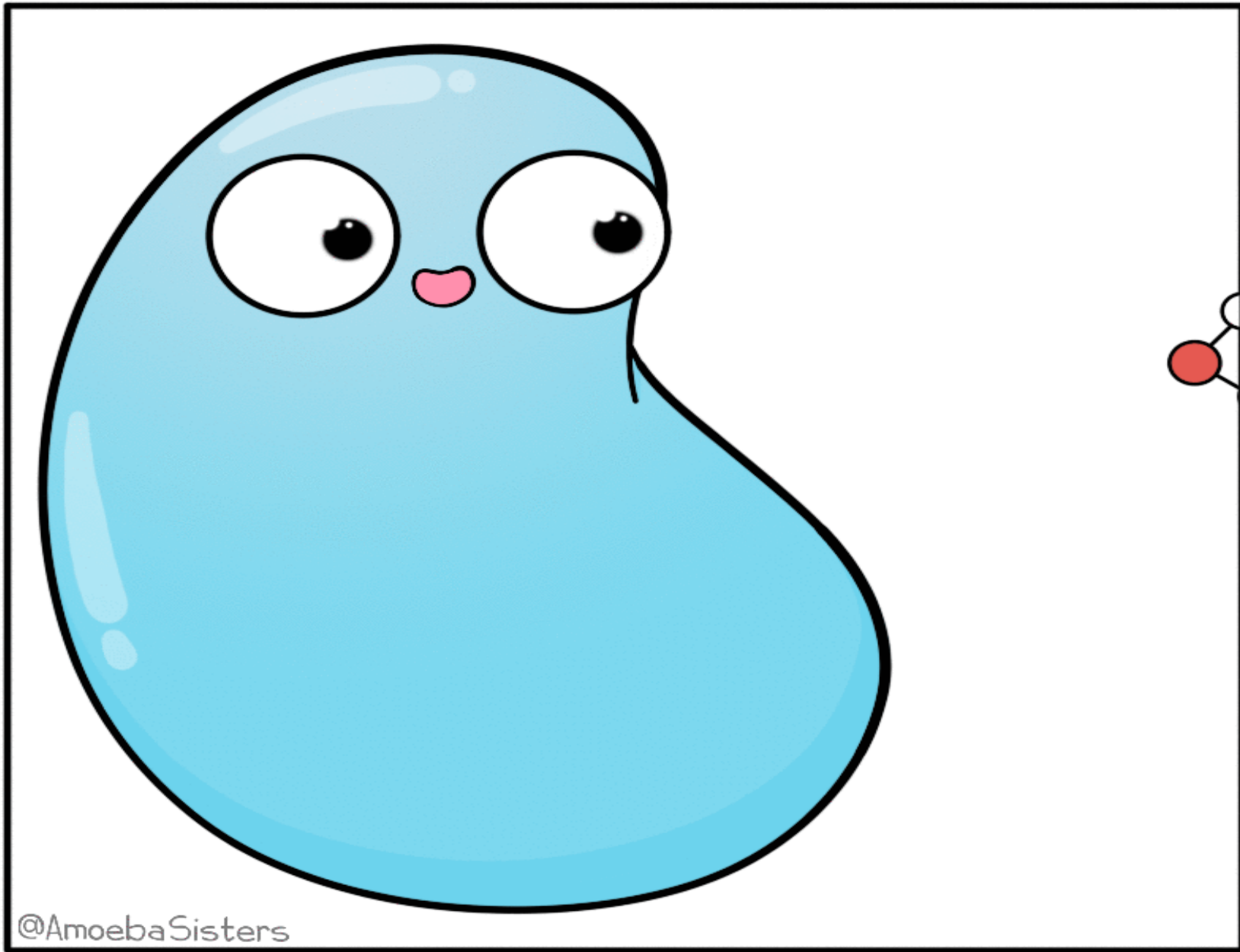


VACUOLE



@AmoebaSisters

Storage containers of the cell

Vacuoles

- ❖ Vacuoles are membrane-bound organelles found in the cells of plants, fungi, protists, animals, and bacteria.
- ❖ These structures play a vital role in maintaining cellular homeostasis and are involved in a variety of essential functions, including storage, waste disposal, and maintaining proper pressure and pH balance within the cell.

