

Laboratoř růstových regulátorů

Miroslav Strnad

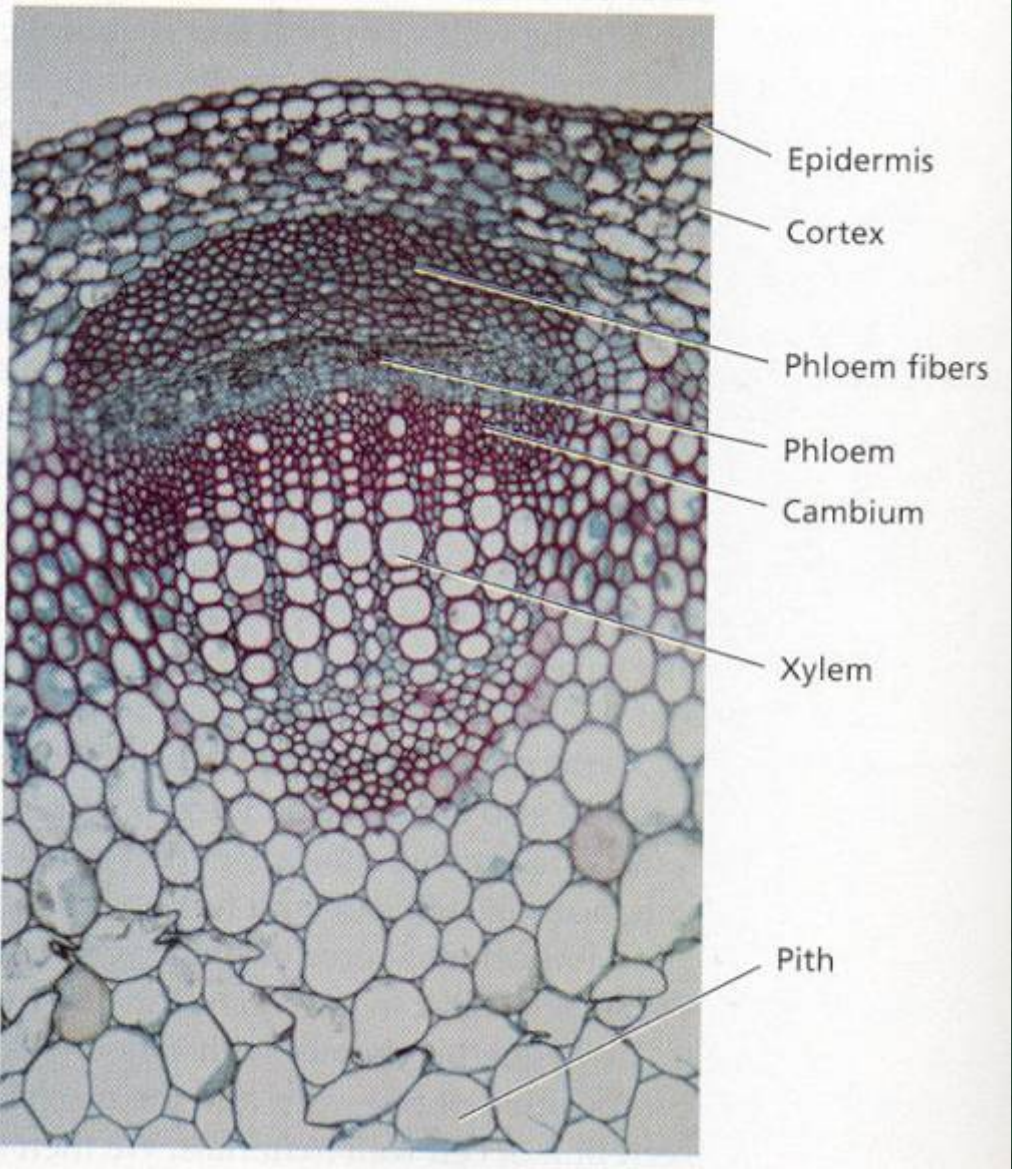
Buněčná stěna a její komponenty [kap 4]



- Univerzita Palackého & Ústav experimentální botaniky AV CR



Cross section of a stem [15.1]



Funkce buněčné stěny

Zajišťuje mechanickou stabilitu buňce, pletiv a orgánů, zabraňuje prasknutí vlivem turgorového tlaku

Fungují jako permeabilní membrány – apoplast

Utvářejí strukturu vodivých pletiv

Na povrchu rostlin jsou pokryty kutikulou a vytvářejí bariéru proti úniku vody

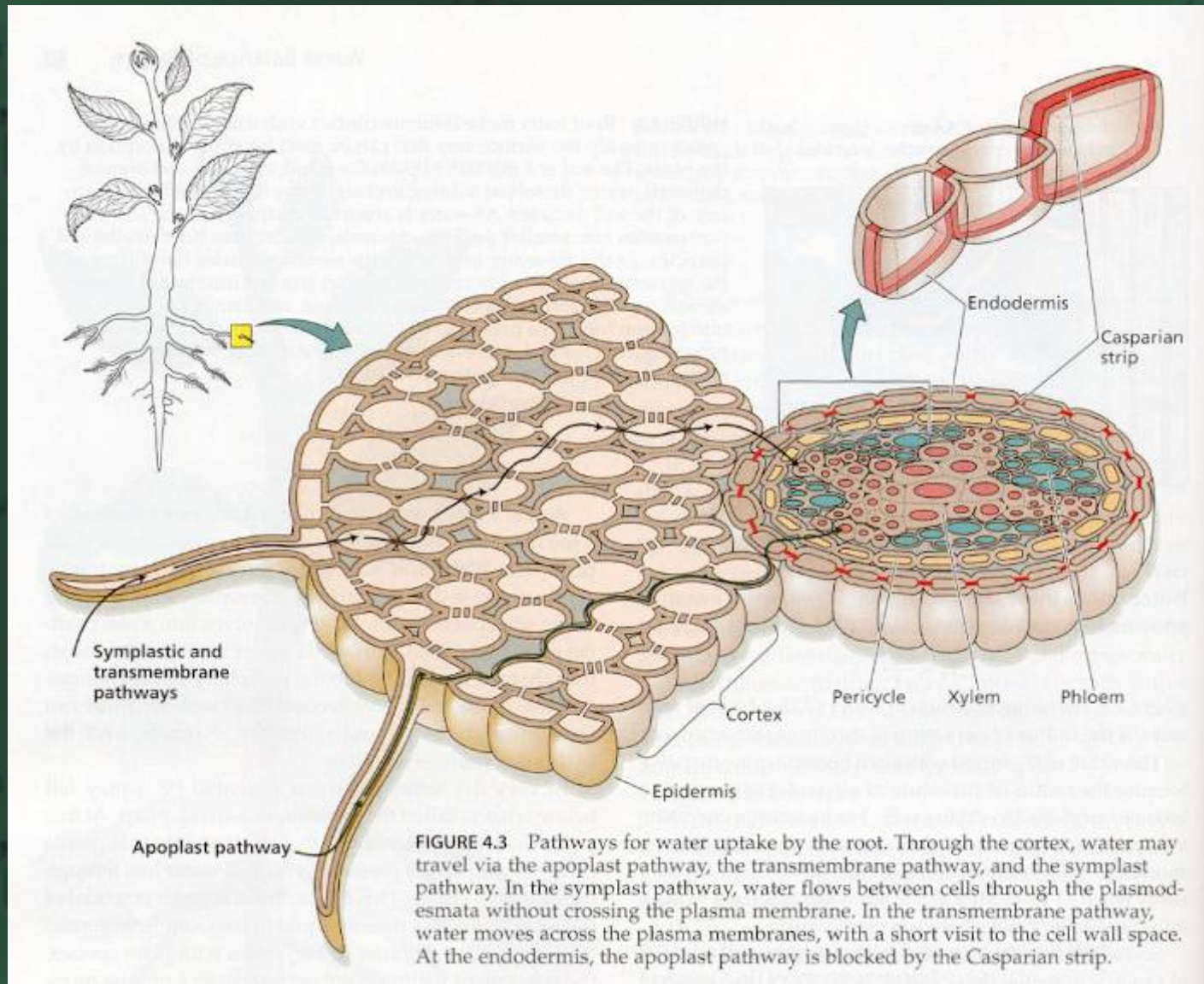
Účastní se procesu morfogeneze spolu s cytoskeletem a bílkovinami

