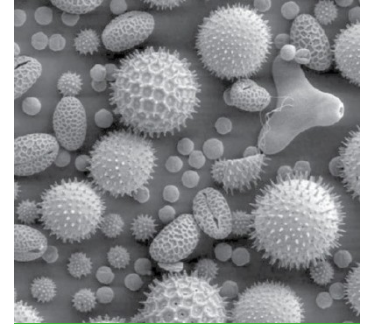




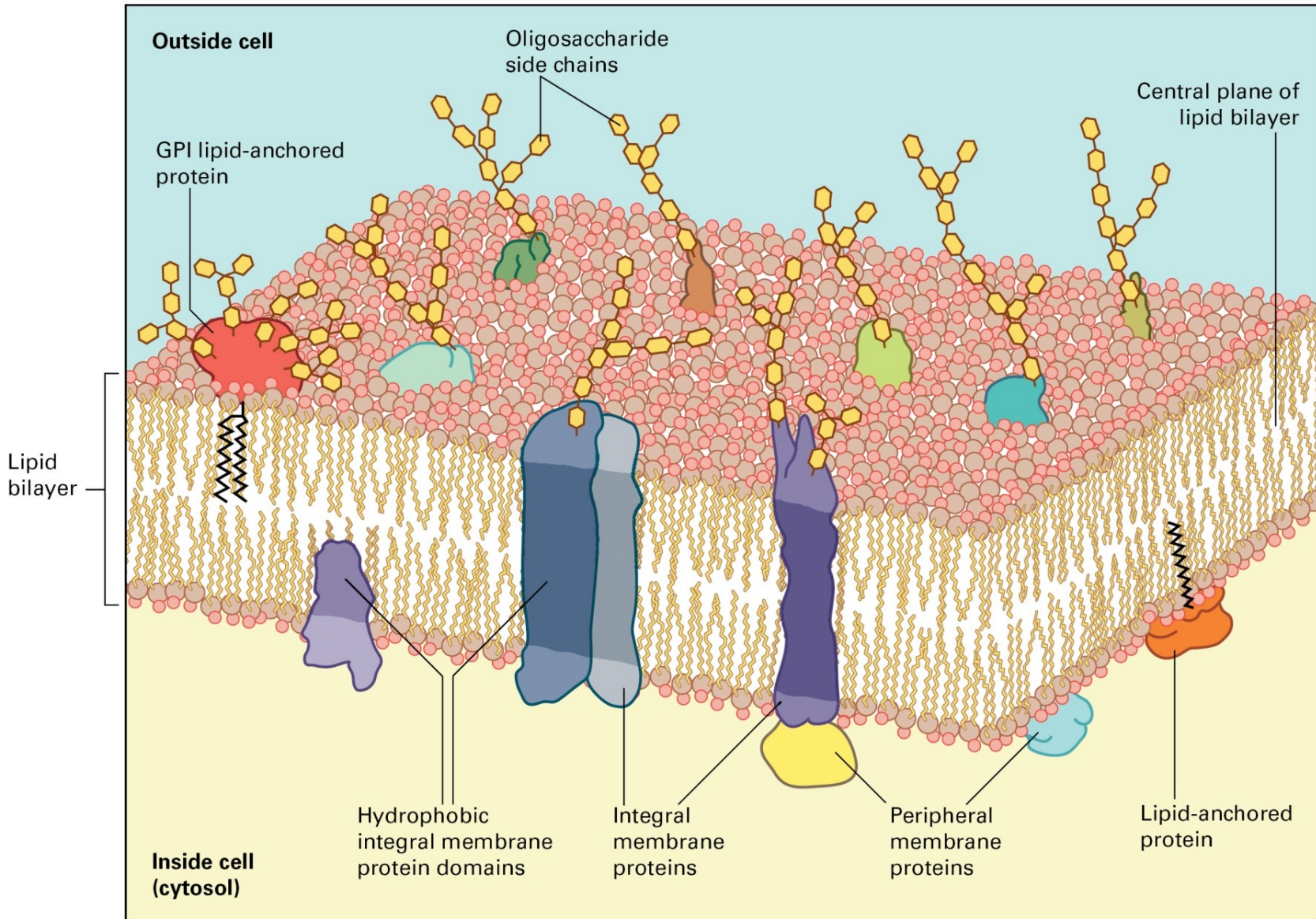
FACULTY
OF SCIENCE
Masaryk University



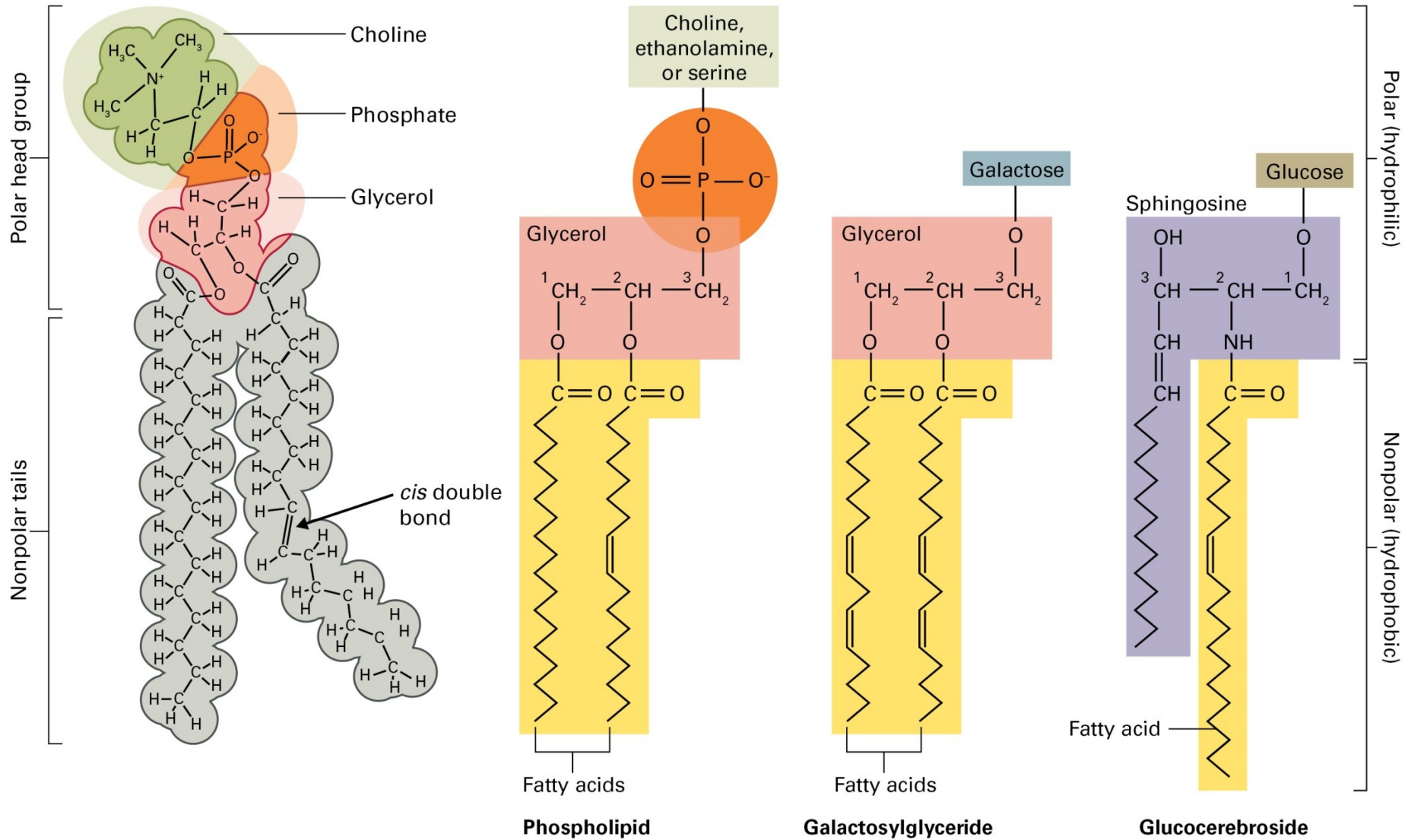
Membrane and Cell Wall



Plant membrane

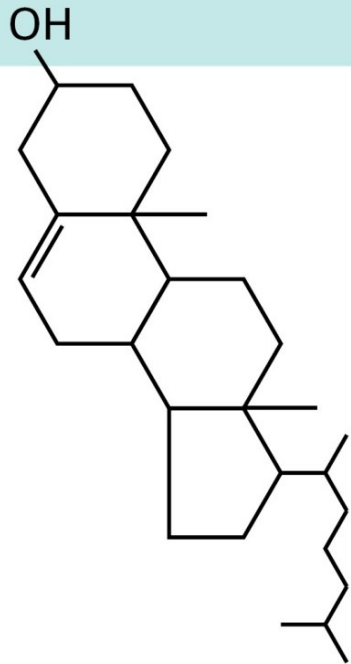


Plant membrane lipids

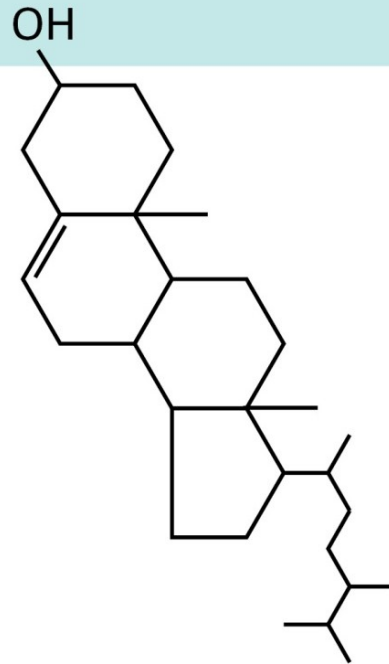


Plant membrane lipids

