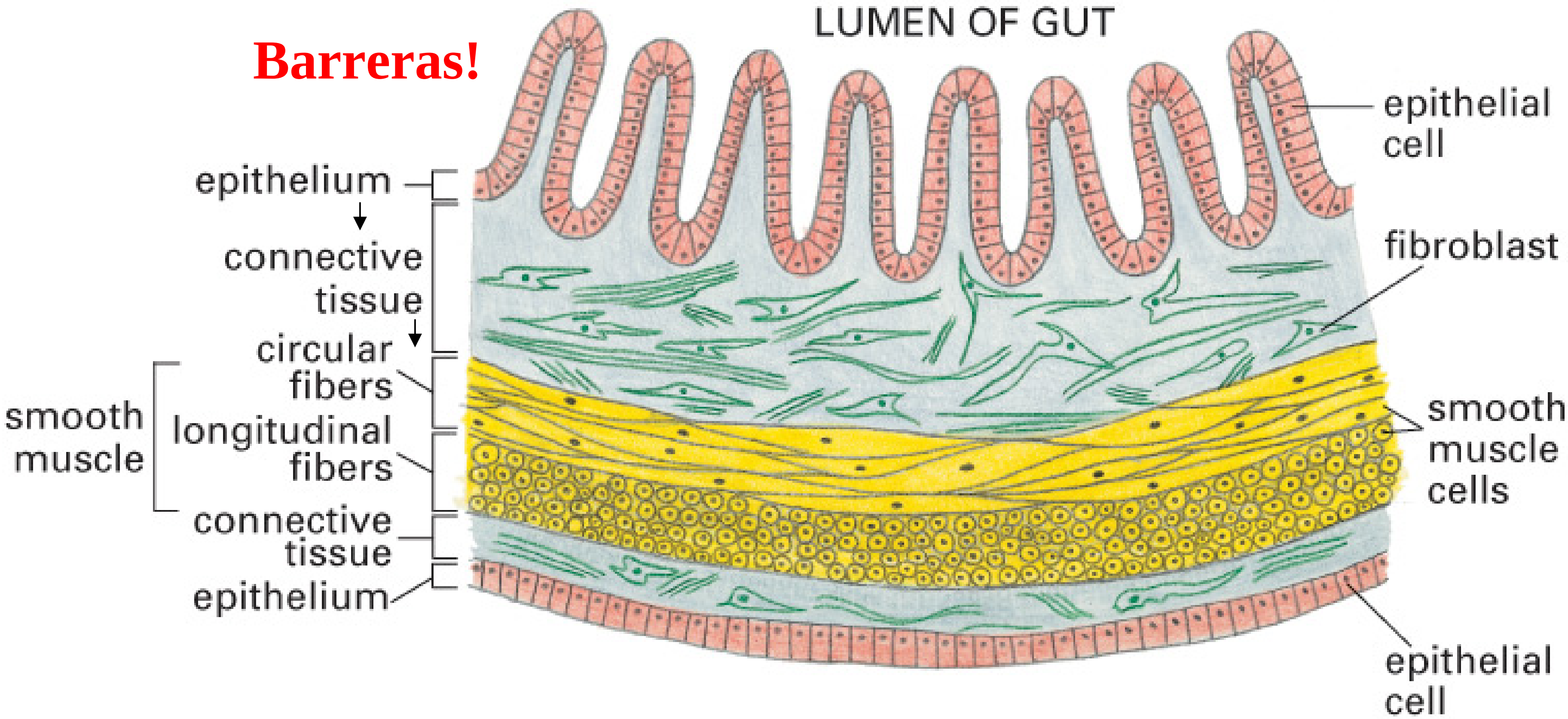
Matriz extracelular y uniones celulares

Christian Gonzalez-Billault Junio 2006

Barreras!



Organos!

Lo que vamos a ver....

1.- Matrix extracelular animal y vegetal

2.- Uniones celulares

3.- Resúmen

Lo que vamos a ver....