Jsou prostorem, do kterého buňka vylučuje přebytečné minerální soli a některé odpadní látky a xenobiotika, ale i metabolizovatelné produkty.

Chrání buňku před napadením houbovými a bakteriálními patogeny.

Je zásobárnou apoplastického Ca^{2+} - přechází ze stěny do cytoplasmy jako sekundární posel.

Pathways for water uptake by the root [4.3]



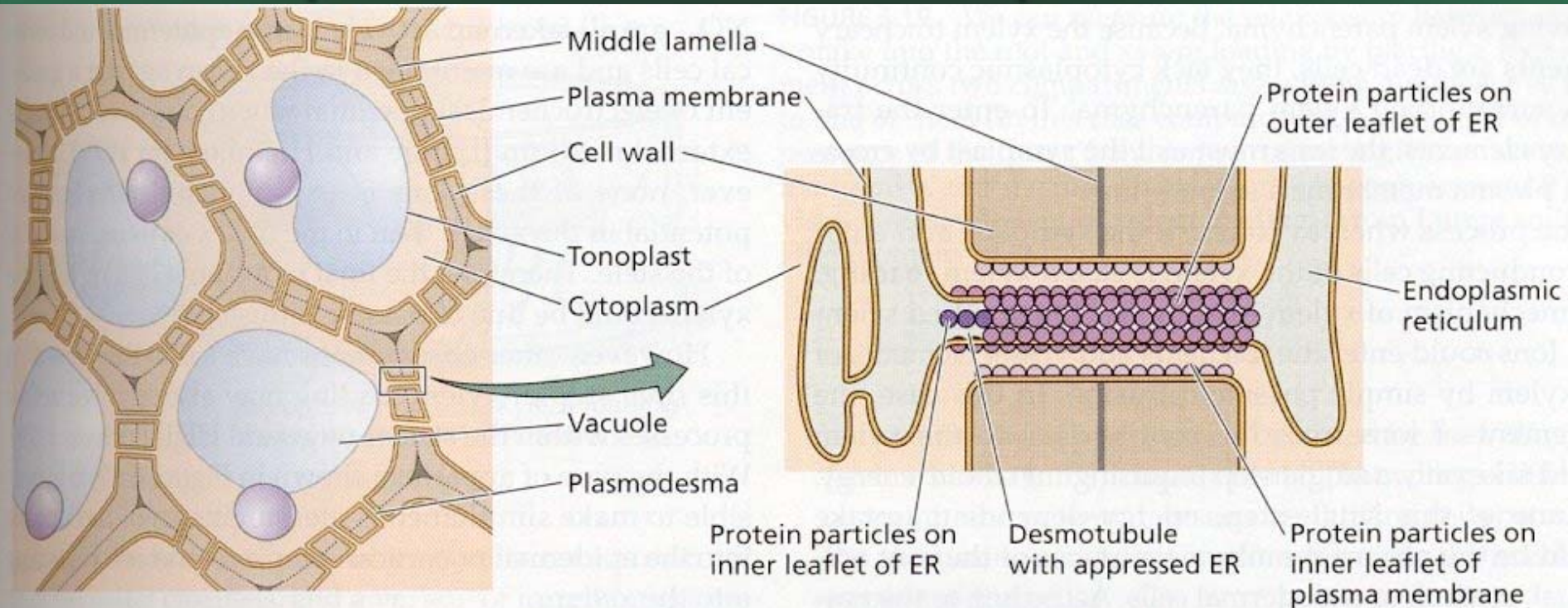


FIGURE 6.17 Diagram illustrating how plasmodesmata connect the cytoplasms of neighboring cells. Plasmodesmata are about 40 nm in diameter and allow diffusion of water and small molecules from one cell to the next. In addition, the size of the opening can be regulated by rearrangements of the internal proteins to allow the passage of larger molecules.

Primary cell walls from onion parenchyma [15.2]