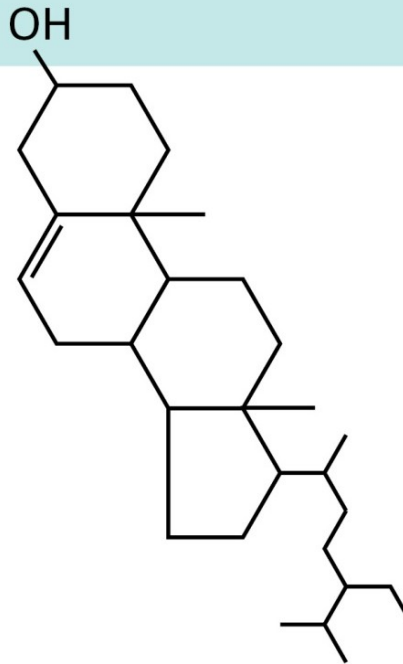
Cholesterol



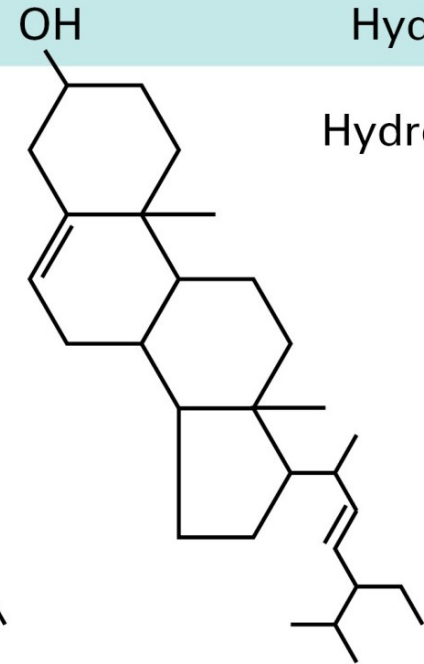
Campesterol



Sitosterol



Stigmasterol



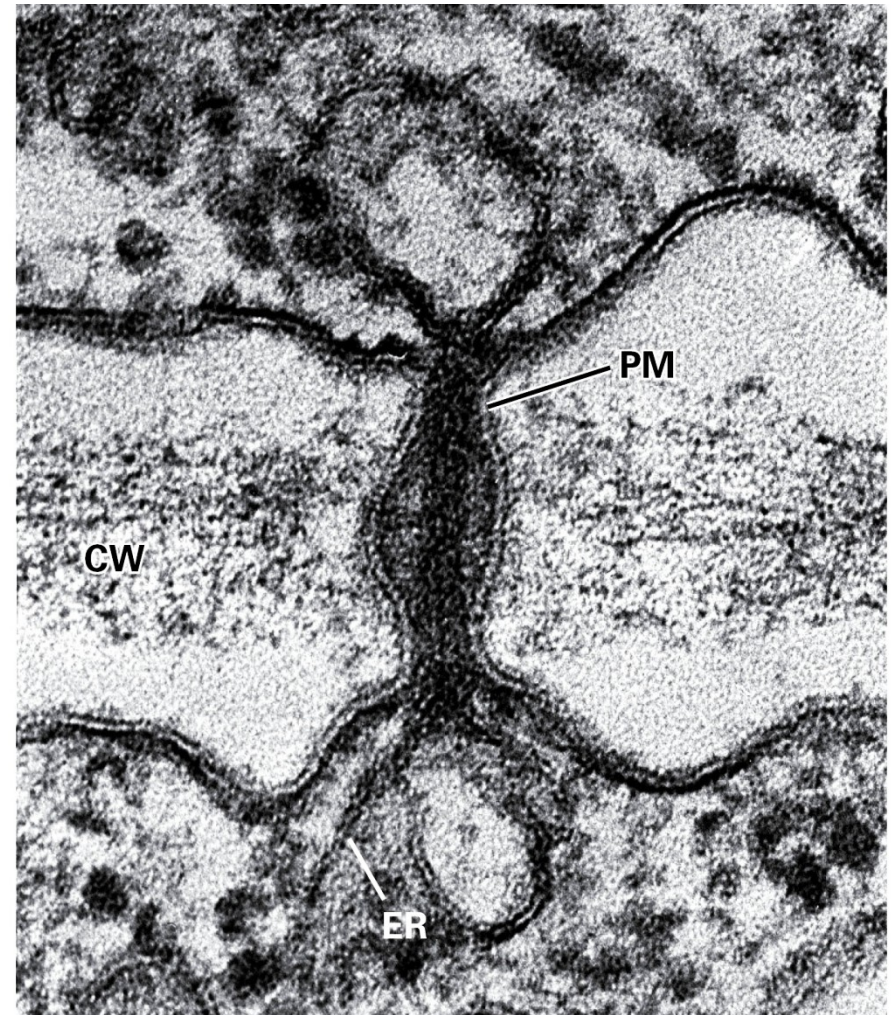
Hydrophilic

Hydrophobic

Plasma membrane

- Transport of molecules
H⁺-ATPase, aquaporins,...
- Signal transduction
receptors
- Cell wall synthesis
cellulose synthase, callose synthase

