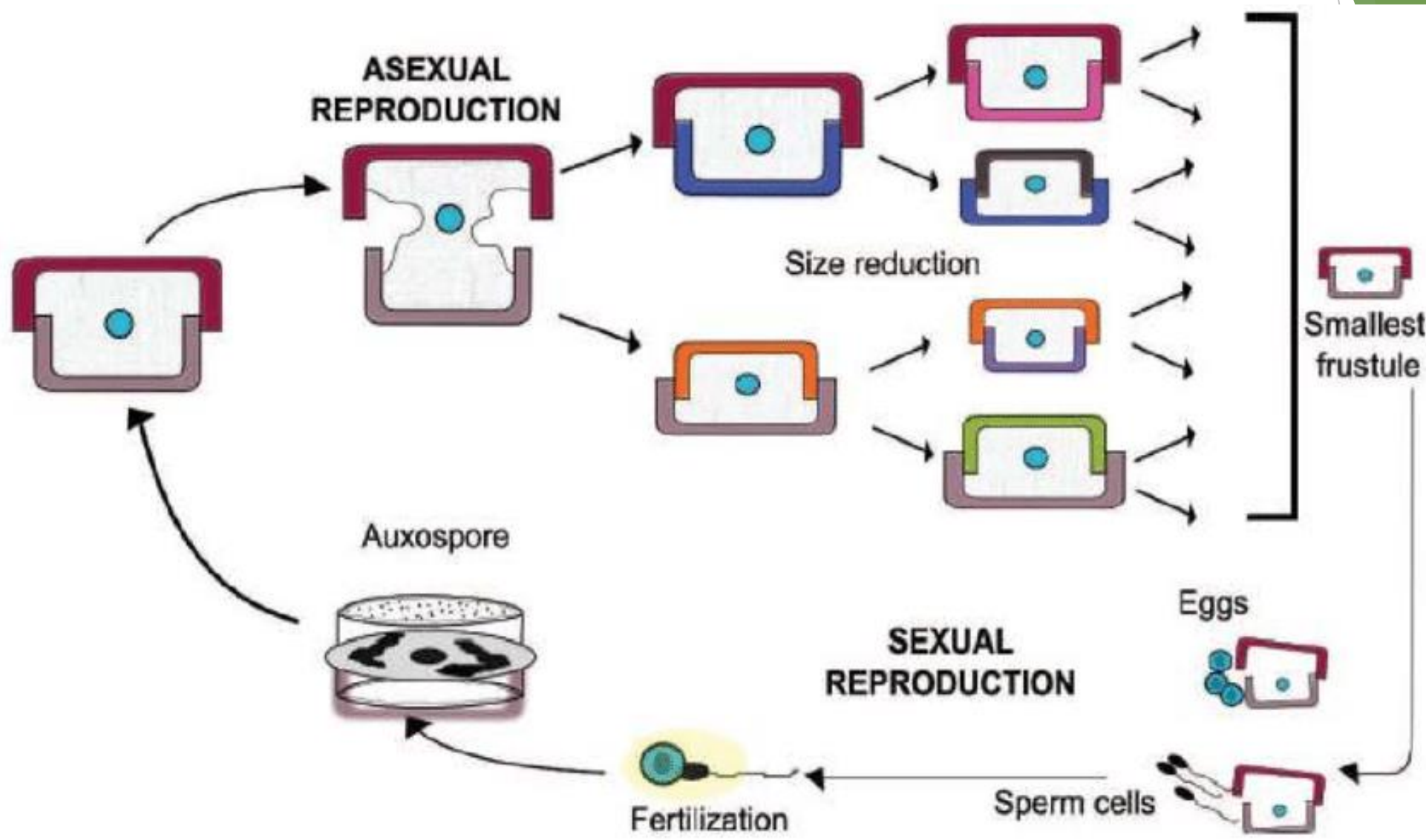
- Starch not formed
- Volutin and fats

► Reproduction:

- Vegetative reproduction through Cell division by special method
- (1) increase volume of frustules (2) both frustules separated slightly (3) mitosis of the nucleus (4) protoplast divided along the girdle region (5) cell divided into two (6) each new cells have half old cell wall and other half secret new cell wall (7) epitheca formed for the both cells, position of valves of parent cell does not matter, it will become hypotheca (8) so, one cell same size as parent, other slightly smaller (9) this cell division take place in night or dark
- Macdonald Pfitzer's law – the continuation of the cell division will lead size of some diatoms decrease, not a strong law, cell walls elastic and decrease of size of the cell wall not continued indefinitely, cells die after reached minimal size - 30%-40% reduction ('wasting away process') and auxospores (sexual reproduction) formed to escape this size issue
- Auxospores or sexual reproduction does not occur where size issue absent (auxo = grow)