Structure of Vacuoles

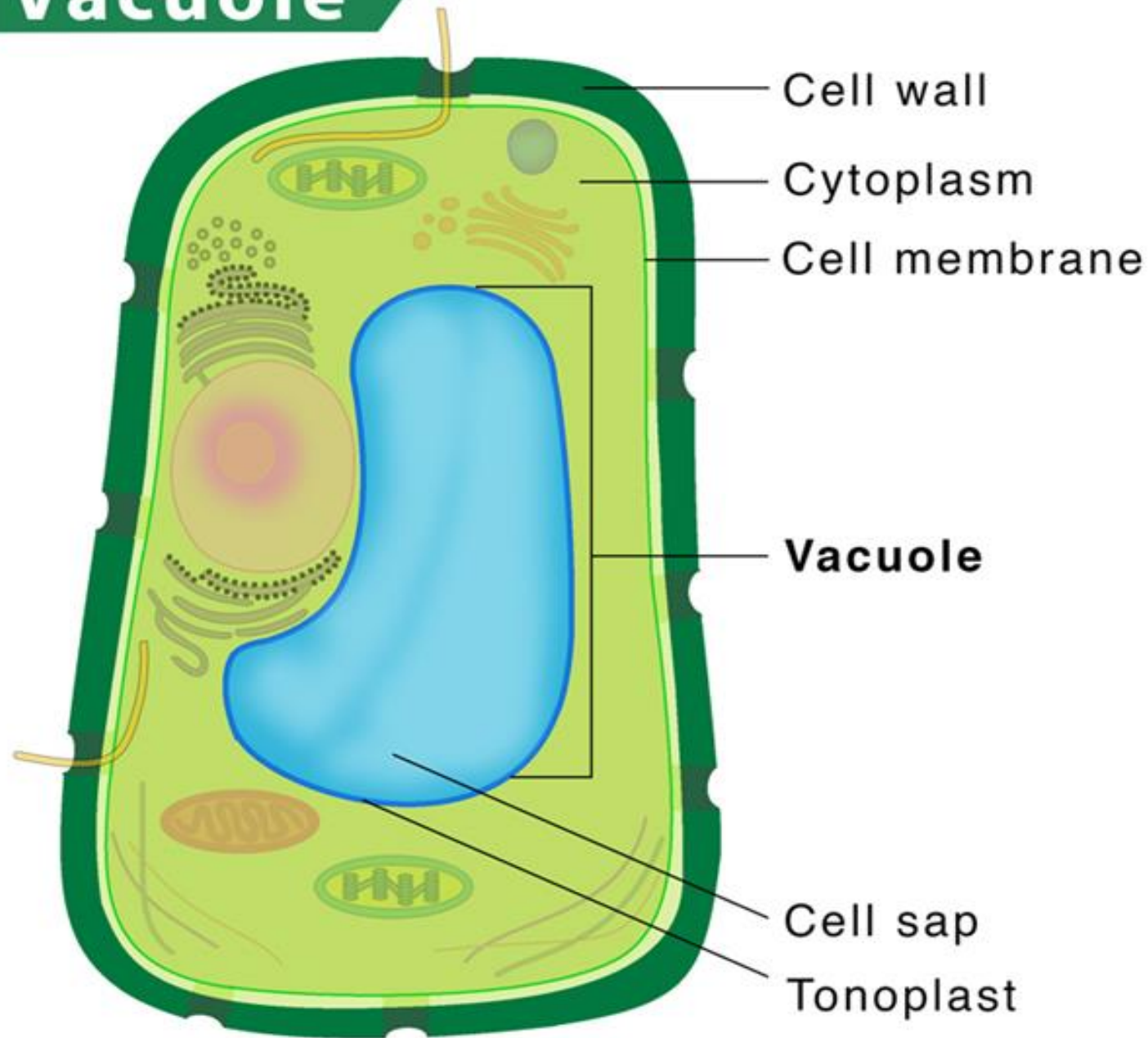
❖ **Membrane:**

- ❖ Vacuoles are enclosed by a single membrane known as the tonoplast in plant cells. The tonoplast regulates the movement of ions, nutrients, and waste materials in and out of the vacuole, maintaining a balance between the cytoplasm and the vacuole's internal environment.