Plasmodesma
PM, plasma membrane
ER, endoplasmic reticulum
CW, cell wall

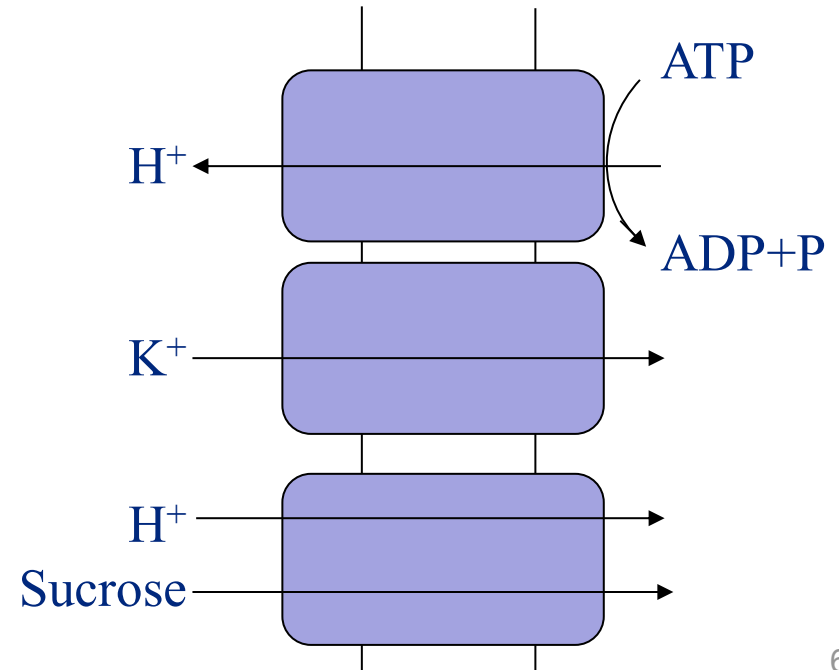


Membrane transport

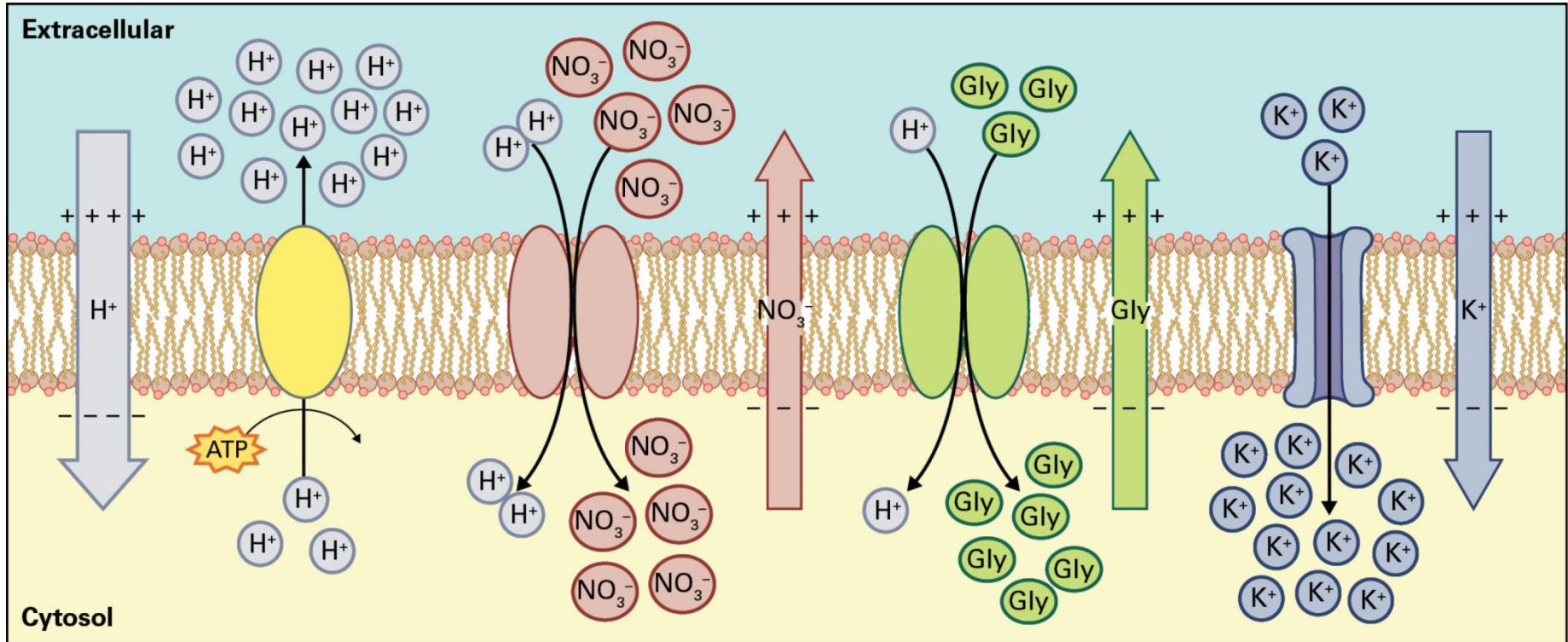
- Nutrient acquisition
- Metabolite distribution
- Compartmentalization of metabolites
- Energy transduction
- Turgor generation
- Waste product excretion
- Signal transduction

Membrane transport systems:

- Pumps
- Channels
- Cotransporters



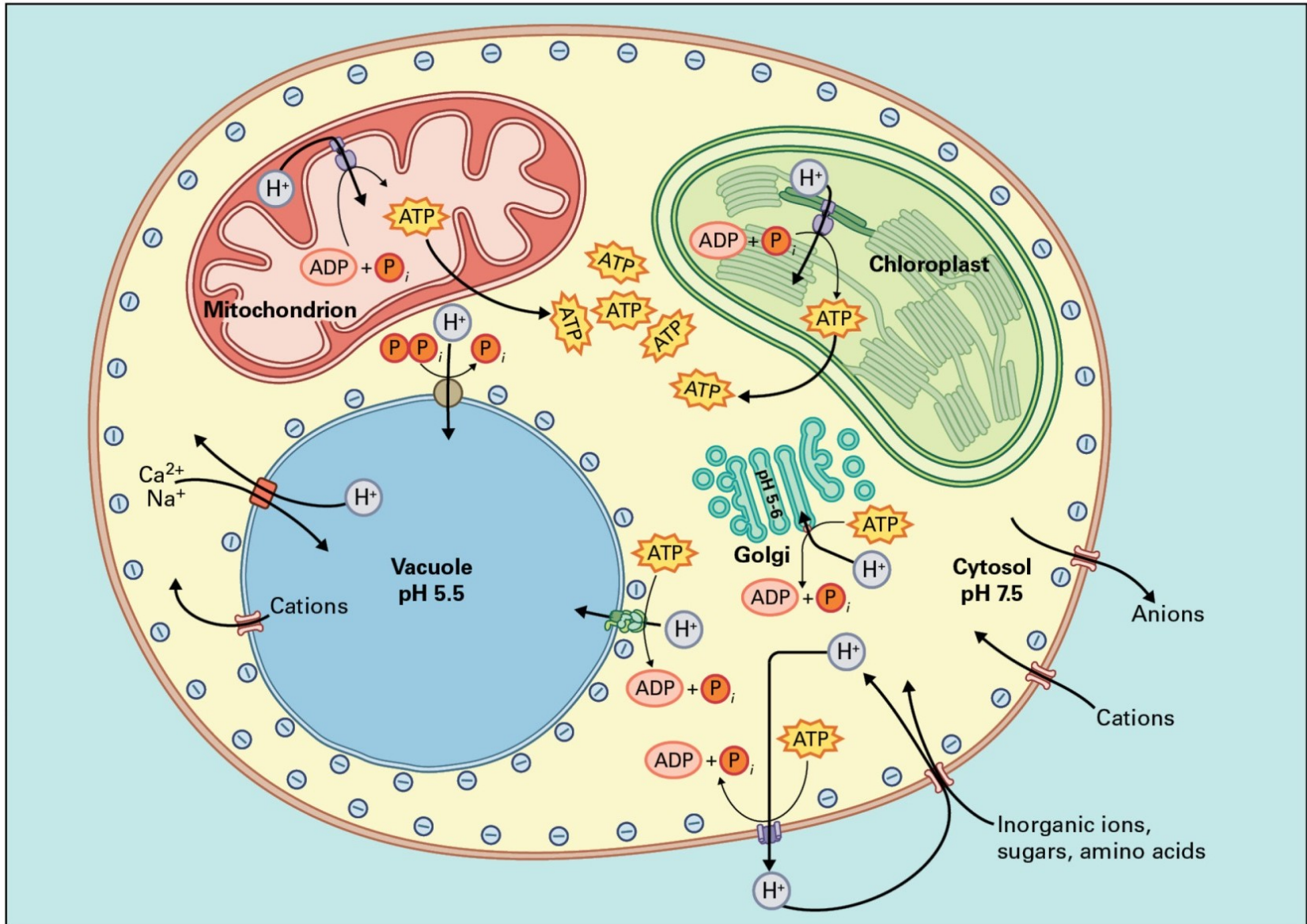
Transmembrane electrochemical potential



Electrochemical potential:

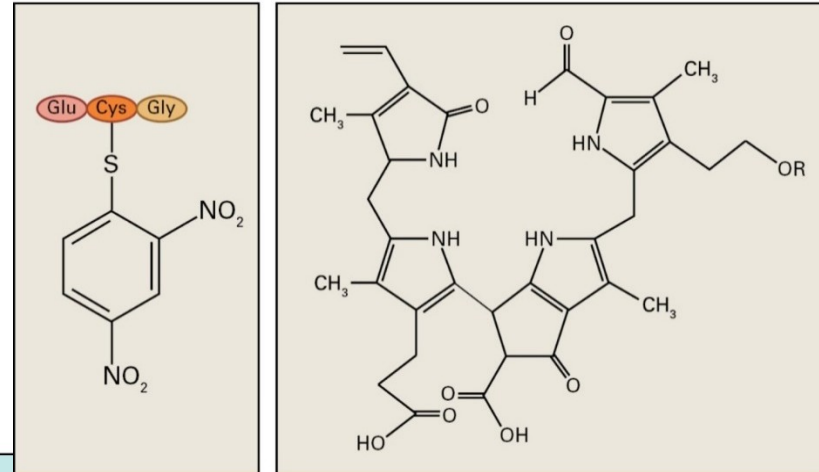
- concentration
- charge
- membrane voltage

