

## CHAP: ANIMAL-LIKE PROTISTS

- ✓ **Life Within a Single Plasma Membrane**
- ✓ **Phylum Sarcomastigophora**
- ✓ **Phylum Labyrinthomorpha**
- ✓ **Phylum Apicomplexa**
- ✓ **Phylum Microspora**
- ✓ **Phylum Acetospora**
- ✓ **Phylum Myxozoa**
- ✓ **Phylum Ciliophora**

## CLASS PHYTOMASTIGOPHOREA

- ✓ Possess chlorophyll
- ✓ One or two flagella
- ✓ Produce a large portion of the food in marine food webs.
- ✓ Much of the oxygen used in aquatic habitats comes from photosynthesis by these marine organisms.

### Examples:

- Dinoflagellates
- Euglena
- Volvox

## ➤ Dinoflagellates

- ✓ Marine phytomastigophoreans include the dinoflagellates.
- ✓ one flagellum wraps around the organism in a transverse groove causes the organism to spin on its axis.
- ✓ A second flagellum is a trailing flagellum that pushes the organism forward
- ✓ In addition to chlorophyll, many dinoflagellates contain xanthophyll pigments, which give them a golden brown color
- ✓ Several genera, such as *Gymnodinium*, have representatives that produce toxins.
- ✓ Periodic “blooms” of these organisms are called “red tides” and result in fish kills along the continental shelves.



Fig: Class Phytomastigophorea: Dinoflagellates. Two species of dinoflagellates—*Peridinium* in the upper left and *Ceratium* in the lower half. The transverse groove in the center of each dinoflagellate is the location for one of the two flagella

## ➤ Euglena

- ✓ freshwater phytomastigophorean
- ✓ Each chloroplast has a **pyrenoid**, which synthesizes and stores polysaccharides
- ✓ Some *euglenoids* (e.g., *Peranema*) lack chloroplasts and are always heterotrophic.
- ✓ A pigment shield (stigma) covers a photoreceptor at the base of the flagellum.
- ✓ The stigma permits light to strike the photoreceptor from only one direction.
- ✓ haploid and reproduce by longitudinal binary fission
- ✓ Sexual reproduction in these species is unknown.