❖ **Contents:**

- ❖ The interior of vacuoles can contain a variety of substances, including water, enzymes, ions, nutrients, waste products, and pigments. The specific contents vary depending on the type of cell and its needs.

Vacuole



Plant cell

Types of Vacuoles

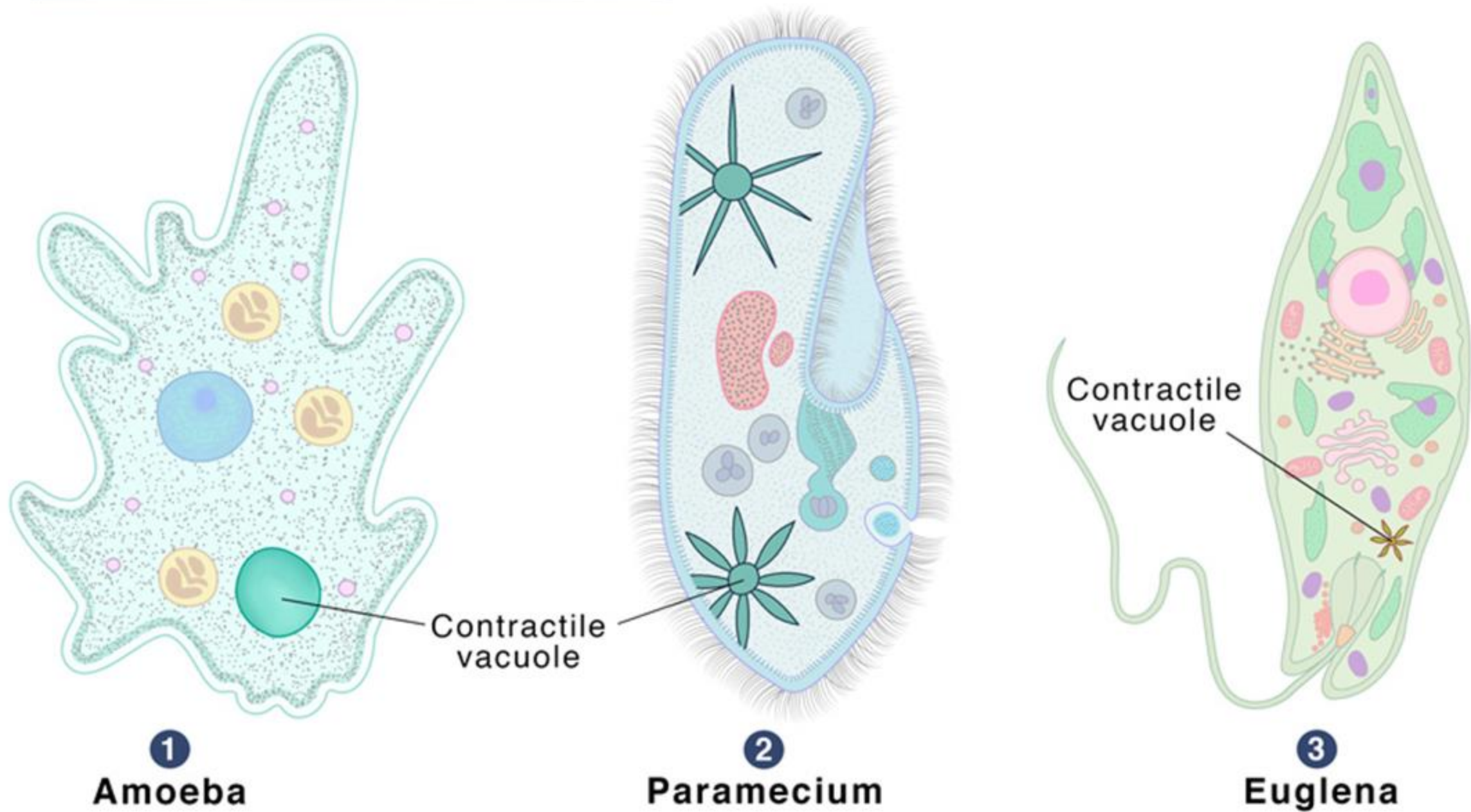
❖ 1. Central Vacuole:

- ❖ Predominantly found in plant cells, the central vacuole can occupy up to 90% of the cell's volume. It is filled with cell sap, a solution of water, enzymes, ions, and other substances. The central vacuole plays a crucial role in maintaining turgor pressure, which helps keep the plant rigid and upright.