H⁺ pumps

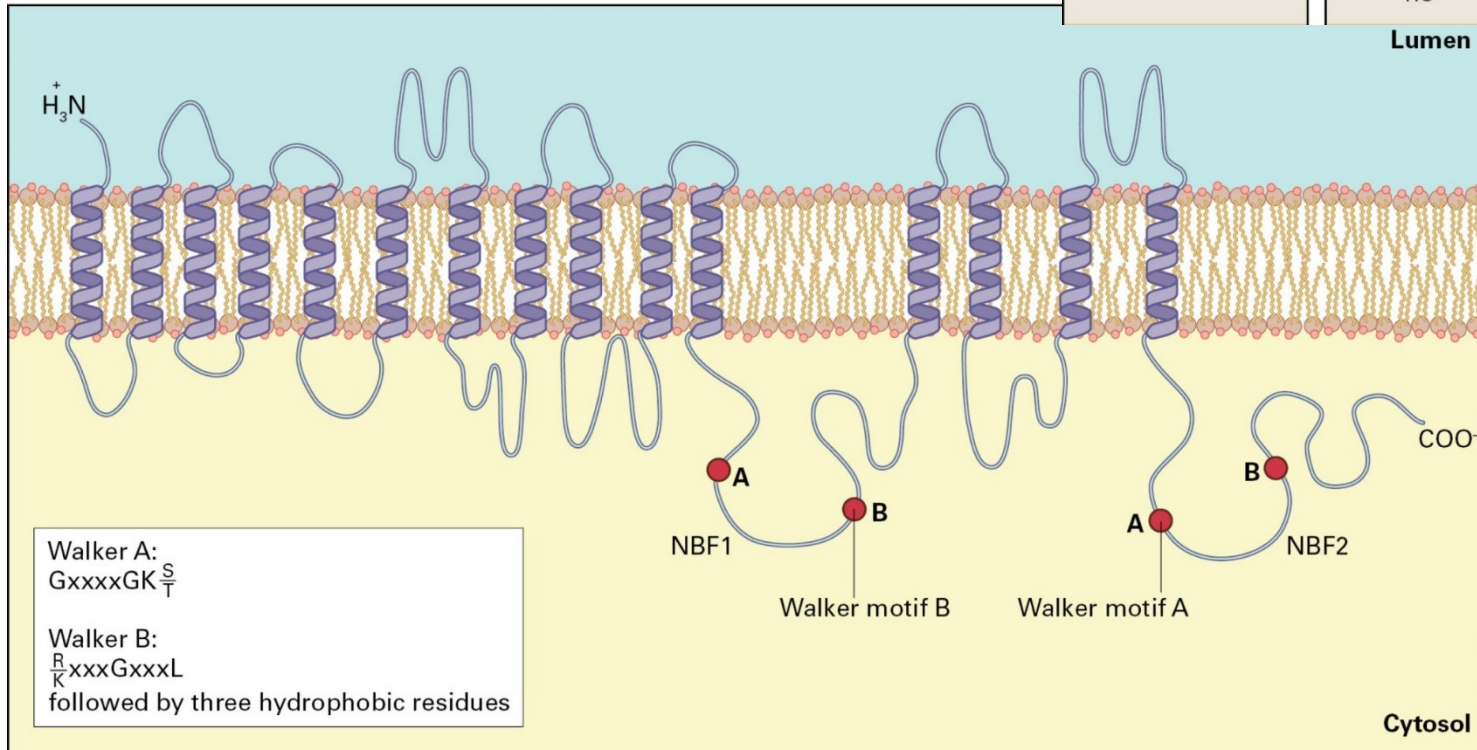


ABC-type pumps

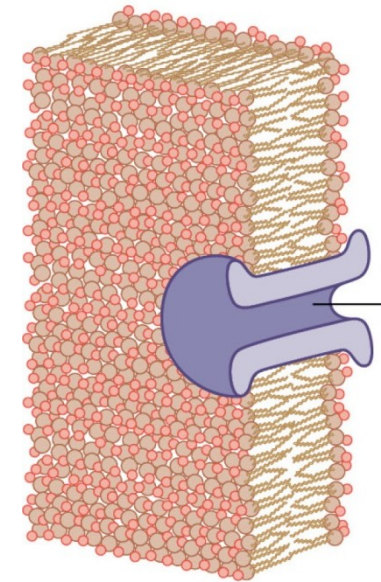
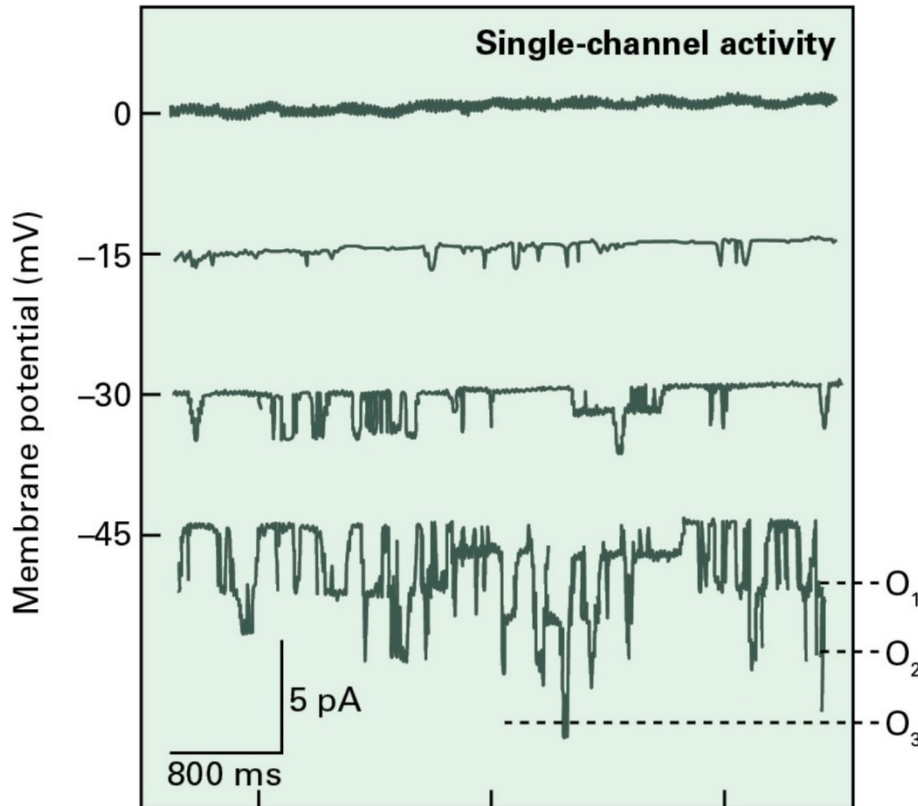
A glutathione-conjugated xenobiotic and a chlorophyll catabolite



ATP-binding cassette transporter



Ion channels



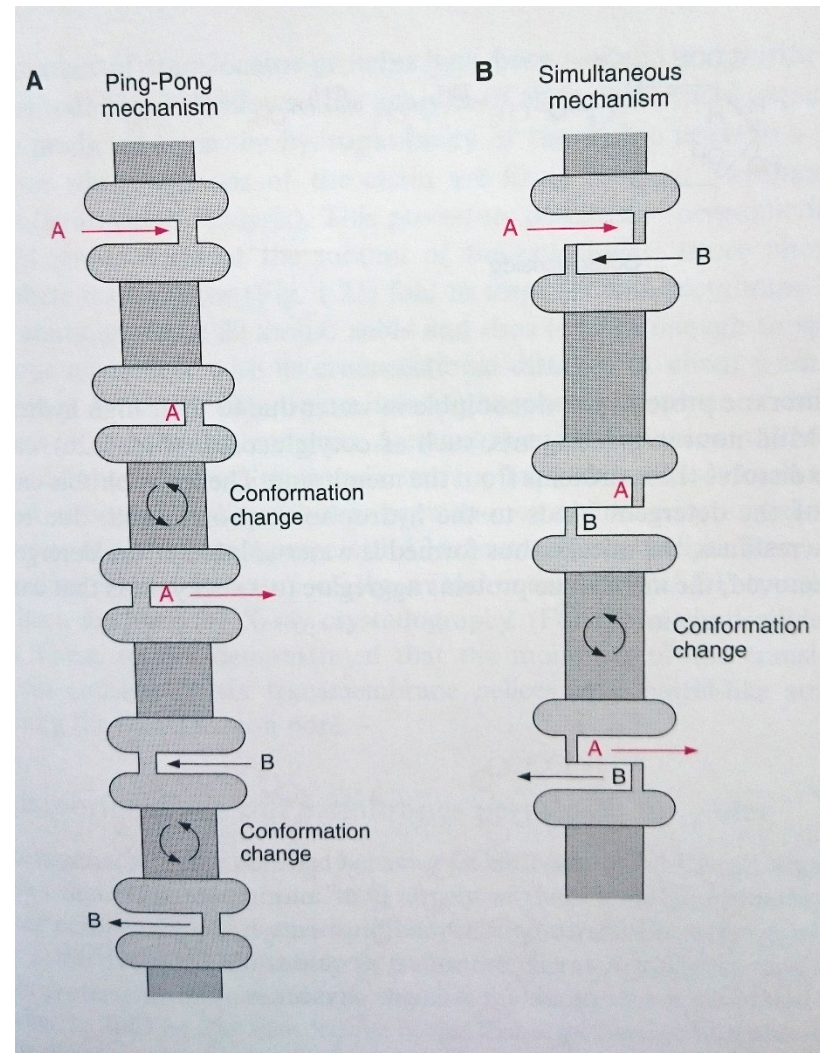
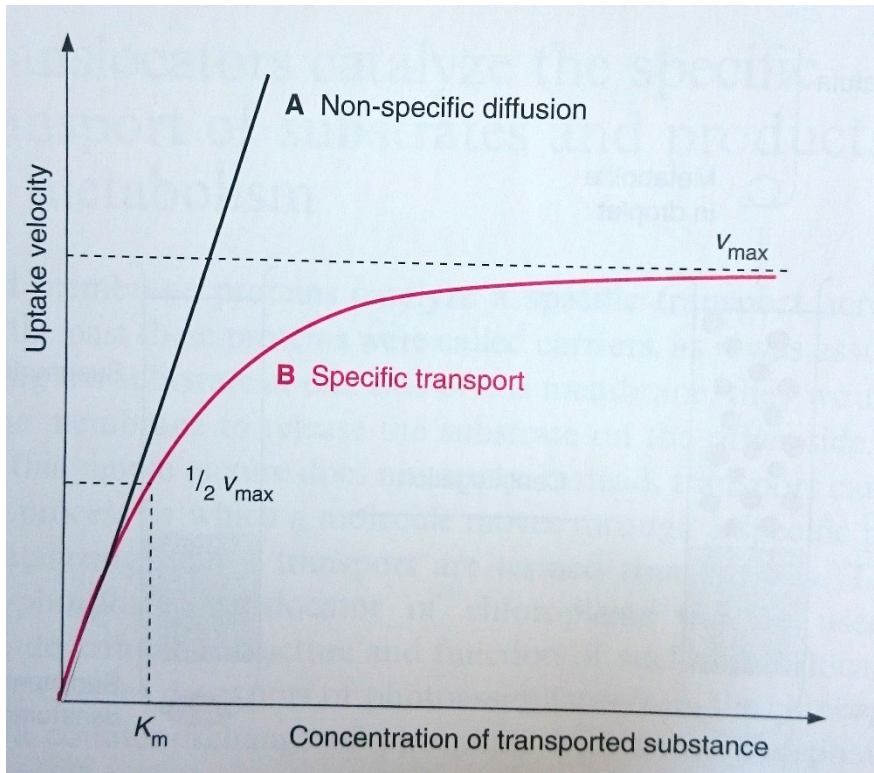
Activity of channels in tonoplast. The prevalence of open state is influenced by membrane voltage. $O_{1,2,}$ or 3 is the number of channels open.