► Reproduction:

- Pennales - mainly by isogamy (1) gamontogamy – 2 cells aggregate and covered by mucilage (2) meiosis of nucleus produces 4 nuclei (3) 1 or 2 nuclei develop gametes (4) Cystogamy – parent cells fuse (5) gametes fused (6) new frustules formed
- Different ways to form auxospores – (1) two gametes produced from each cell but fusion occur between gametes of two different cells (2) one gamete produced from each cell and fusion of two gametes from two different cells (3) two gametes formed in each cell and they fuse with each other (4) parthenogenetically entire protoplast of a cell transformed into an auxospore
- Centrales - mainly by oogamous (1) oogonium – slightly extended from cell, only one egg cell (2) spermatogonium – Four uniflagellate spermatozooids – spermatocytes (3) Vegetative cells either act directly to form 1 spermatogonium or divides to form or 4-8 spermatogonia (4) spermatogonia dispersed through water (5) then spermatozooids formed (6) only nucleus of spermatozoid get injected into egg cell
- Statospores – formed during unfavourable condition in many of the Centrales

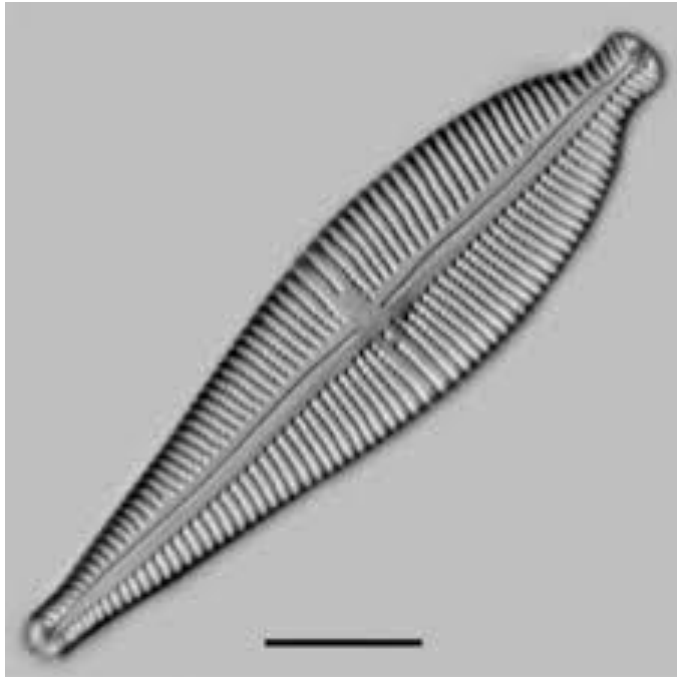


► Evolution:

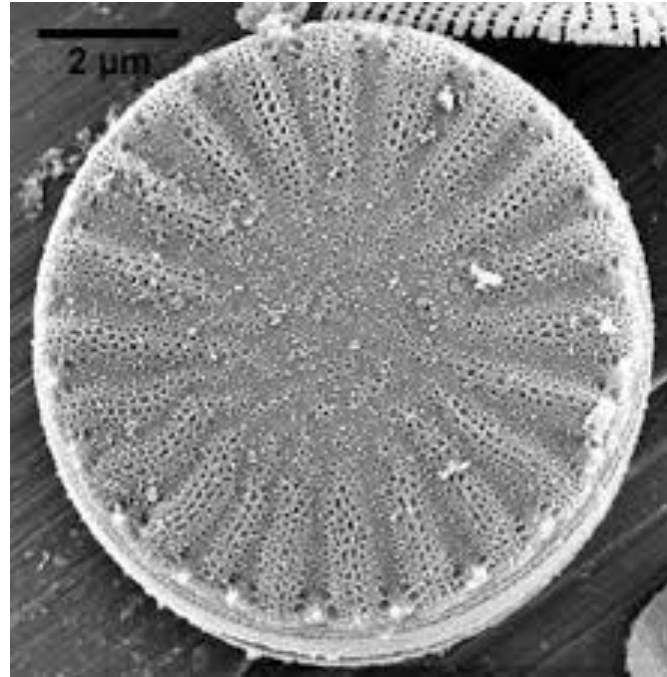
- Fucoxanthin and chlorophyll a and chlorophyll c suggest close relation with the Phaeophyta
- Have relationship with the Xanthophyta and Chrysophyta and sometimes classified it under Chryosophyta for golden-brown pigment and similar assimilation product
- Centric forms most primitive in the Jurassic, the pennate appear first in the Tertiary period
- Pennate forms derived from the centric forms

► Example:

- Pennales – *Gomphonema*, *Navicula*; Centrales – *Cyclotella*, *Biddulphia*, etc.



Gomphonema



Cyclotella