❖ 2. Contractile Vacuoles:

- ❖ Found mainly in freshwater protists, contractile vacuoles regulate water balance by expelling excess water from the cell. This is essential for maintaining osmotic balance in environments where water continuously enters the cell by osmosis.

Contractile Vacuoles



Types of Vacuoles

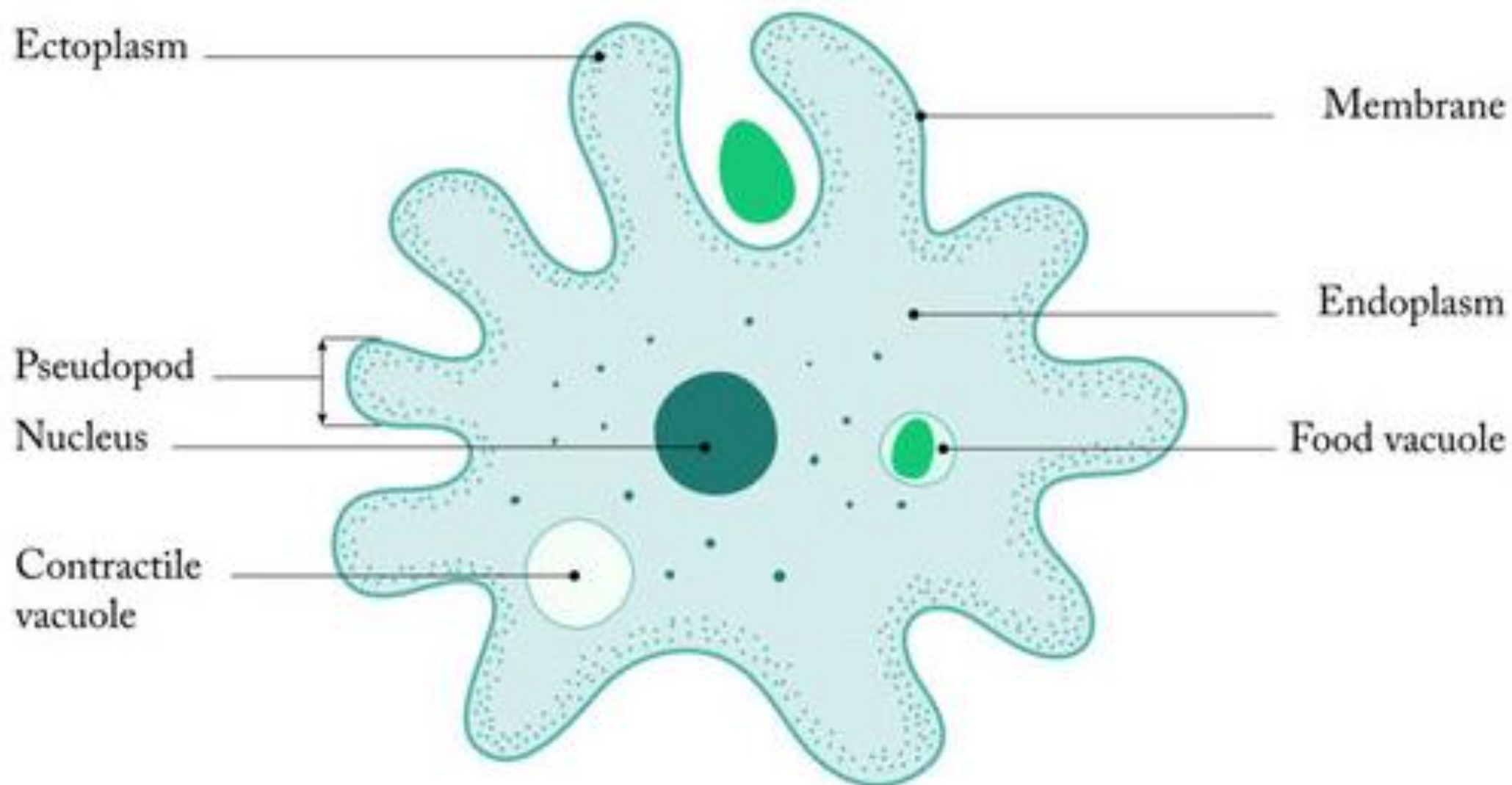
❖ **3. Food Vacuoles:**

- ❖ Present in many protists and some animal cells, food vacuoles are formed by the engulfment of food particles. These vacuoles fuse with lysosomes containing digestive enzymes, breaking down the food into nutrients that can be absorbed by the cell.

❖ **4. Storage Vacuoles:**

- ❖ Found in various cells, these vacuoles store important substances like proteins, lipids, and starch. In seeds, storage vacuoles can store proteins needed for germination.

Food Vacuole in Amoeba



Functions of Vacuoles

❖ **1. Storage:**

- ❖ Vacuoles serve as storage compartments for various substances, including nutrients, waste products, and secondary metabolites. In plant cells, they store important compounds like pigments, which can help attract pollinators, and defensive chemicals to deter herbivores.

❖ **2. Waste Disposal:**

- ❖ Vacuoles can sequester waste products and toxic substances, isolating them from the rest of the cell and preventing damage.

❖ **3. Turgor Pressure Maintenance:**