Ion channels are:

- passive
- selective (to some degree)
- regulated

Cotransporters

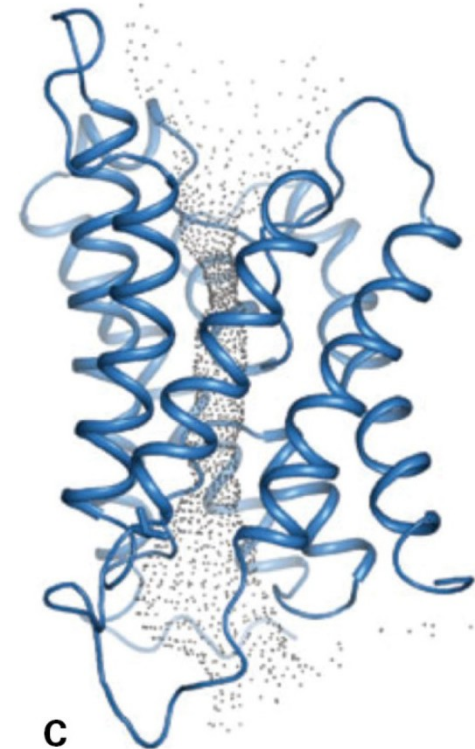
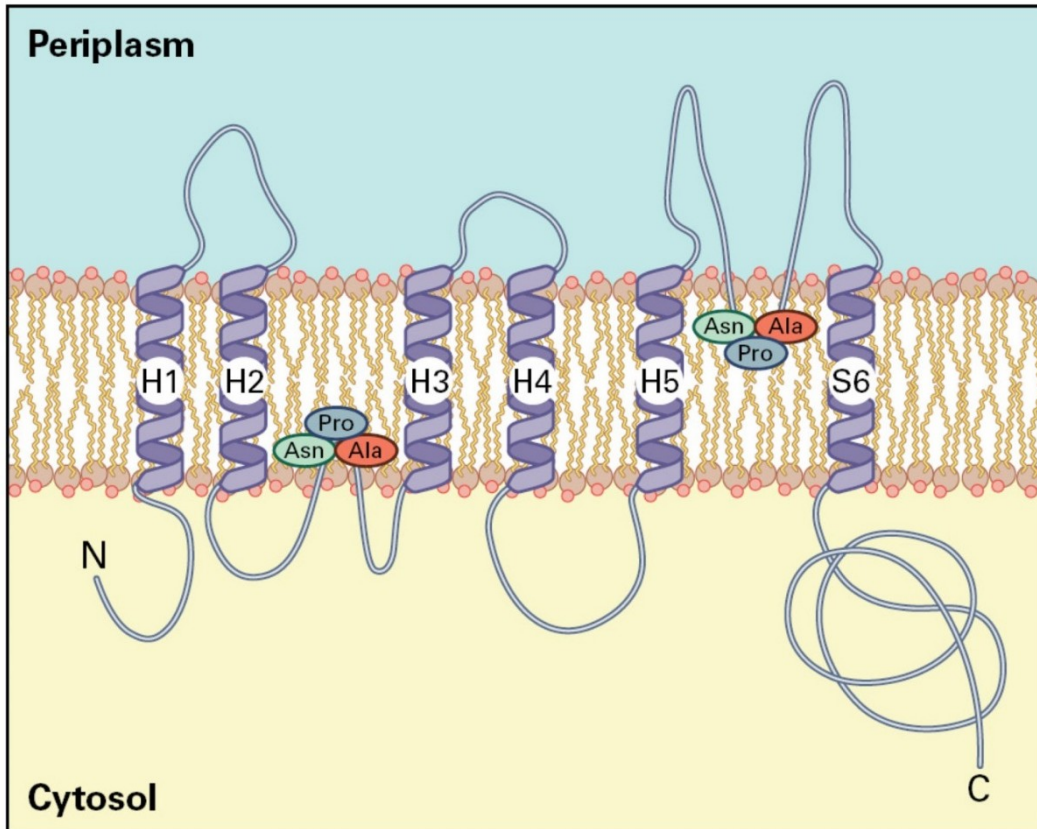
Transport process mechanisms



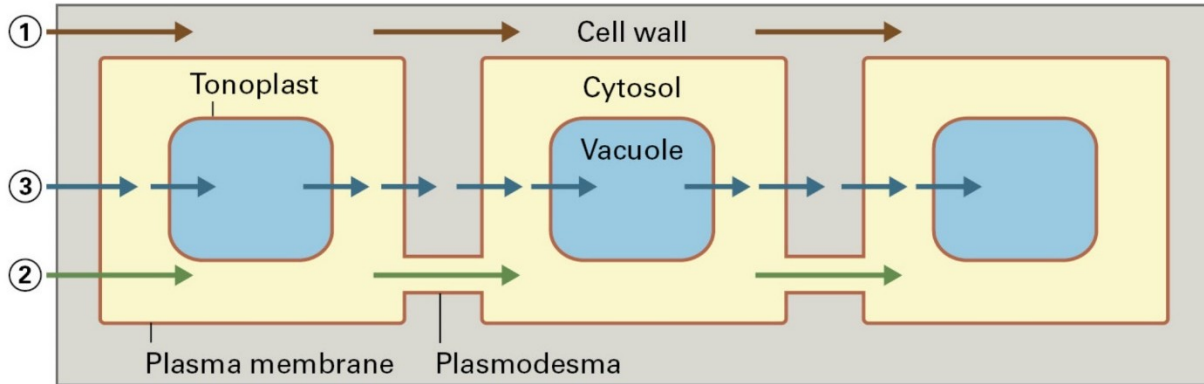
Aquaporins

Plant membranes are highly permeable for water

The direction of water transport across membranes is determined by hydrostatic and osmotic pressures.