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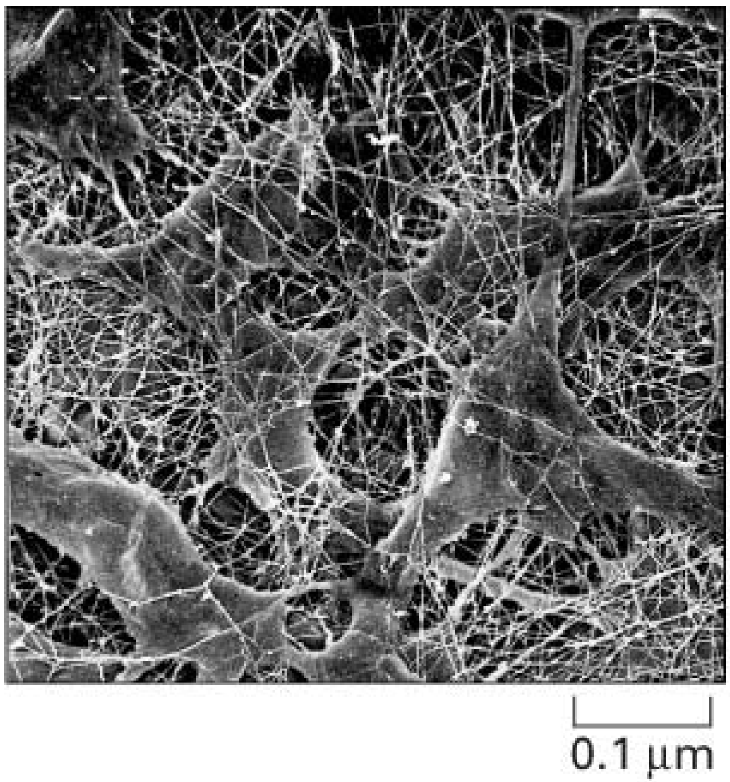
Matrix extracelular?

Cualquier material producido y secretado por las células hacia el medio que las rodea, usualmente se refiere a la porcion no celular de los tejidos

Figure 21–8 Extracellular matrix is plentiful in connective tissue such as bone. Cells in this cross section of bone appear as small, dark, ant-like objects embedded in the bone matrix, which occupies most of the volume of the tissue and provides all its mechanical strength. The alternating light and dark bands are layers of matrix containing oriented collagen (made visible with the help of polarized light). Calcium phosphate crystals filling the interstices between the collagen fibrils make bone matrix resistant to compression as well as tension, like reinforced concrete.



-Celulas secretoras de MEC son los fibroblastos (tejido conectivo)

-En el caso de tejidos conectivos más especializados como cartilago (condroblastos) y hueso (osteoblastos)

- Esta compuesta de elementos fibrosos (colágeno), proteínas de unión (fibronectina y laminina) y moléculas complejas que rellenan el espacio extracelular (proteoglicanos)