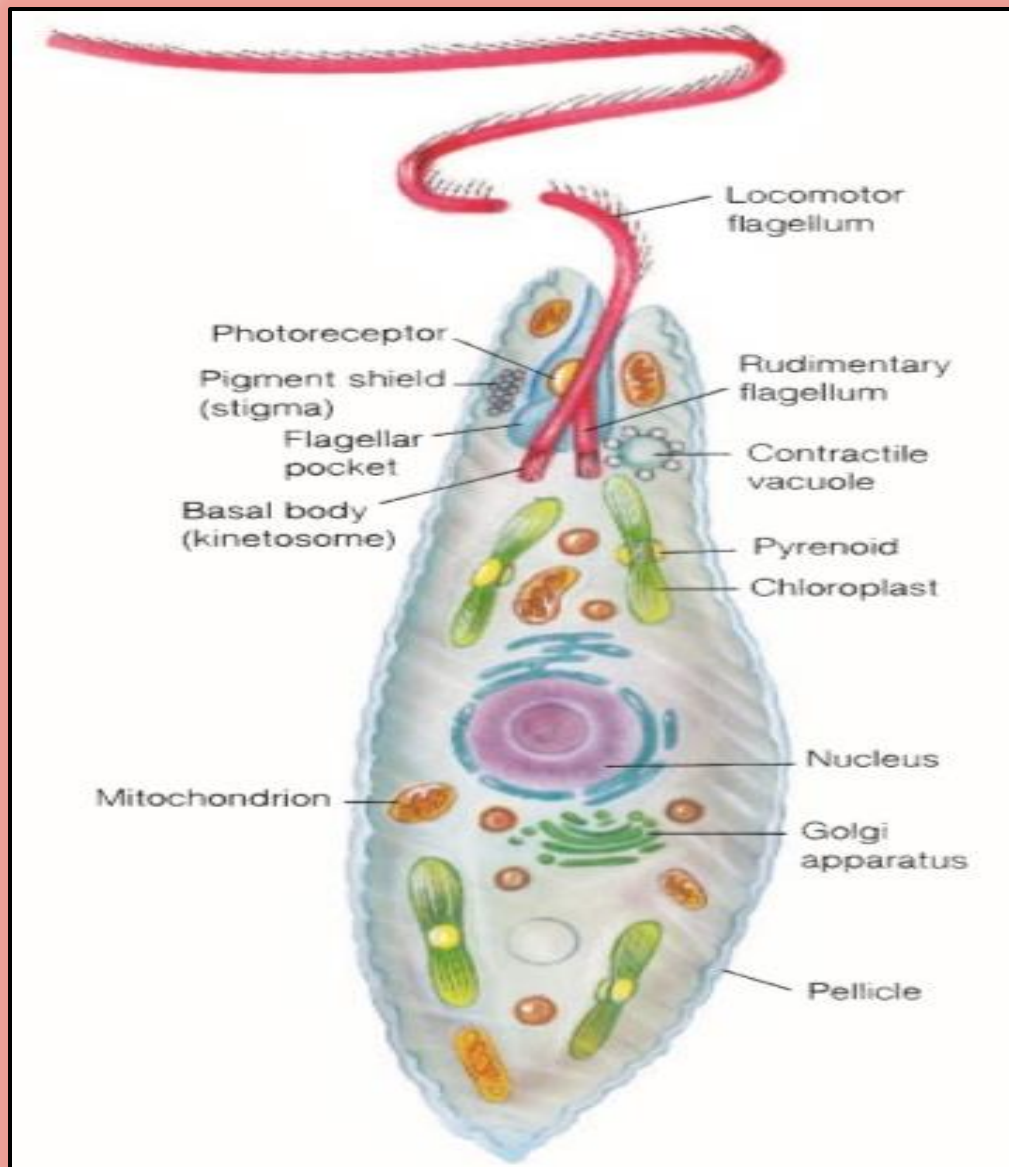
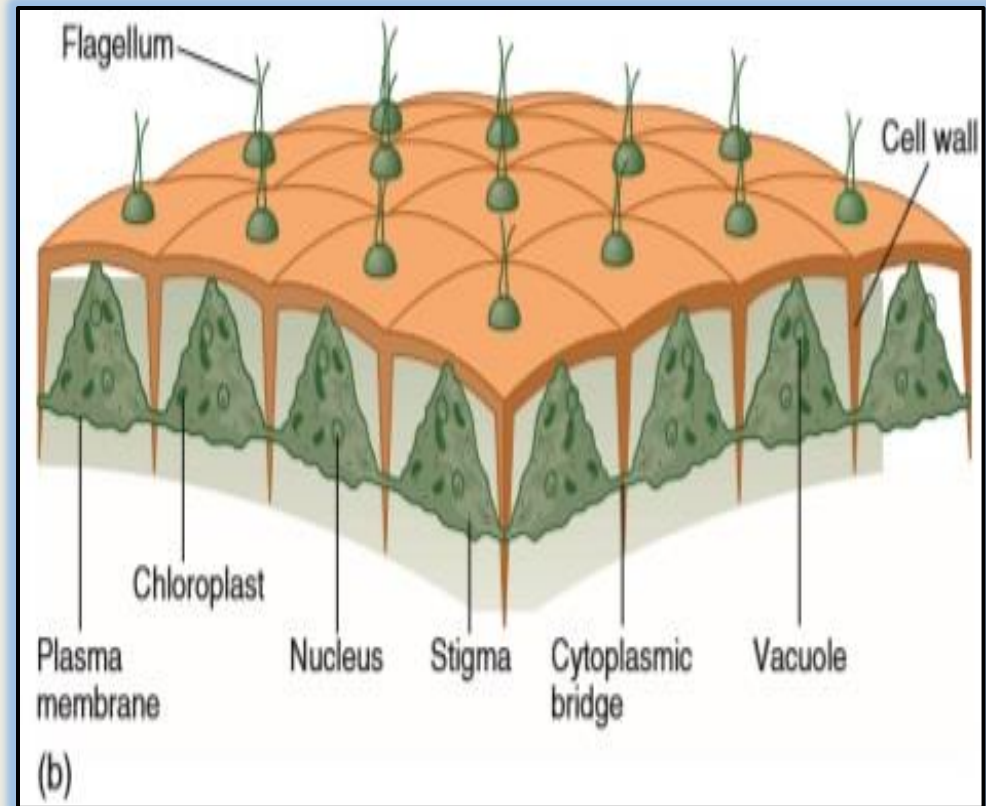