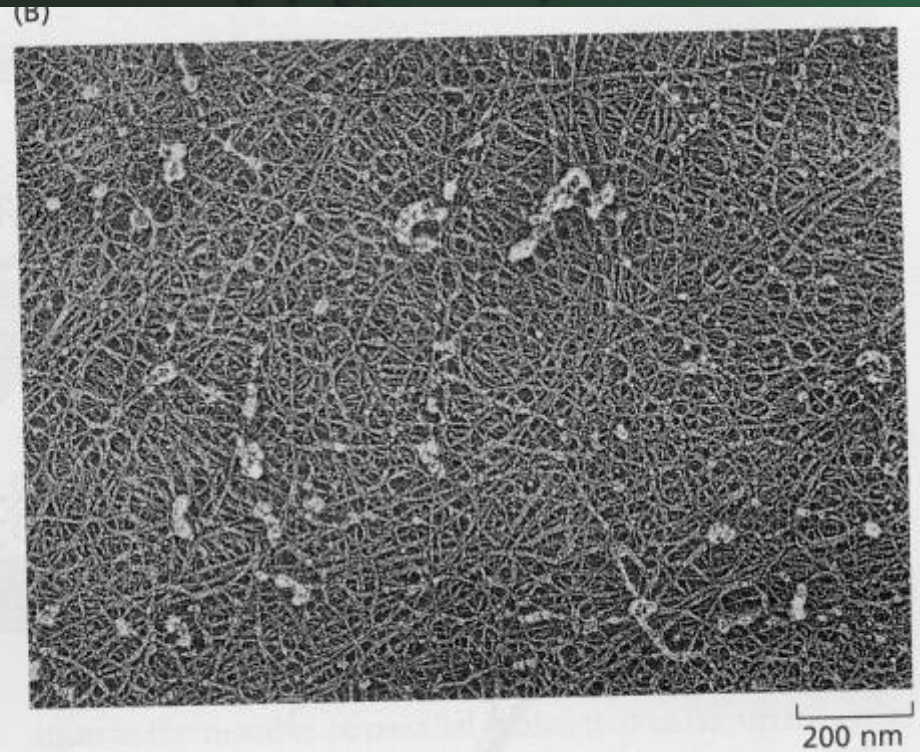
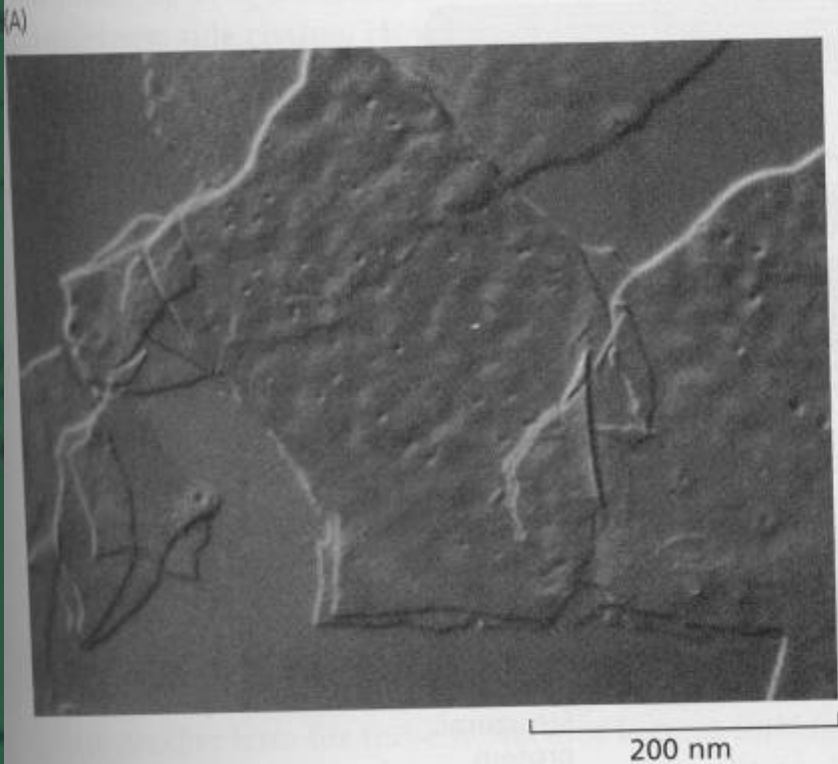
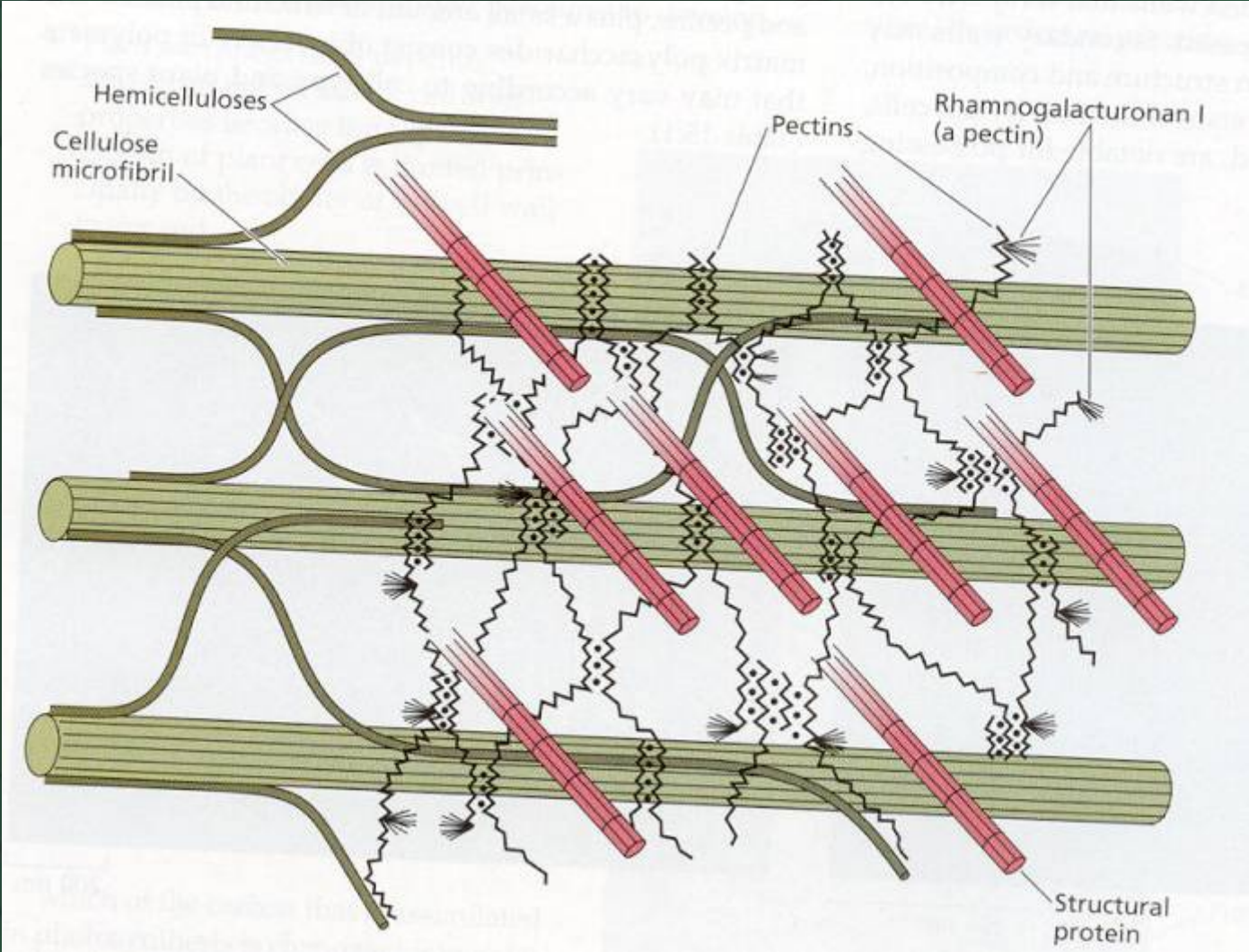


Table [15.1]