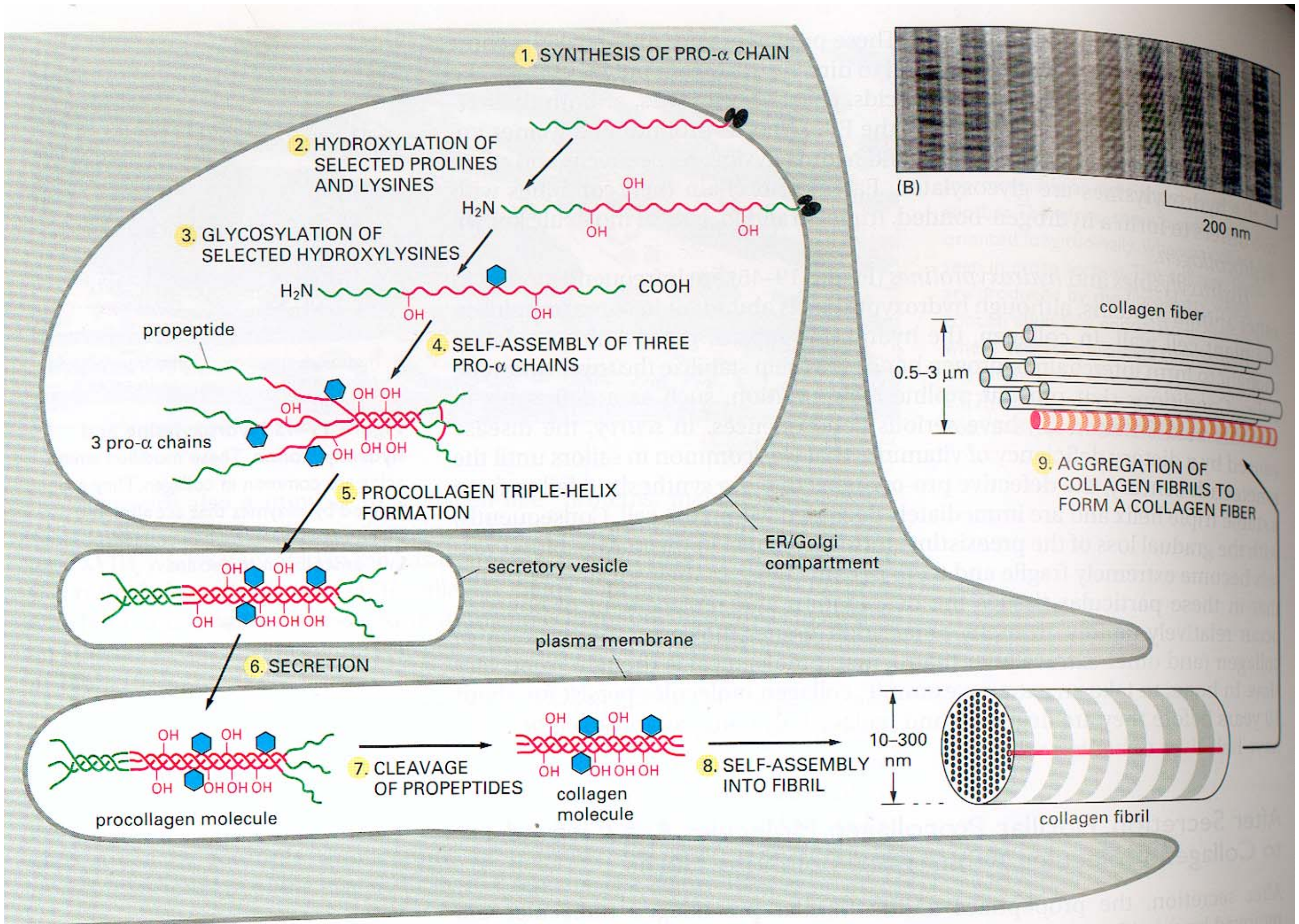
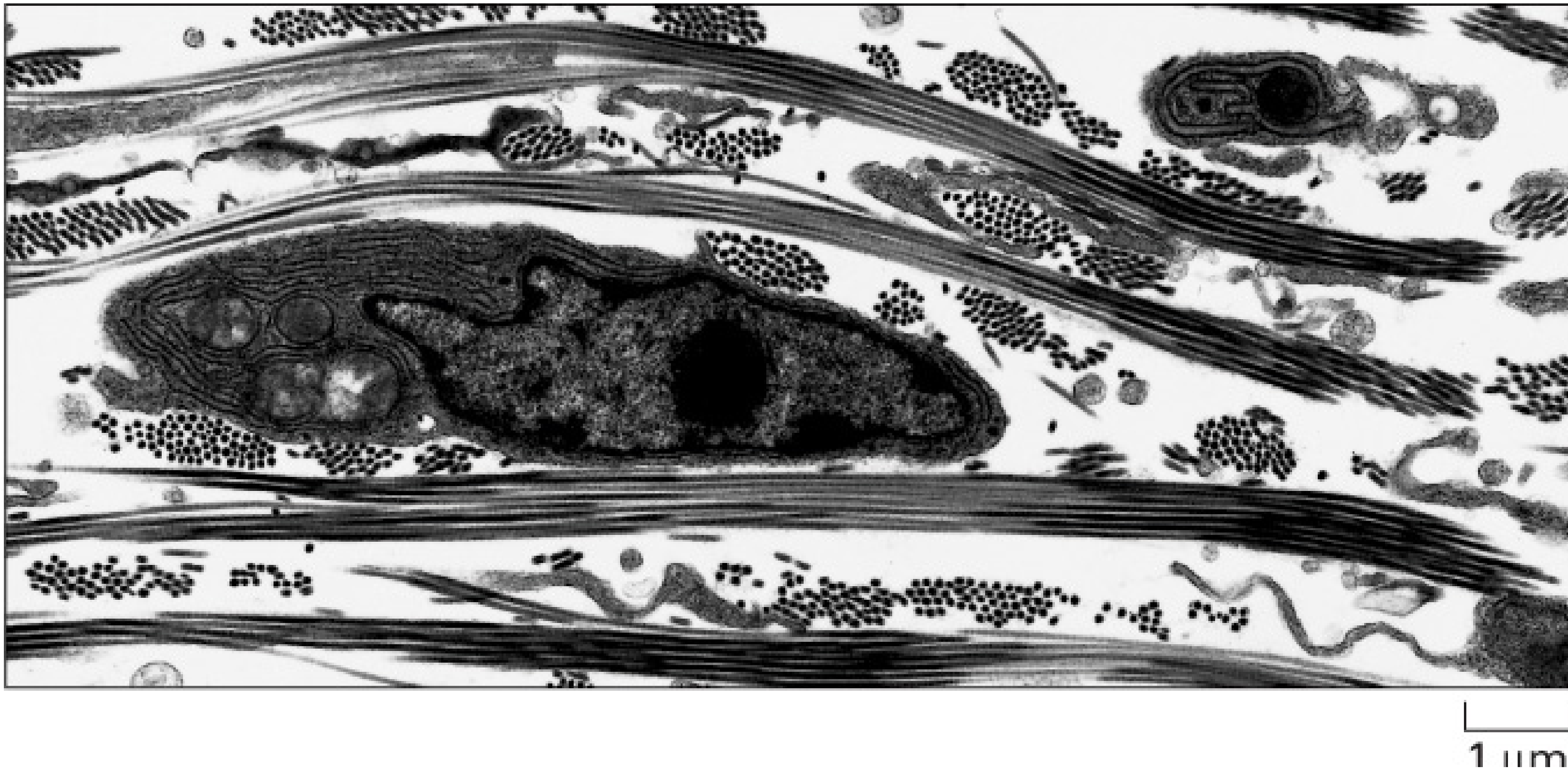