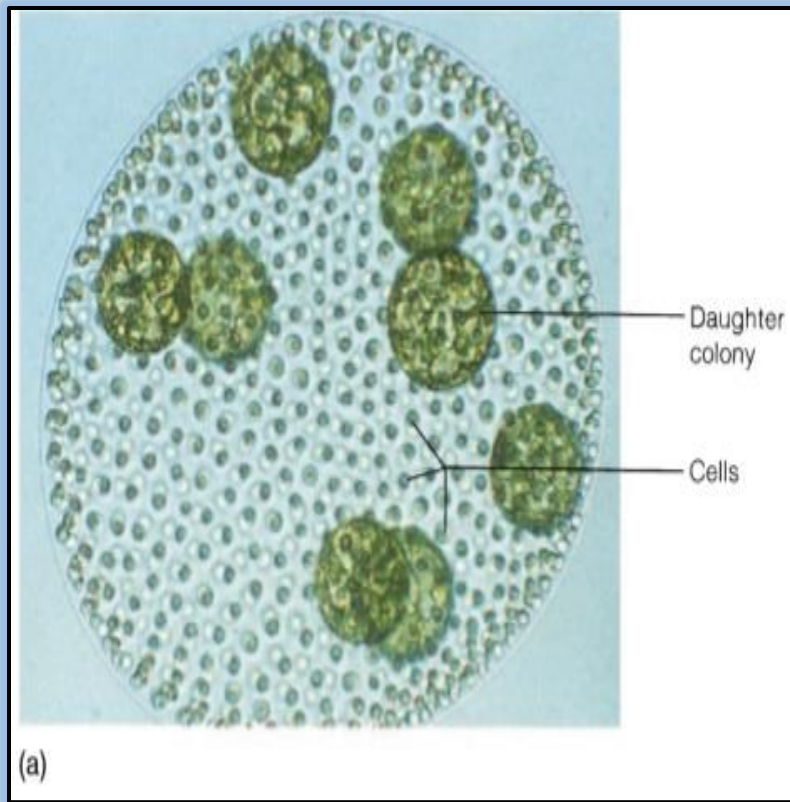