TABLE 15.1
Structural components of plant cell walls

Class	Examples
Cellulose	Microfibrils of (1→4)β-D-glucan
Matrix Polysaccharides	
Pectins	Homogalacturonan Rhamnogalacturonan Arabinan Galactan
Hemicelluloses	Xyloglucan Xylan Glucomannan Arabinoxylan Callose (1→3)β-D-glucan (1→3,1→4)β-D-glucan [grasses only]
Lignin	(see Chapter 13)
Structural proteins	(see Table 15.2)

Structure of the primary cell wall [15.4]



[15.6]

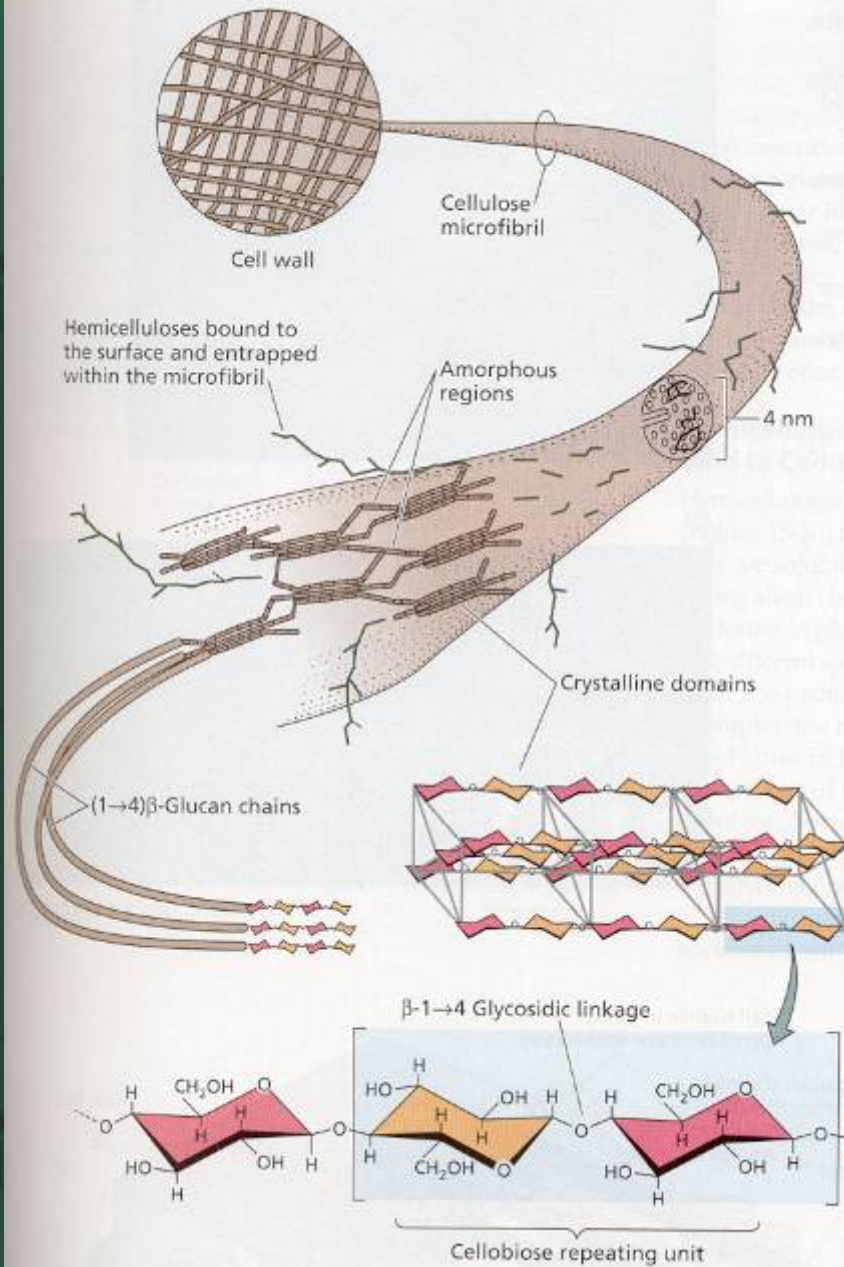
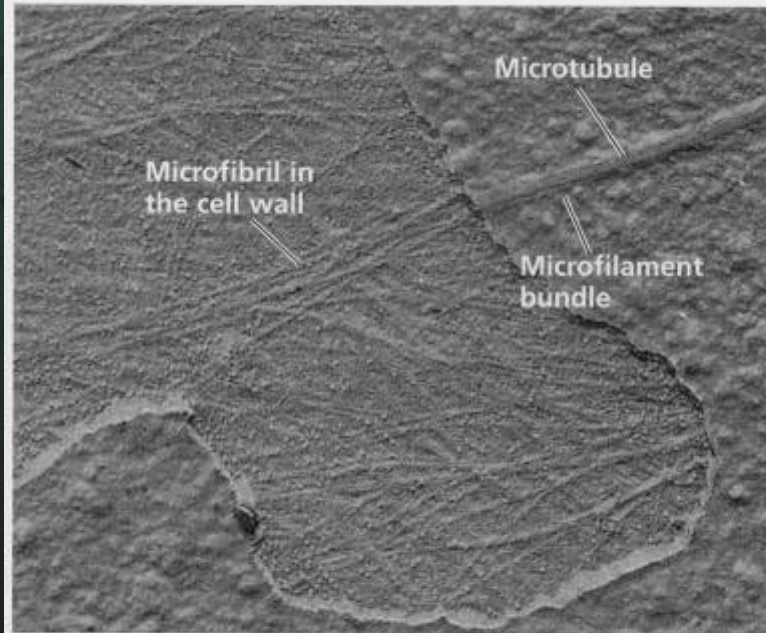


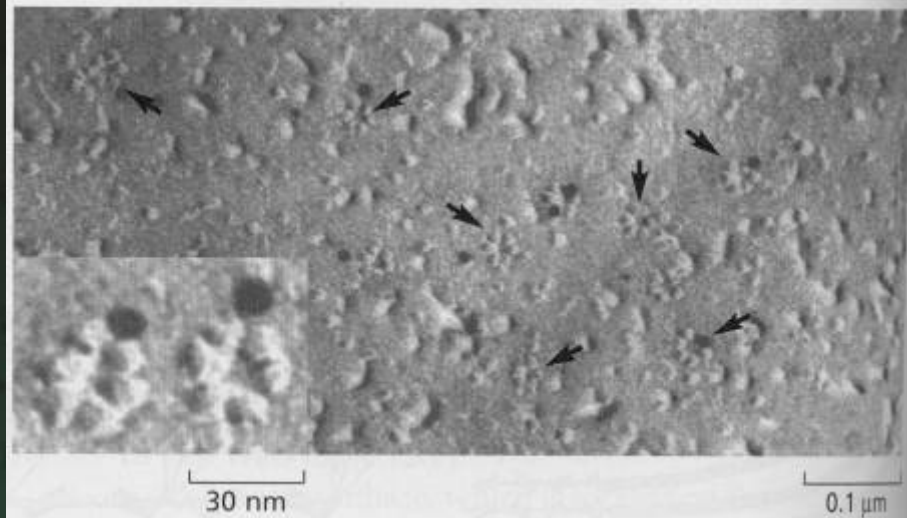
FIGURE 15.6 Structural model of a cellulose microfibril. The microfibril has regions of high crystallinity intermixed with less organized glucans. Some hemicelluloses may also be trapped within the microfibril and bound to the surface.