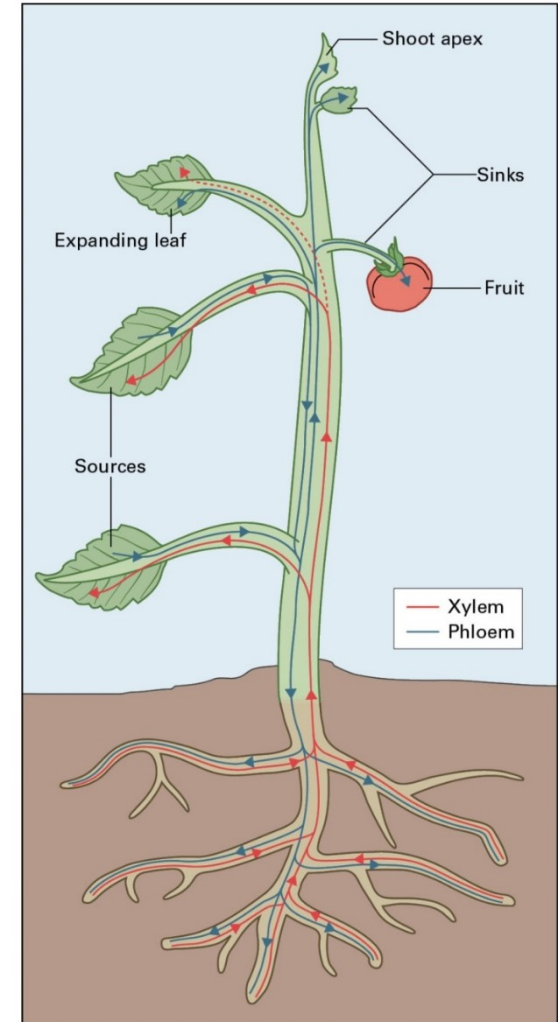


Cell-to-cell transport

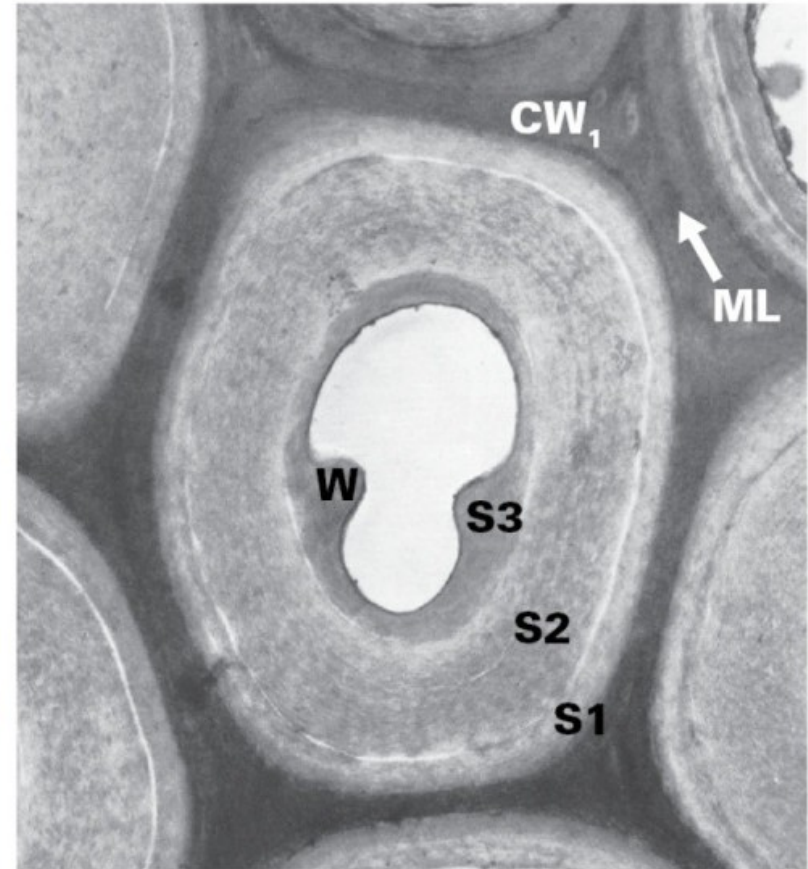
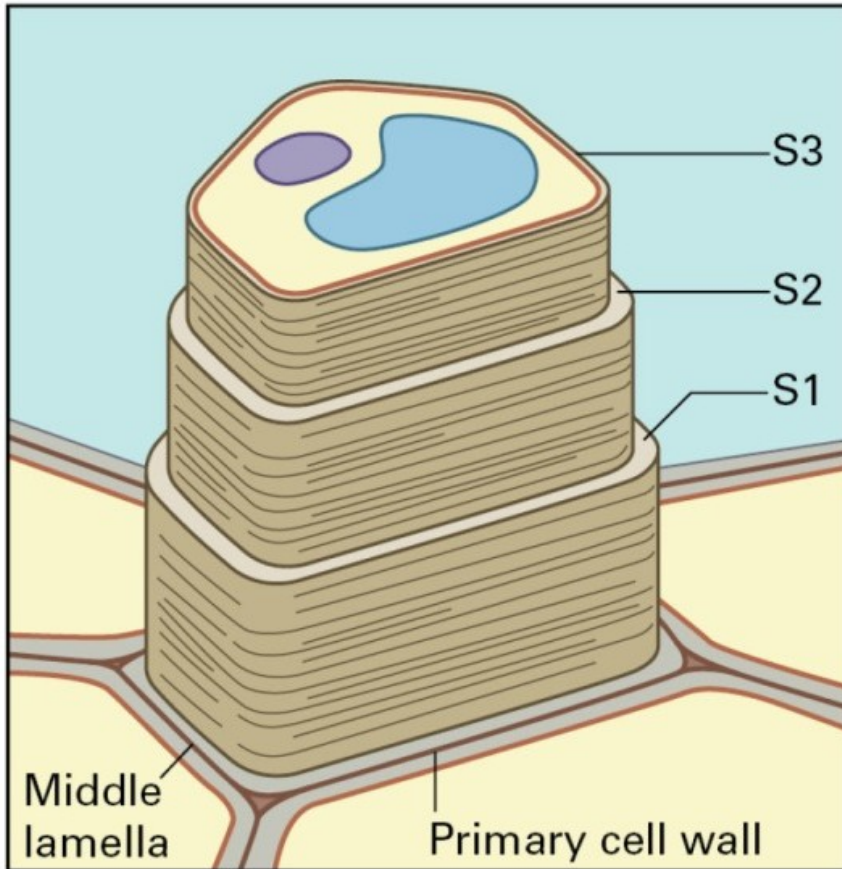


Intercellular transport can occur along apoplastic, symplastic, and transcellular routes

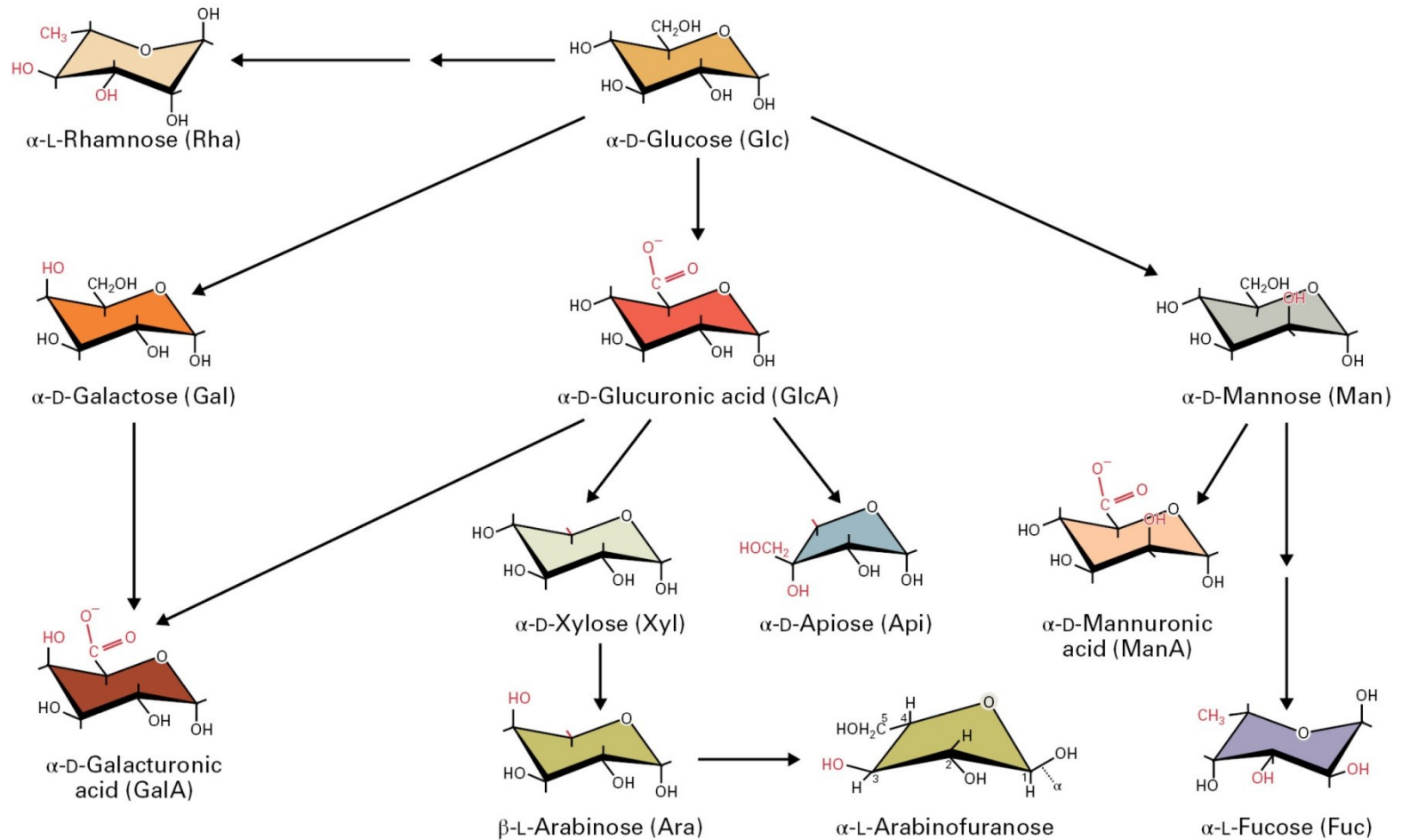
Long-distance transport follows two pathways: xylem and phloem