Fig: Phytomastigophorean Anatomy: The Structure of Euglena. Note the large, well-organized chloroplasts. The photoreceptor allows the organism to swim toward light. The organism is about 50  $\mu\text{m}$  long.

## Volvox

- ✓ Volvox is a colonial flagellate consisting of up to **50,000 cells** embedded in a spherical, gelatinous matrix
- ✓ Individual cells possess two flagella
- ✓ Asexual reproduction occurs in the spring and summer
- ✓ When the parental colony dies, it ruptures and releases daughter colonies
- ✓ Sexual reproduction in Volvox occurs during autumn.
- ✓ Some species are dioecious (having separate sexes); other species are monoecious



**Fig: Class Phytomastigophorea: *Volvox*, a Colonial Flagellate. (a) A *Volvox* colony, showing asexually produced daughter colonies. (b) An enlargement of a portion of the colony wall.**



## Sexual reproduction in Volvox

- ✓ In autumn, specialized cells differentiate into macrogametes or microgametes.
- ✓ Macrogametes are large, filled with nutrient reserves, and nonmotile.
- ✓ Microgametes form as a packet of flagellated cells that leaves the parental colony and swims to a colony containing macrogametes.
- ✓ Syngamy occurs between macro- and microgametes.
- ✓ Zygote secretes a resistant wall around itself and is released when the parental colony dies.
- ✓ Zygote undergoes meiosis and one of the products of meiosis after repeated mitotic divisions form a colony consisting of just a few cells.
- ✓ The other products of meiosis degenerate. This colony is released from the protective zygotic capsule in the spring.