Cellulose synthesis by the cell [15.7]

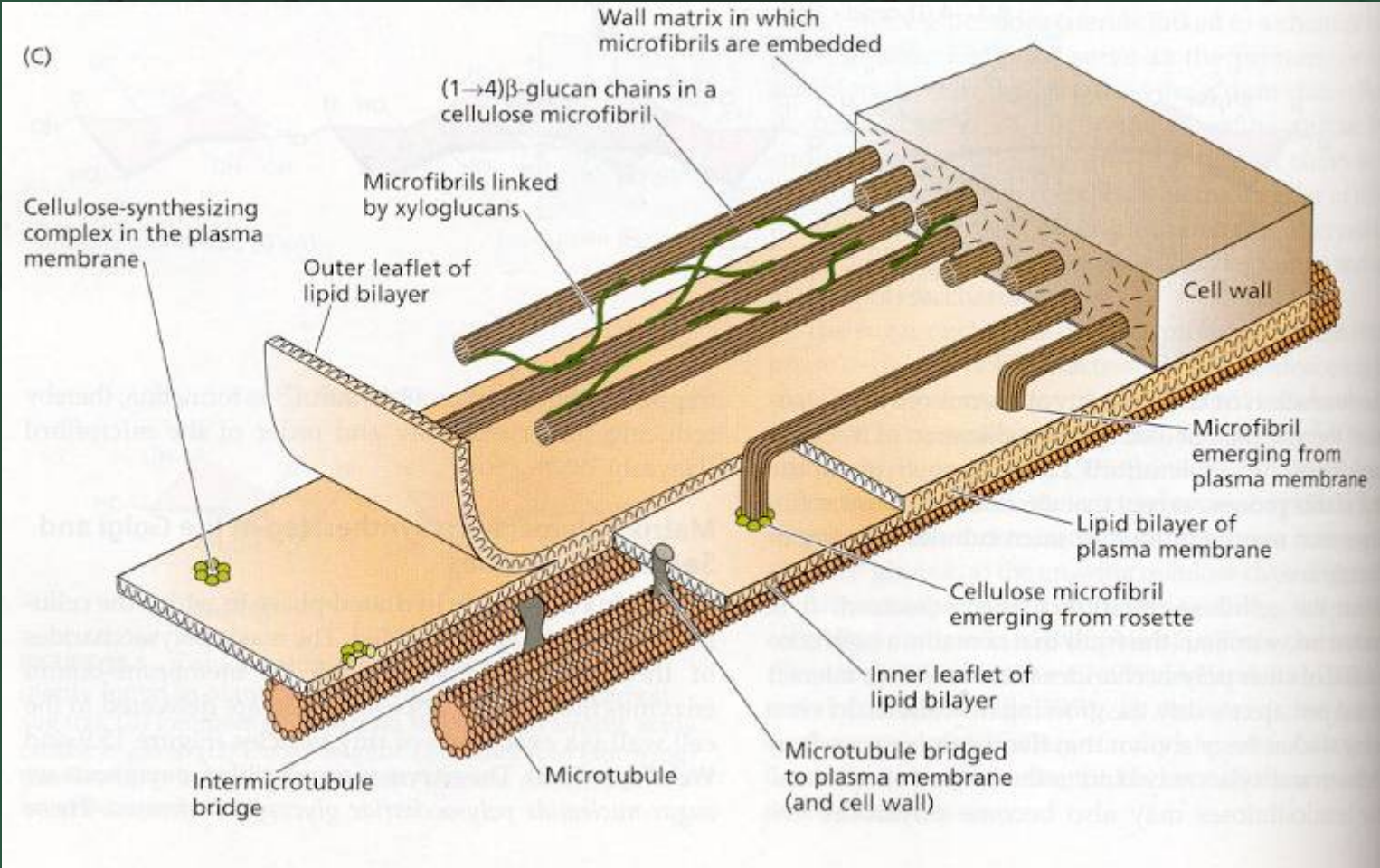
(A)



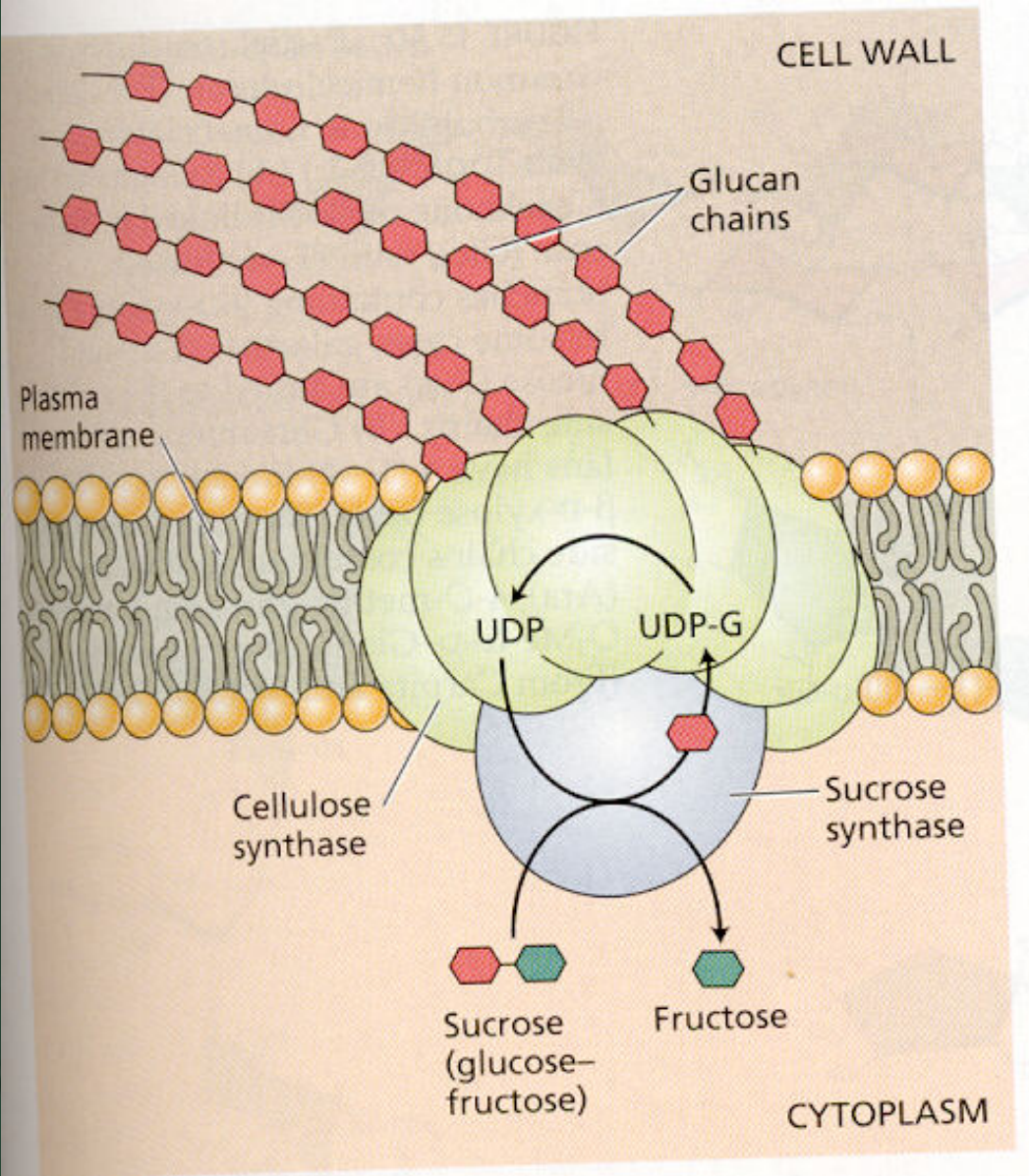
(B)



