Structure of Phloem

AS Biology

Phloem

- **Phloem** is the main transport tissue of organic material in vascular plants

- Function:
  - Carries organic materials (sugars and amino acids) from leaves and storage organs to other parts of the plant

Structure of Phloem - Sieve tube elements

- Elongated cells joined end to end to form long tubes
- Cells are living
  - Retain a thin layer of cytoplasm
  - To reduce the resistance to the flow of liquid
    - No nucleus
    - No golgi body
    - No ribosomes
- End walls are perforated by large pores (2-6 micrometers)
  - Called **sieve plates**
- Central space within the sieve tube is called the **lumen**

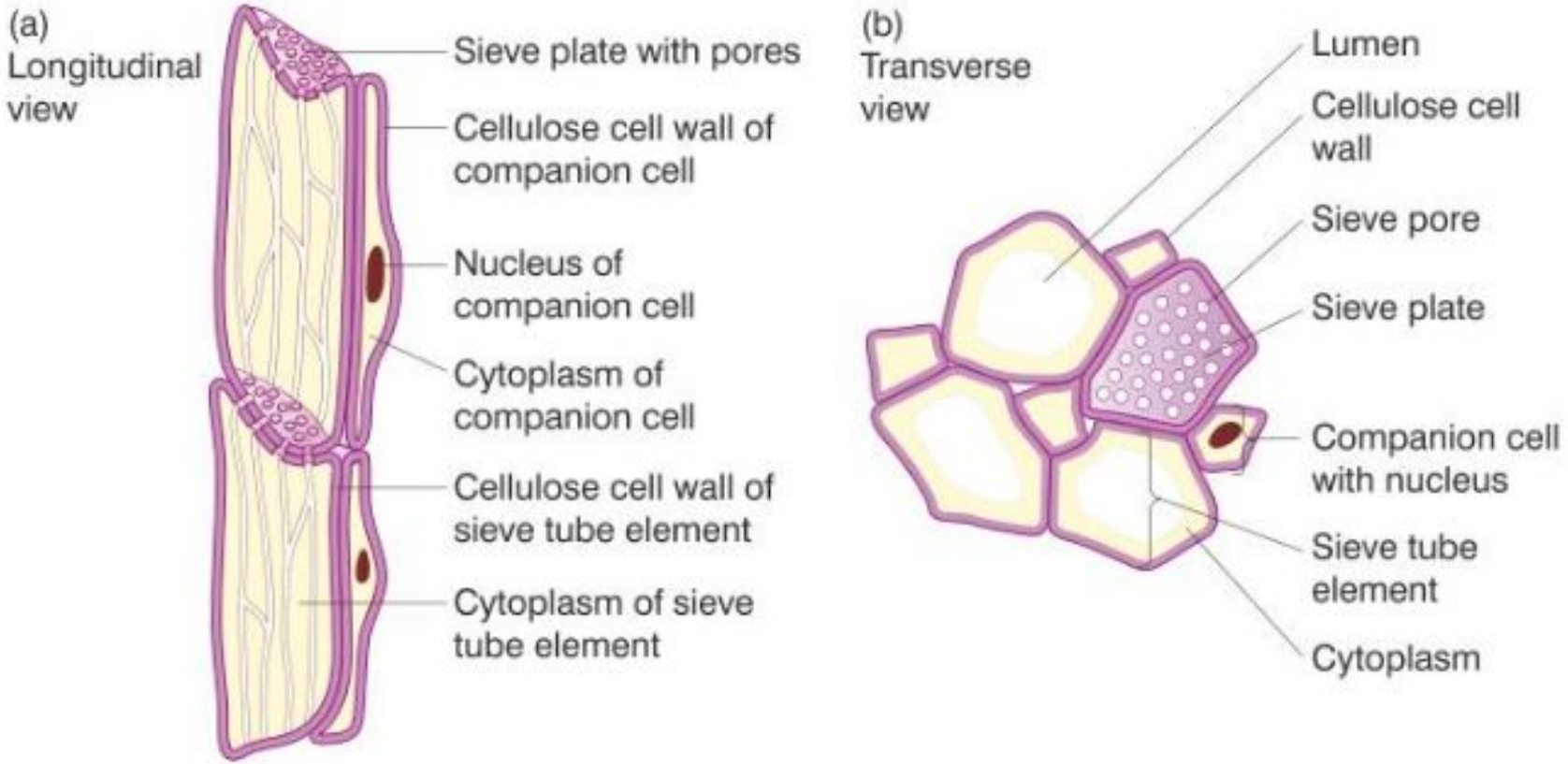

Figure 3 *Phloem as seen under a light microscope*

Structure of Phloem - Companion Cells

- Always associated with sieve elements
- Where many metabolic processes happen for themselves and sieve elements
  - Have a nucleus, ribosomes, and golgi unlike sieve elements
  - Dense cytoplasm and a thin cellulose cell wall
- In areas where assimilates are loaded/unloaded into the phloem, there are several plasmodesmata between companion cells and phloem sieve tubes
  - Maintains a pressure gradient
  - Companion cell uses specific membrane carrier proteins for lateral transfer of materials
- Companion cells have very folded cell walls and surface membranes at the tips of veins
  - Called: **Transfer cells** - large surface area increase the rate of transfer of sucrose into the sieve tube elements