## CLASS ZOOMASTIGOPHOREA

- ✓ Lack chloroplasts and are
- ✓ Heterotrophic.
- ❖ **Some members of this class are important parasites of humans i.e., Trypanosoma brucei. This species is divided into three subspecies:**
  - **T. b. brucei**
  - **T. b. gambiense**
  - **T. b. rhodesiense**
- ✓ The first of these three subspecies is a parasite of nonhuman mammals of Africa. The latter two cause **sleeping sickness** in humans.
- ✓ **Tsetse flies** (*Glossina spp.*) are intermediate hosts and vectors of all three subspecies.

# Life Cycle of *Trypanosoma brucei*

A tsetse fly feeds on a vertebrate host

*trypanosomes* enter the vertebrate's circulatory system with the fly's saliva.

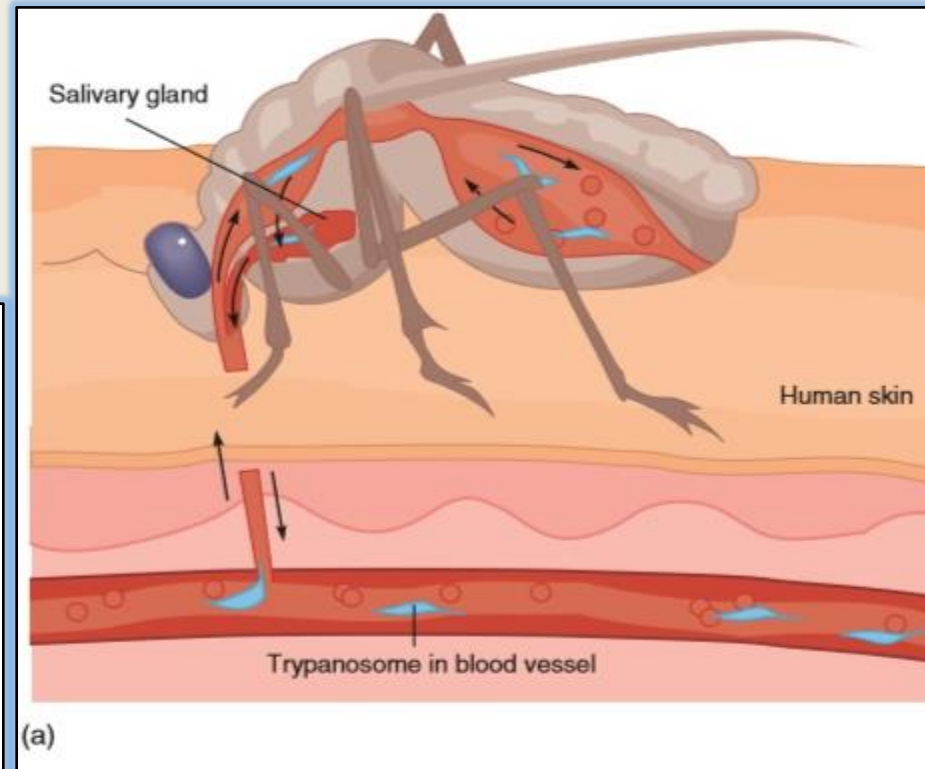
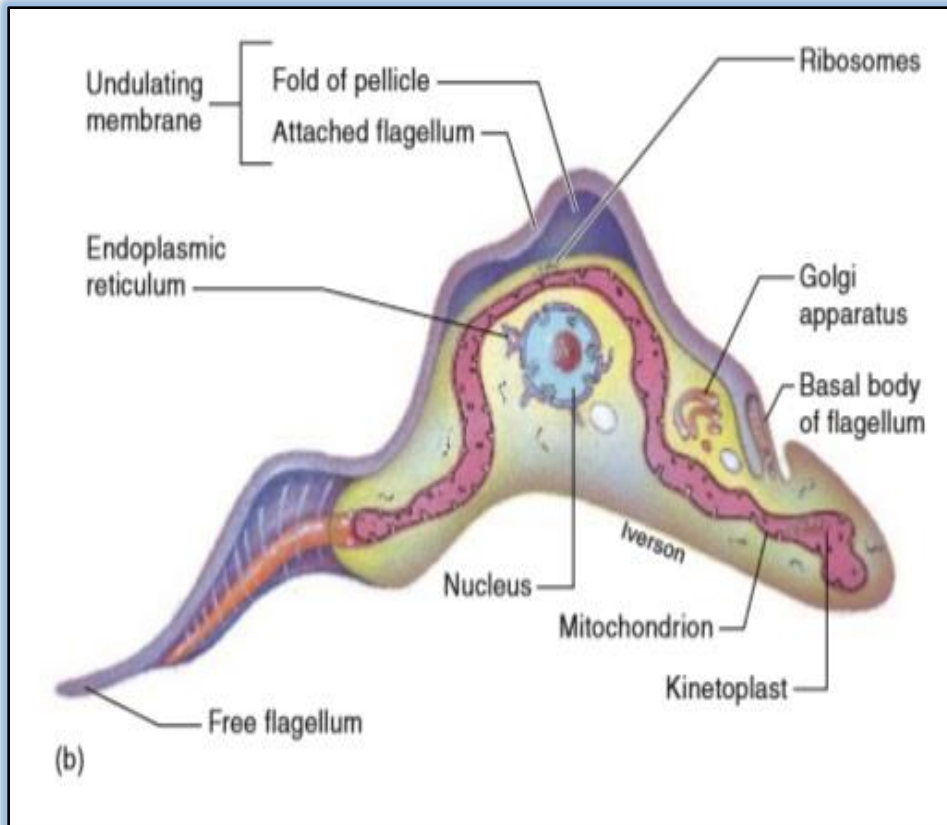
*Trypanosomes* multiply in the vertebrate's circulatory and lymphatic systems by binary fission.