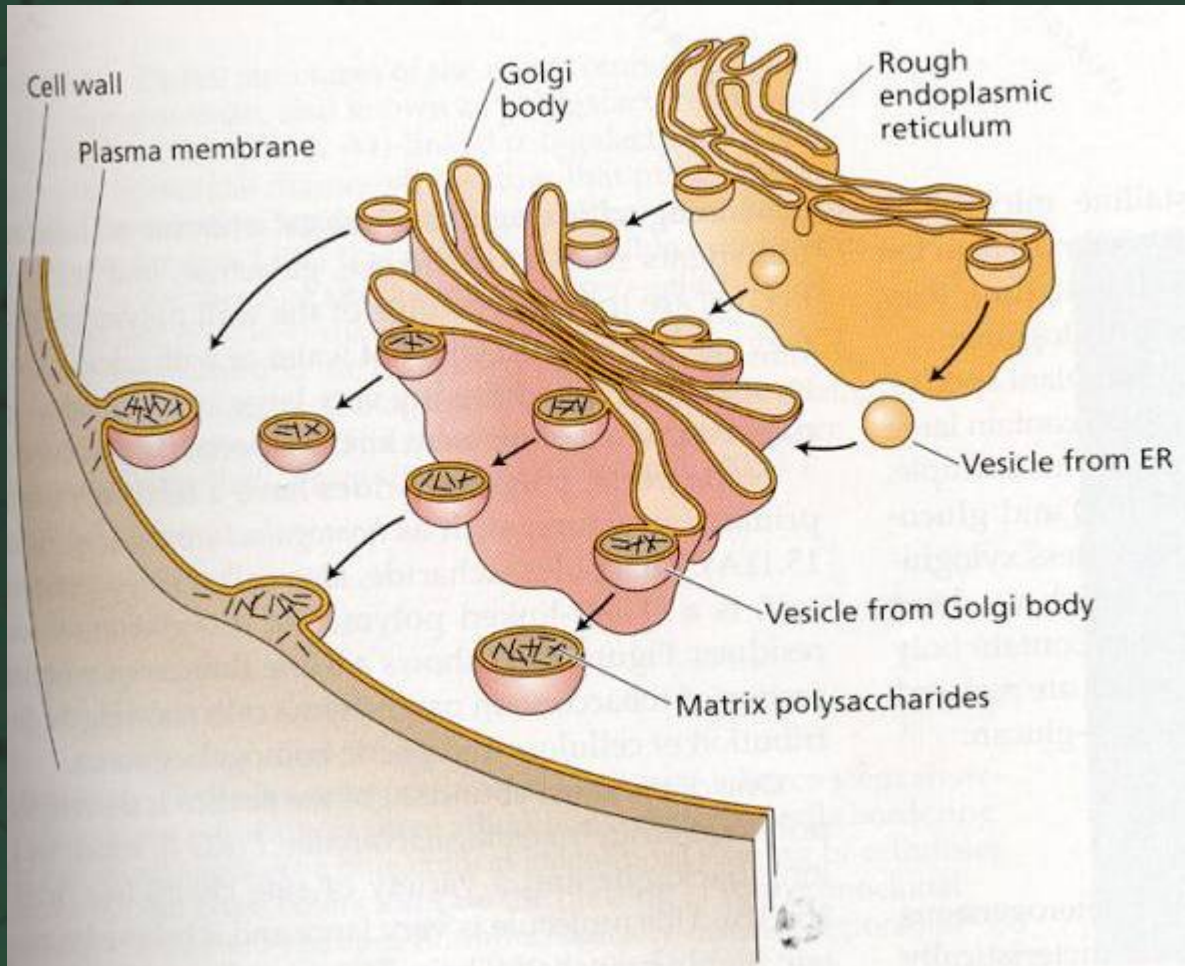
Cellulose synthesis by the cell [15.7]



Cellulose synthesis by a multisubunit complex [15.8]

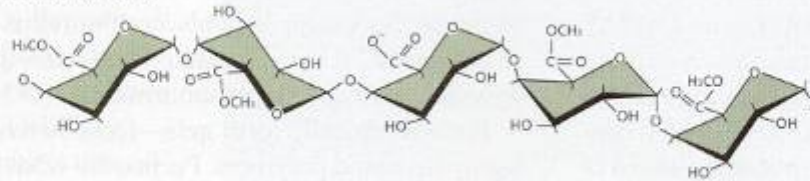


Synthesis and delivery of matrix polysaccharides [15.9]

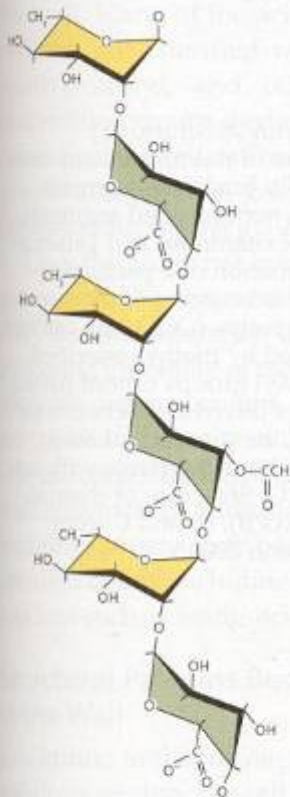


Partial structures of the most common pectins [15.10]