- ❖ In plant cells, the central vacuole helps maintain turgor pressure, which is the pressure of the cell contents against the cell wall. This pressure is crucial for maintaining the structural integrity of the plant and for various physiological processes.

Functions of Vacuoles

❖ **4. pH Regulation:**

- ❖ Vacuoles can help regulate the pH of the cytoplasm by sequestering or releasing ions as needed.

❖ **5. Osmoregulation:**

- ❖ Contractile vacuoles in protists are vital for osmoregulation, the process of maintaining water balance within the cell.

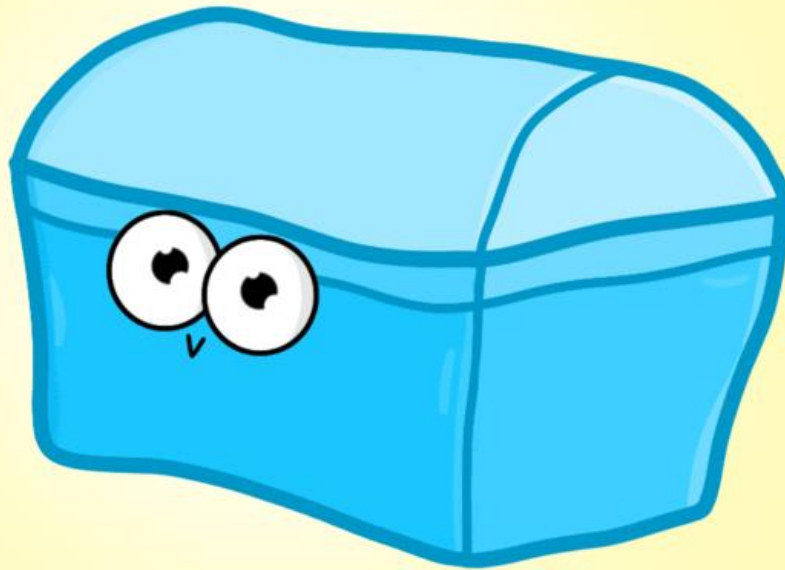
❖ **6. Intracellular Digestion:**

- ❖ In cells with food vacuoles, these organelles are involved in the digestion of ingested food particles. The breakdown products are then absorbed into the cytoplasm for use by the cell.

Amoeba Sisters

Vacuole

#AmoebaGIFs



Storage containers of the cell

Difference b/w Plant and Animal Vacuole

❖ **Size and Number:**

- ❖ Plant cells typically contain a single large central vacuole, whereas animal cells may have several smaller vacuoles. The large central vacuole in plant cells can occupy a significant portion of the cell volume.

❖ **Function:**

- ❖ While both plant and animal cells use vacuoles for storage and waste disposal, plant vacuoles play a more prominent role in maintaining cell structure and turgor pressure.

THE END