*trypanosomes* move into the gut of the fly and undergo binary fission.

When another tsetse fly bites this vertebrate host again

Trypanosomes then migrate to the fly's salivary glands

They are available to infect a new host



**Fig: Class Zoomastigophorea: The Life Cycle of *Trypanosoma brucei*.**

# **SUBPHYLUM SARCODINA: PSEUDOPODIA AND AMOEBOID LOCOMOTION**

Pseudopodia exist in a variety of forms:

## **Lobopodia**

- ✓ Broad cell processes containing ectoplasm and endoplasm.
- ✓ Used for locomotion and engulfing food.

## **Filopodia**

- ✓ Contain ectoplasm only and provide a constant two-way streaming that
- ✓ Delivers food in a conveyor-belt fashion.

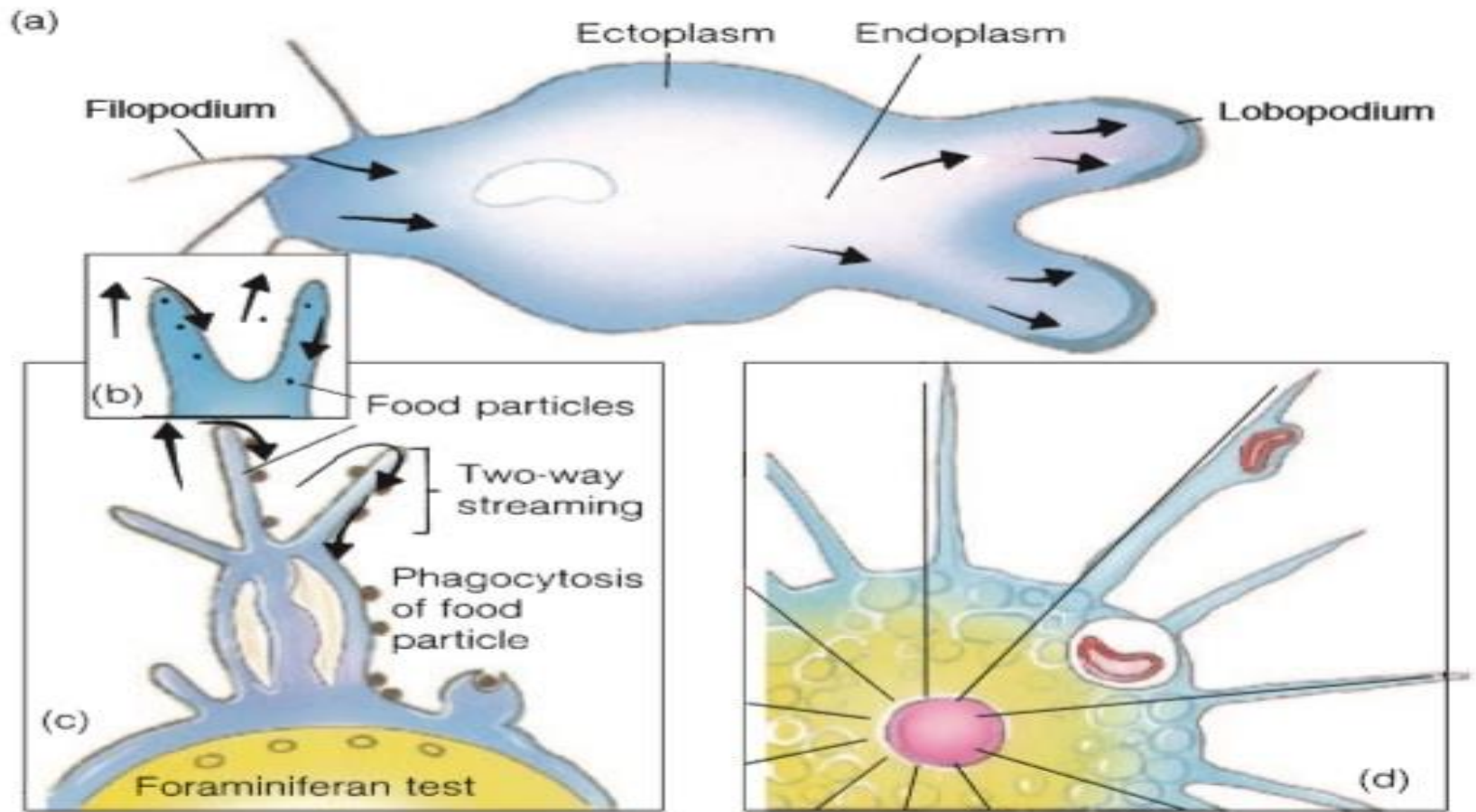
## **Reticulopodia**

- ✓ Similar to filopodia, except that they branch and rejoin to form a netlike series of cell extensions.

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## Axopodia

- ✓ Thin, filamentous, and supported by a central axis of microtubules.
- ✓ The cytoplasm covering the central axis is adhesive and movable.
- ✓ Food caught on axopodia can be delivered to the central cytoplasm of the amoeba.



**Fig: Variations in Pseudopodia.** (a) **Lobopodia** of Amoeba contain both ectoplasm and endoplasm and are used for locomotion and engulfing food. (b) **Filopodia** of a shelled amoeba contain ectoplasm only and provide constant two-way streaming that delivers food particles to this protozoan in a conveyor-belt fashion. (c) **Reticulopodia** are similar to filopodia except that they branch and rejoin to form a netlike series of cell extensions. They occur in foraminiferans such as Globigerina. (d) **Axopodia** on the surface of a heliozoan such as Actinosphaerium deliver food to the central cytoplasm.

## SUPERCLASS RHIZOPODA, CLASS LOBOSEA

The most familiar amoebae belong to the superclass Rhizopoda, class Lobosea and the genus Amoeba.