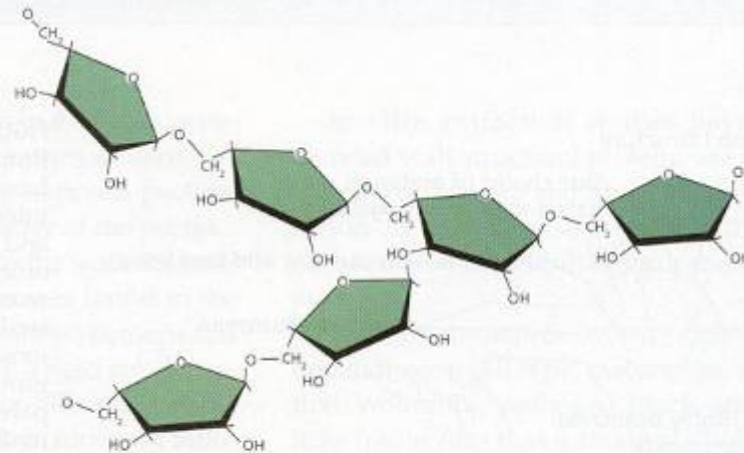
(A) Homogalacturonan (HGA)



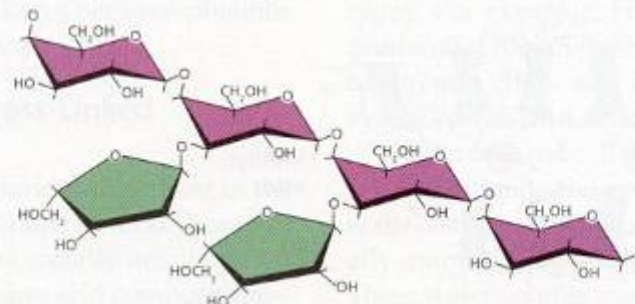
(B) Rhamnogalacturonan I (RG I)



(C) 5-Arabinan



(D) Type I arabinogalactan



Tomato extensin [15.14]

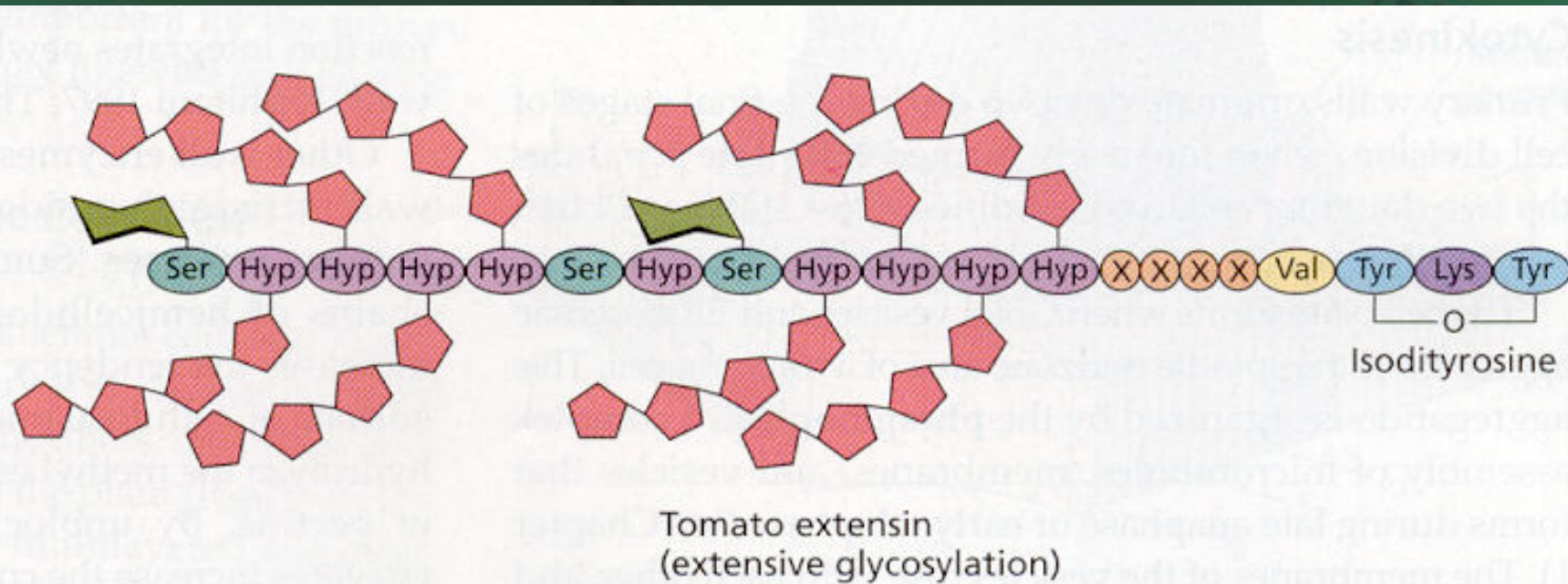
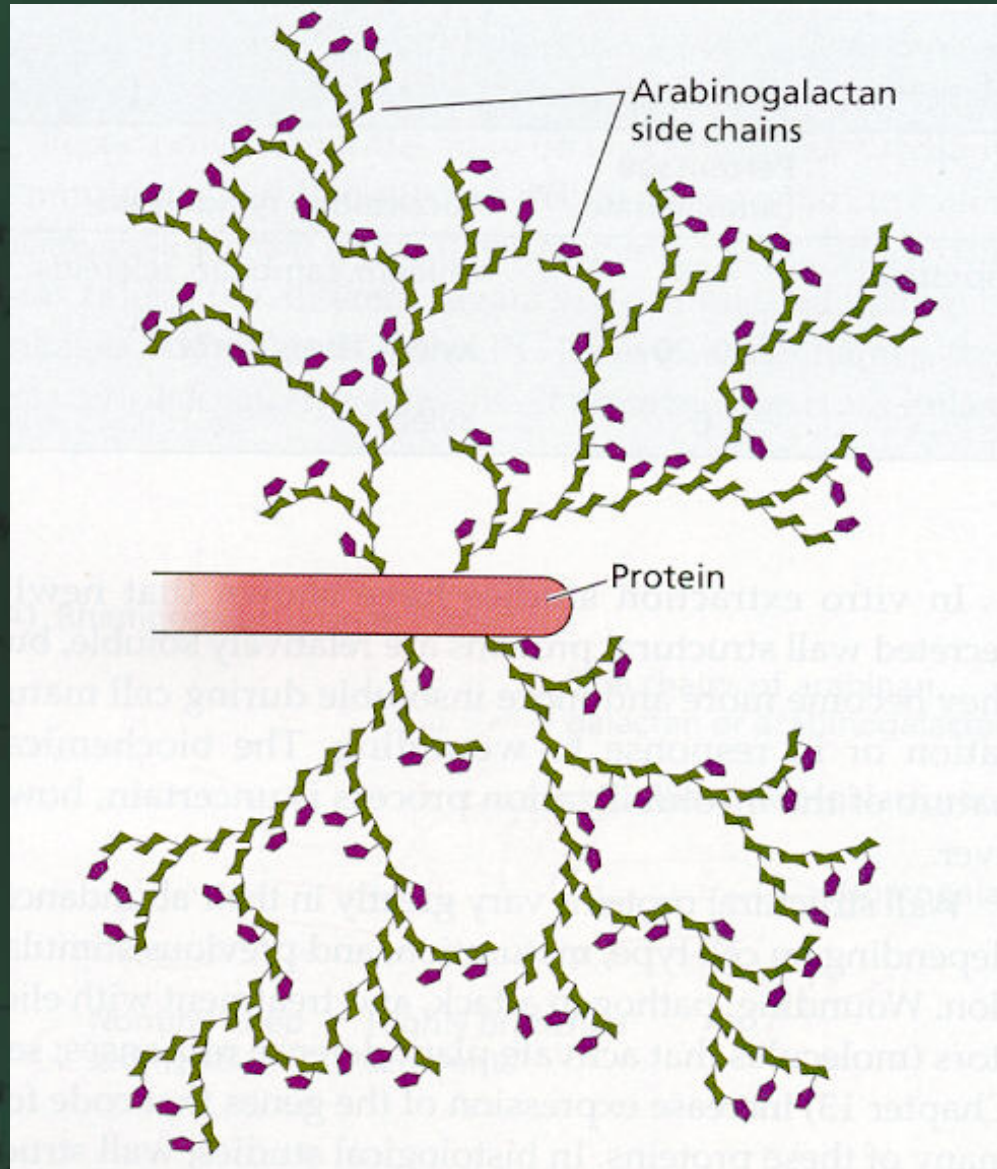