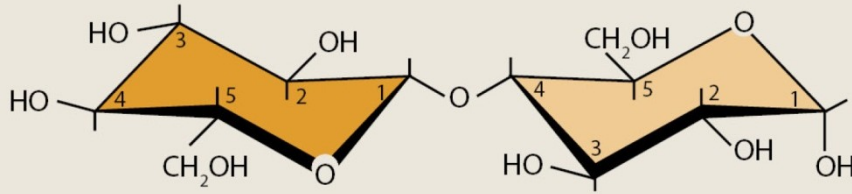
Cell wall



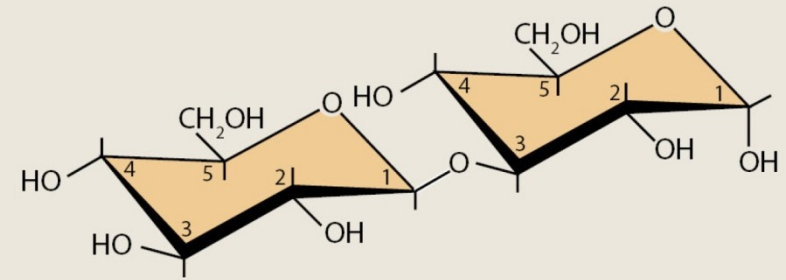
Cell wall sugars



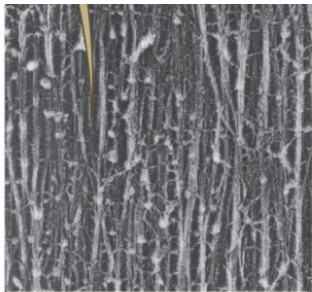
Cell wall polysaccharides



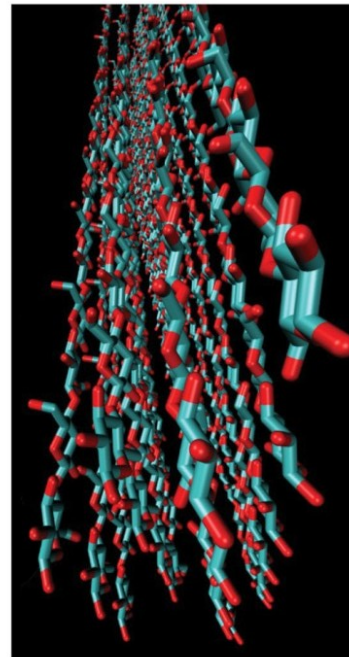
Cellobiose
 (β -D-Glucosyl-(1 \rightarrow 4)-D-glucose)



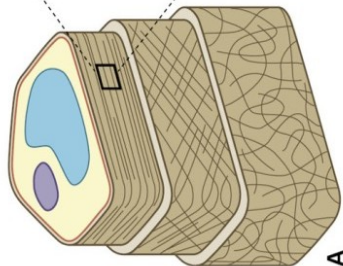
Laminaribiose
 (β -D-Glucosyl-(1 \rightarrow 3)-D-glucose)



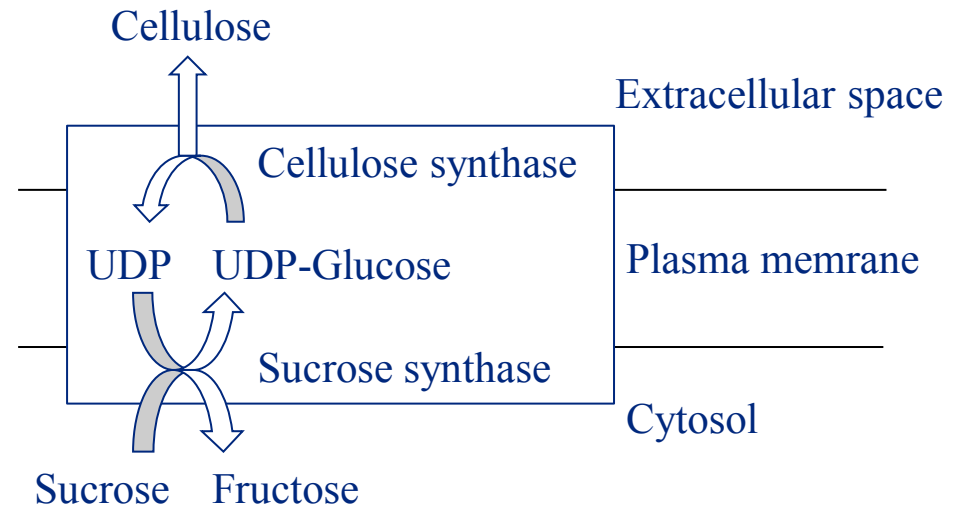
B



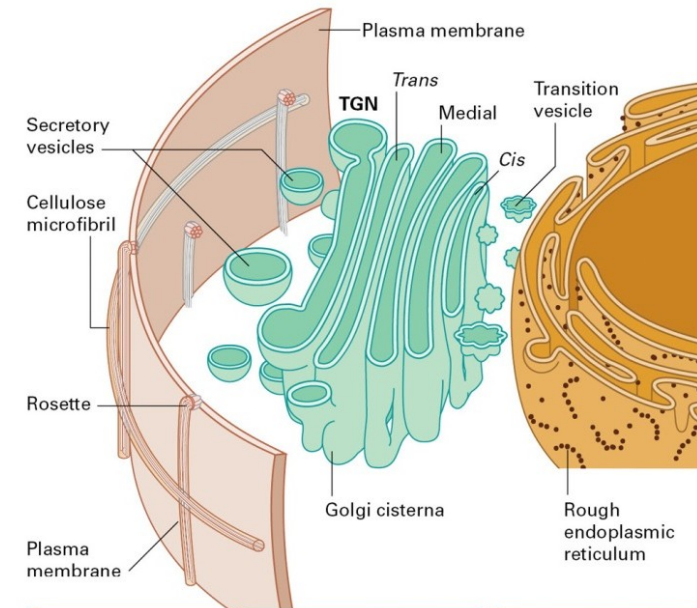
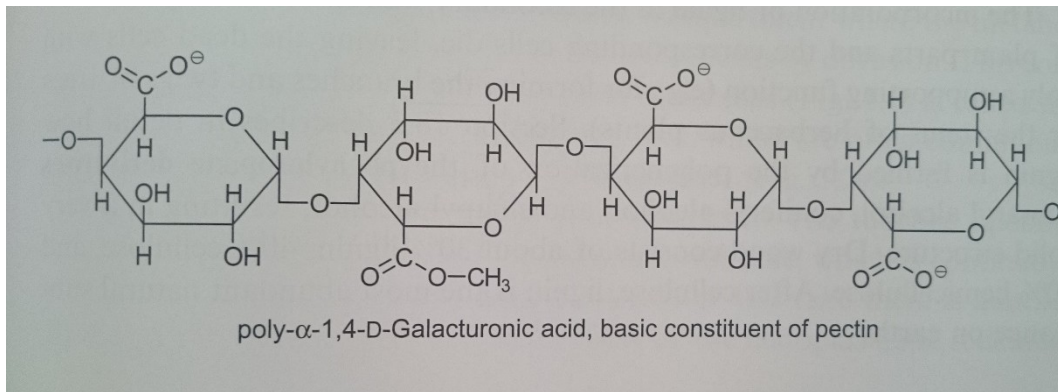
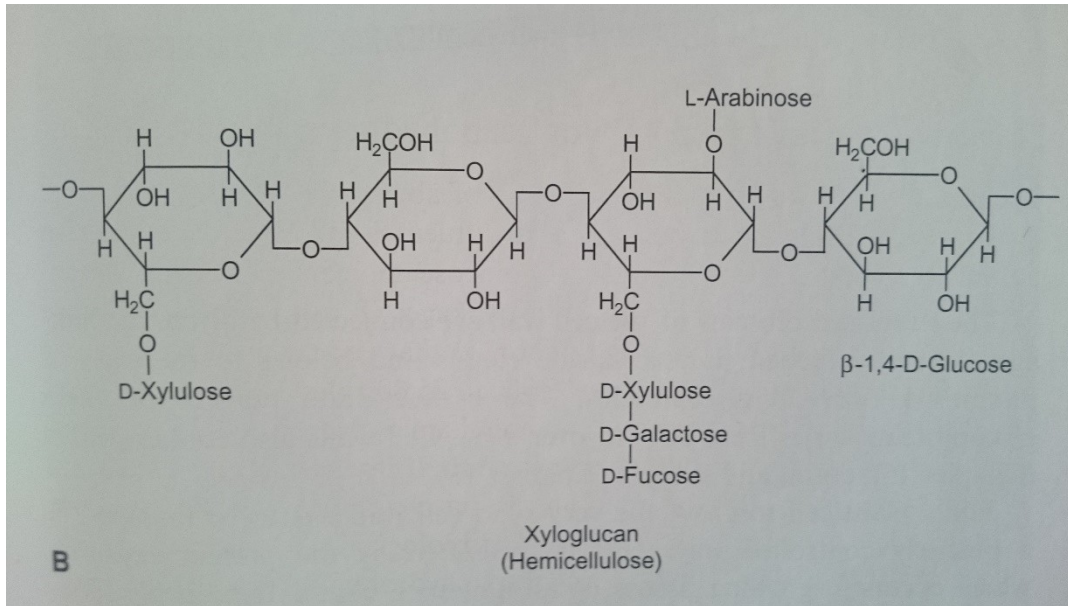
E



A



Crosslinking glycans and pectin polymers



Site of synthesis for:

Cellulose
Callose

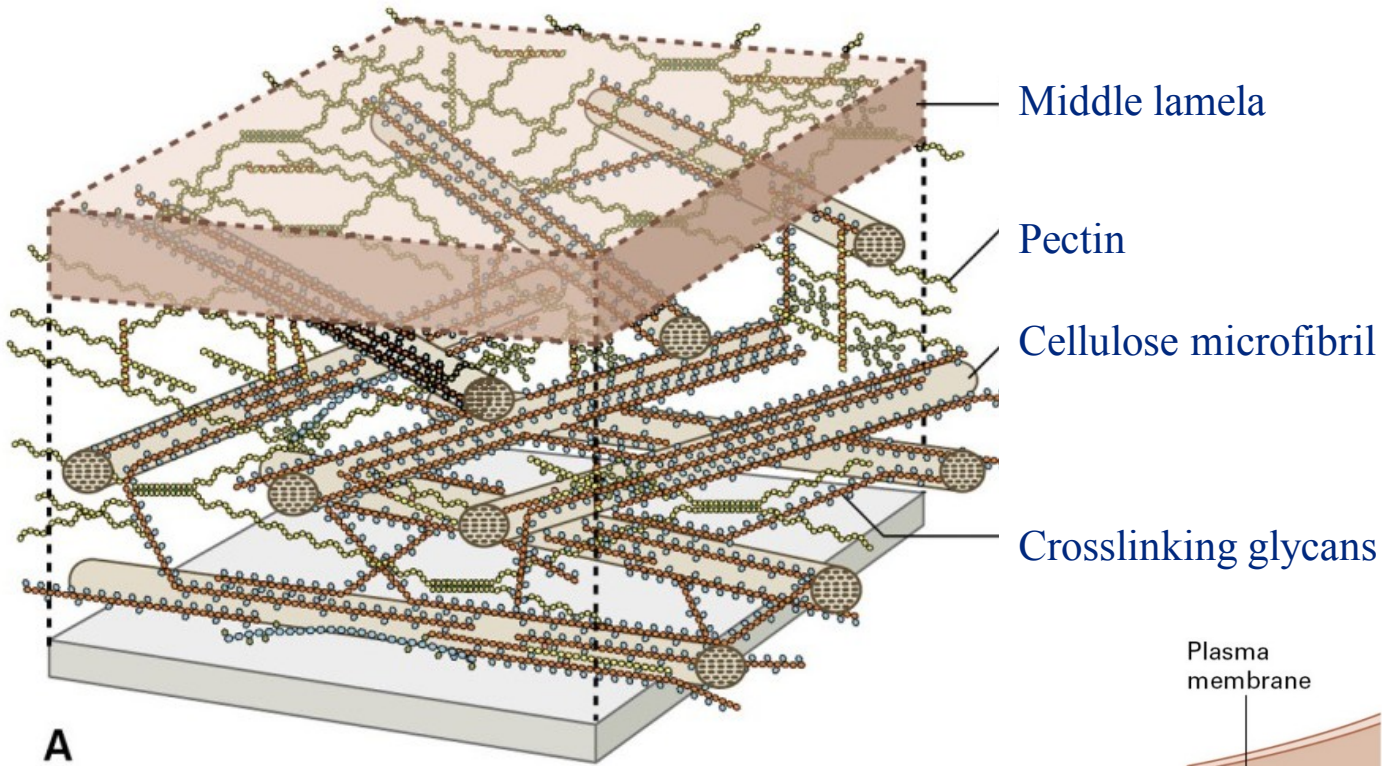
Site of synthesis for:

Pectins
Crosslinking glycans

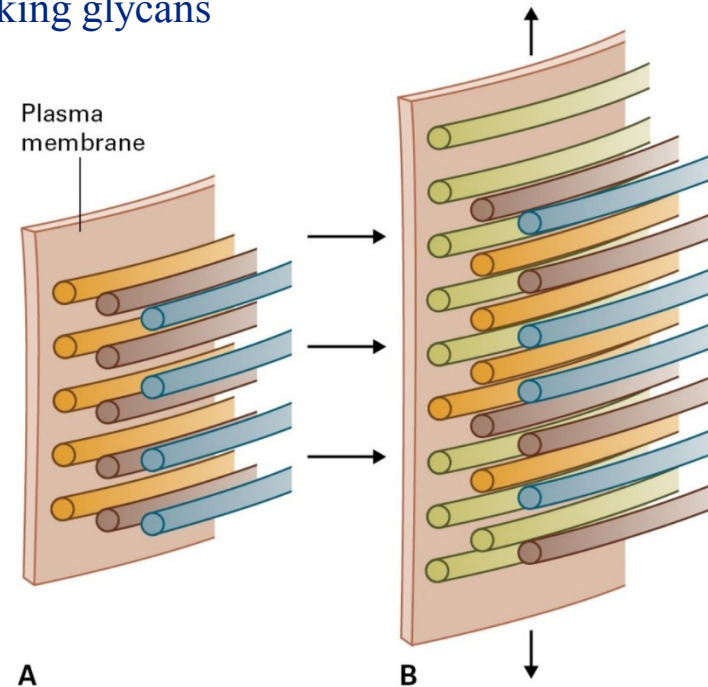
Site of synthesis for:

Cell wall proteins

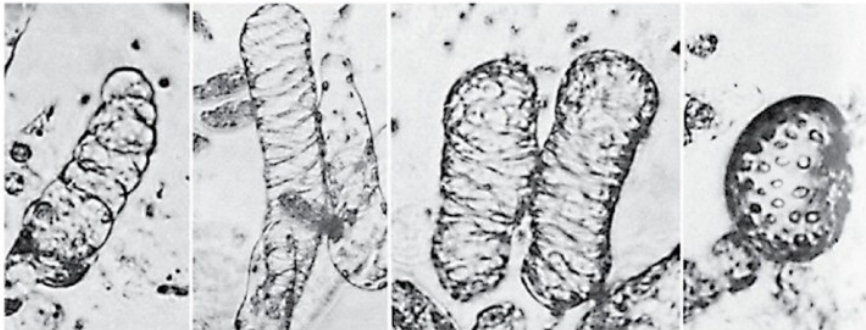
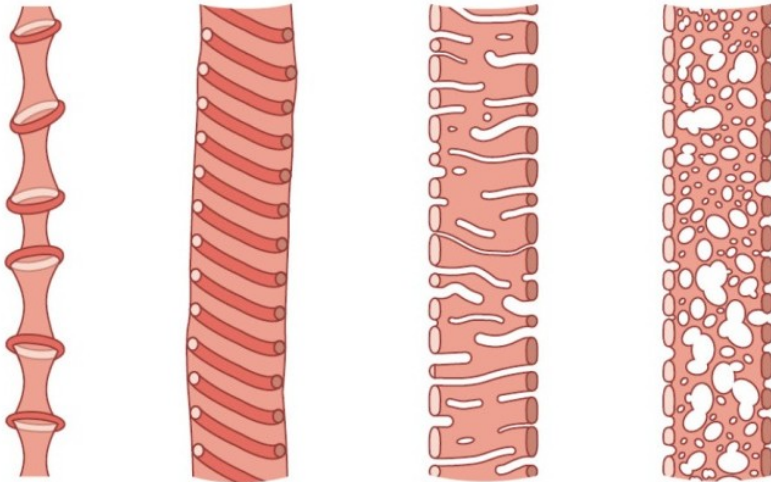
Cell wall architecture



Cell growth



Secondary wall



A Annular

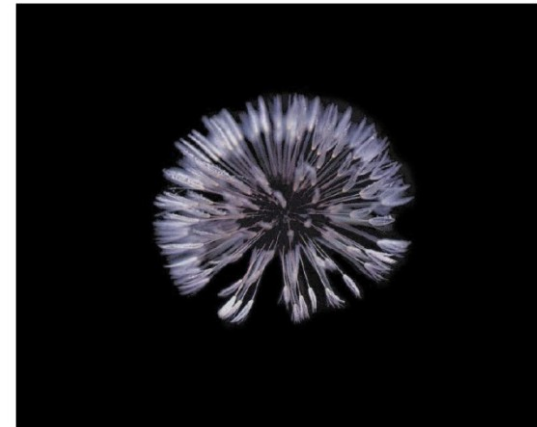
Spiral

Reticulate

Pitted

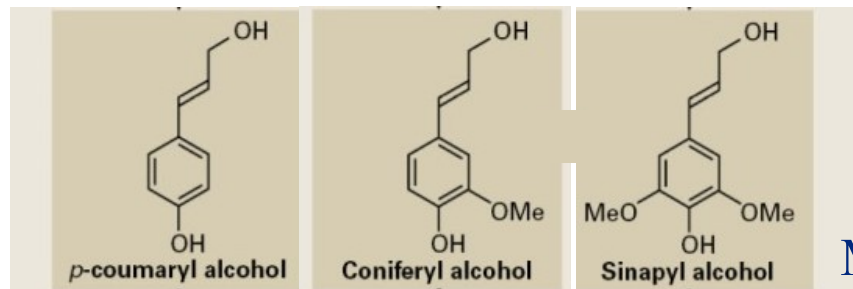


A



C

Vessel elements



Monolignols