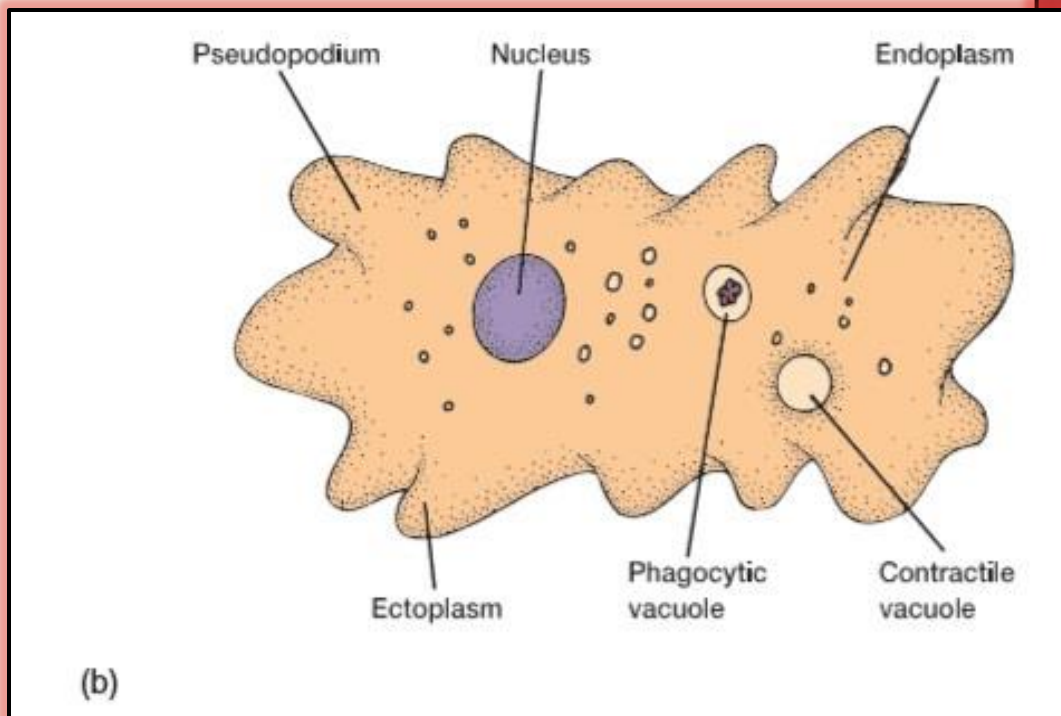
### Amoeba

- ✓ Amoebae are naked (they have no test or shell)
- ✓ Normally found on shallow-water substrates of freshwater ponds, lakes, and slow-moving streams
- ✓ feed on other protists and bacteria
- ✓ Phagocytosis
- ✓ Binary fission occurs when an amoeba reaches a certain size limit
- ✓ No sexual reproduction is known to occur.





(a)



(b)

Fig: Subphylum Sarcodina: Superclass Rhizopoda, Class Lobosea. (a) Amoeba proteus, showing blunt lobopodia. (b) Anatomy of Amoeba proteus.

## SUPERCLASS RHIZOPODA, CLASS LOBOSEA

❖ Other members of the superclass Rhizopoda possess a test shell

### TYPES OF TEST AND SHELLS:

- Calcareous → (made of calcium carbonate)
- Proteinaceous → (made of protein)
- Siliceous → (made of silica [SiO<sub>2</sub>])
- Chitinous → (made of chitin—a polysaccharide)
- Other tests may be composed of **sand or other debris** cemented into a secreted matrix.

## EXAMPLES:

### ➤ **Arcella**

- Freshwater, shelled amoeba
- Brown, proteinaceous test
- Flattened on one side and domed on the other.
- Pseudopodia project from an opening on the flattened side.

### ➤ **Diffugia**

- Freshwater, shelled amoeba
- Test is vase shaped composed of mineral particles embedded in a secreted matrix.