FIGURE 15.14 A repeated hydroxyproline-rich motif from a molecule of extensin from tomato, showing extensive glycosylation and the formation of intramolecular isodityrosine bonds. (From Carpita and McCann 2000.)

- + pektin methyltransferasy a pektinesterasy – regulace plasticity
- + glukonasy a trans-glykosylasy – rozvolnění buněčné stěny

Arabinogalactan molecule [15.15]



Sekundární stěna a její impregnace ligninem

Ze strany plasmalemy nové vrstvy – celuloza, pektiny, xyloglikany + lignin (20 -35%)

Lignifikace – zvýšení elasticity a pevnosti, dřevnatění, odvozen od kys. skořicové – modifikace v Golgiho komplexu – i 3 a více vrstev lišící se orientací mikrofibril

Kutikula, korek, exina – pokrytí kutinem nebo suberinem zvenku, exina u pylových zrn – sporopolenin – velmi odolný, paleopalynologie

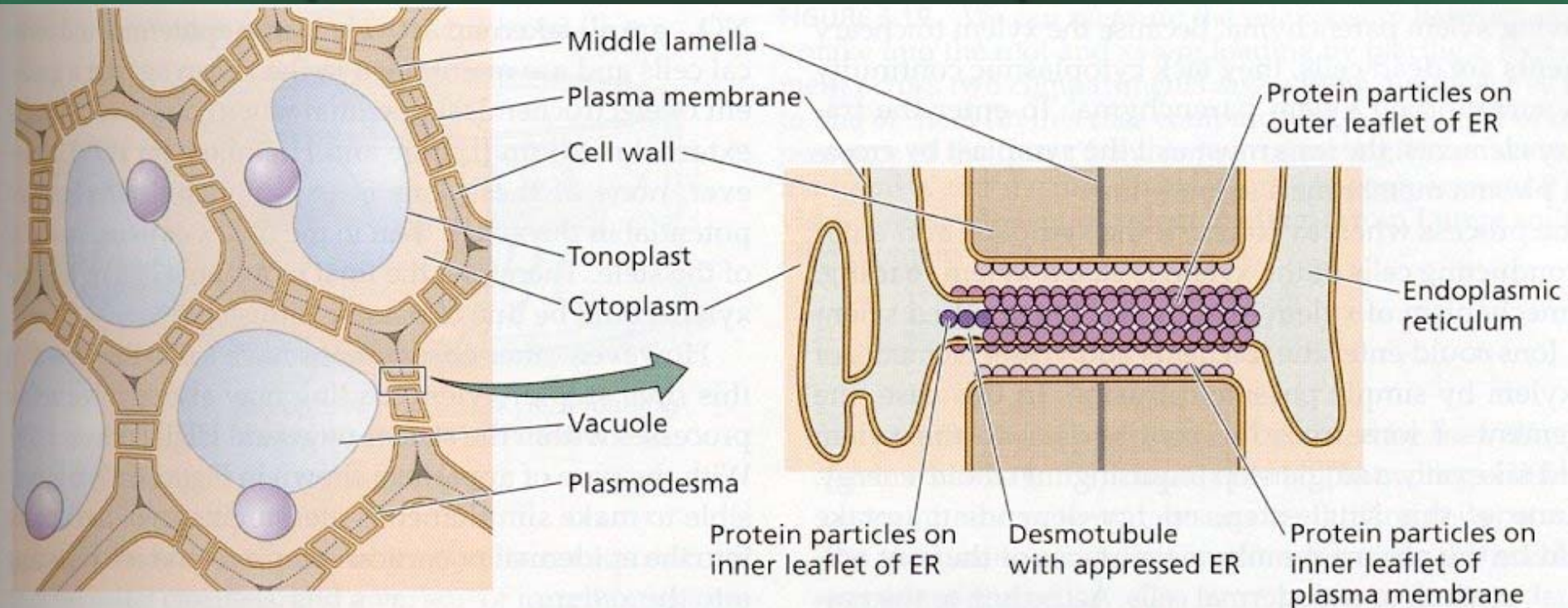


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Table [3.2]

TABLE 3.2

Values of RT and osmotic potential of solutions at various temperatures

Temperature (°C)	RT^a (L MPa mol ⁻¹)	Osmotic potential (MPa) of solution with solute concentration in mol L ⁻¹ water			Osmotic potential of seawater (MPa)
		0.01	0.10	1.00	
0	2.271	-0.0227	-0.227	-2.27	-2.6
20	2.436	-0.0244	-0.244	-2.44	-2.8
25	2.478	-0.0248	-0.248	-2.48	-2.8
30	2.519	-0.0252	-0.252	-2.52	-2.9

^a $R = 0.0083143 \text{ L MPa mol}^{-1} \text{ K}^{-1}$.