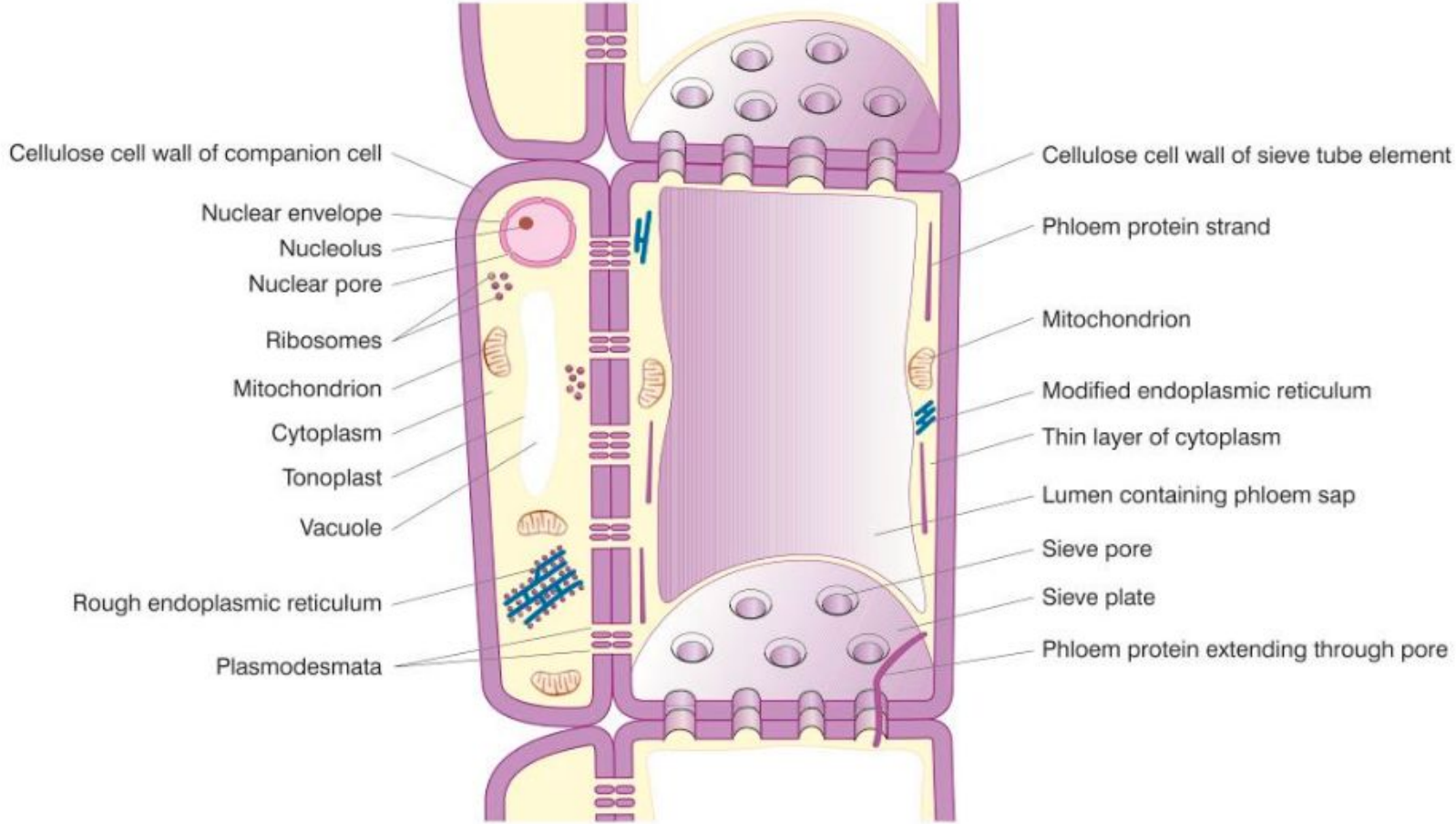

Figure 4 *Sieve tube element and companion cell structure as shown by using an electron microscope*

How structure is related to function

- Sieve elements are elongated and arranged end to end to form a continuous tube
- The nucleus and many of the organelles are located in the companion cells leaving the lumen of the sieve tube elements more open to reduce resistance to the flow of liquid
- Sieve plates are perforated with sieve pores, reducing the resistance to liquid flow
- Sieve plates hold the walls of sieve tube elements together and prevent them from bursting

How structure is related to function

- The walls contain cellulose microfibrils that run around the cells, giving strength and preventing the tubes bursting under pressure
- The walls are thin to allow easy entry of water at the source which helps to build up pressure
- Companion cells have many mitochondria to release the energy needed for translocation of organic materials
- Plasmodesmata in the areas of loading and unloading allow easy movement of substances to and from companion cells
- Phloem proteins are a variety of different proteins that are thought to have a role in defence against pathogens and in sealing wounds