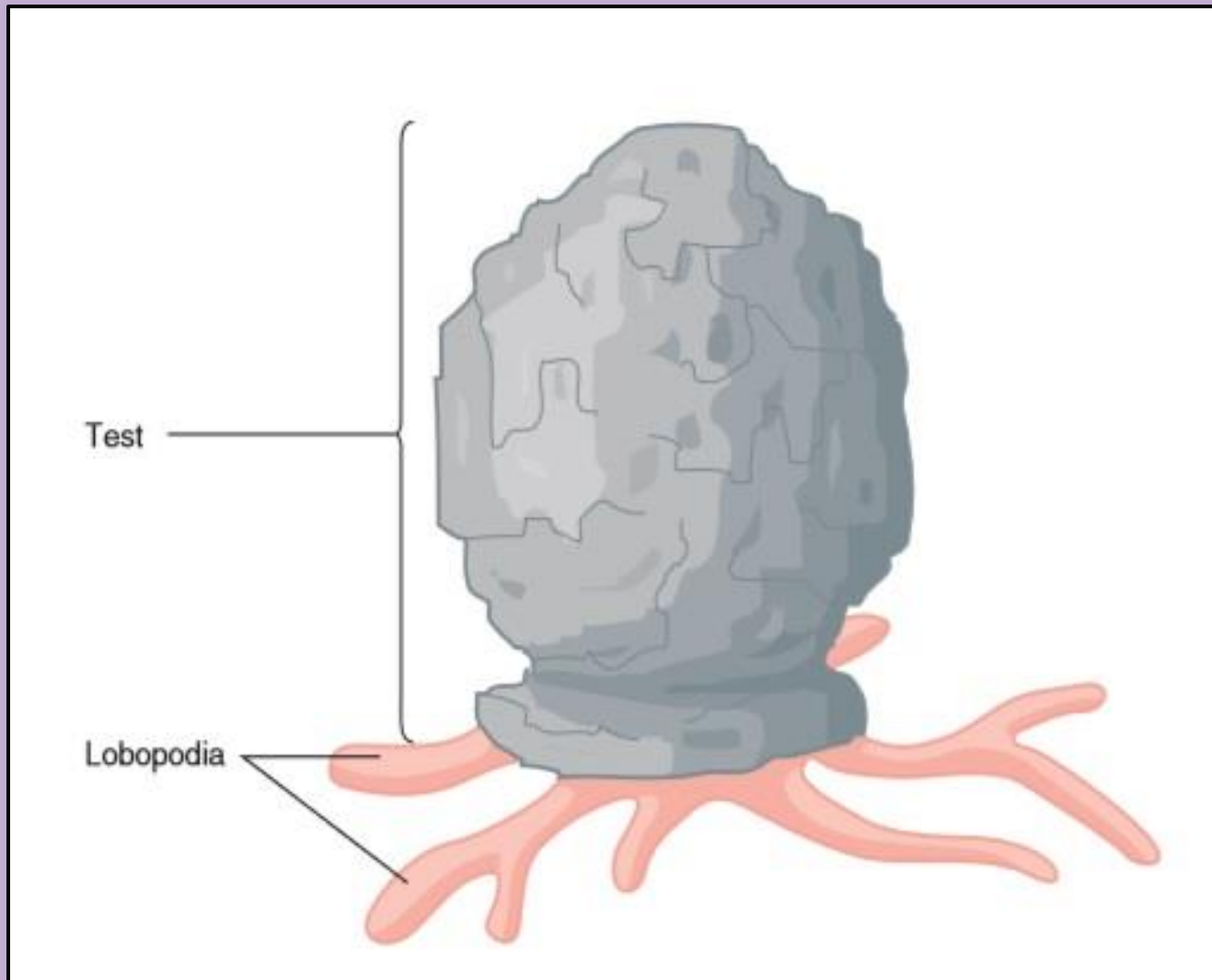


Fig: Subphylum Sarcodina. *Diffflugia oblongata*, a common freshwater, shelled amoeba. The test consists of cemented mineral particles.

## Pathogenic amoeba:

- *Entamoeba histolytica* causes one form of dysentery in humans.
  - Live in the folds of the intestinal wall.
  - Feeding on starch and mucoid secretions.
  - Pass from one host to another in the form of cysts transmitted by fecal contamination of food or water.
  - After ingestion by a new host, amoebae leave their cysts and take up residence in the host's intestinal wall.