Figure 19–47 The intracellular and extracellular events in the formation of a collagen fibril. (A) Note that collagen fibrils are shown assembling in the extracellular space contained within a large infolding in the plasma membrane. As one example of how collagen fibrils can form ordered arrays in the extracellular space, they are shown further assembling into large collagen fibers, which are visible in the light microscope. The covalent cross-links that stabilize the extracellular assemblies are not shown. (B) Electron micrograph of a negatively stained collagen fibril reveals its typical striated appearance. (B, courtesy of Robert Horne.)

James Morris (1890)

Colágeno



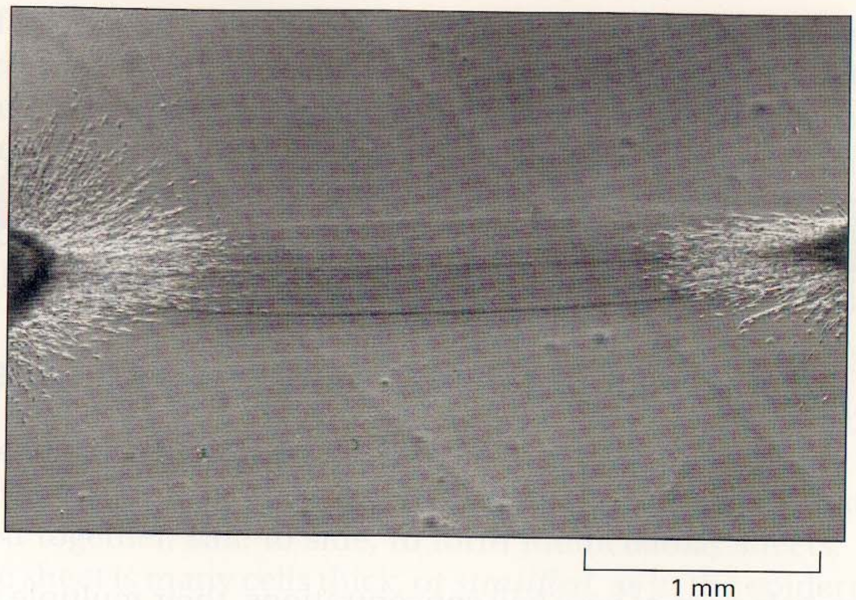


Figure 21–13 Fibroblasts influence the alignment of collagen fibers. This micrograph shows a region between two pieces of embryonic chick heart (rich in fibroblasts as well as heart muscle cells) that have grown in culture on a collagen gel for four days. A dense tract of aligned collagen fibers has formed between the explants, presumably as a result of the fibroblasts in the explants tugging on the collagen. Elsewhere in the culture dish the collagen remains disorganized and unaligned, so it appears uniformly gray. (From D. Stopak and A.K. Harris, *Dev. Biol.* 90:383–398, 1982.)

Fibronectina

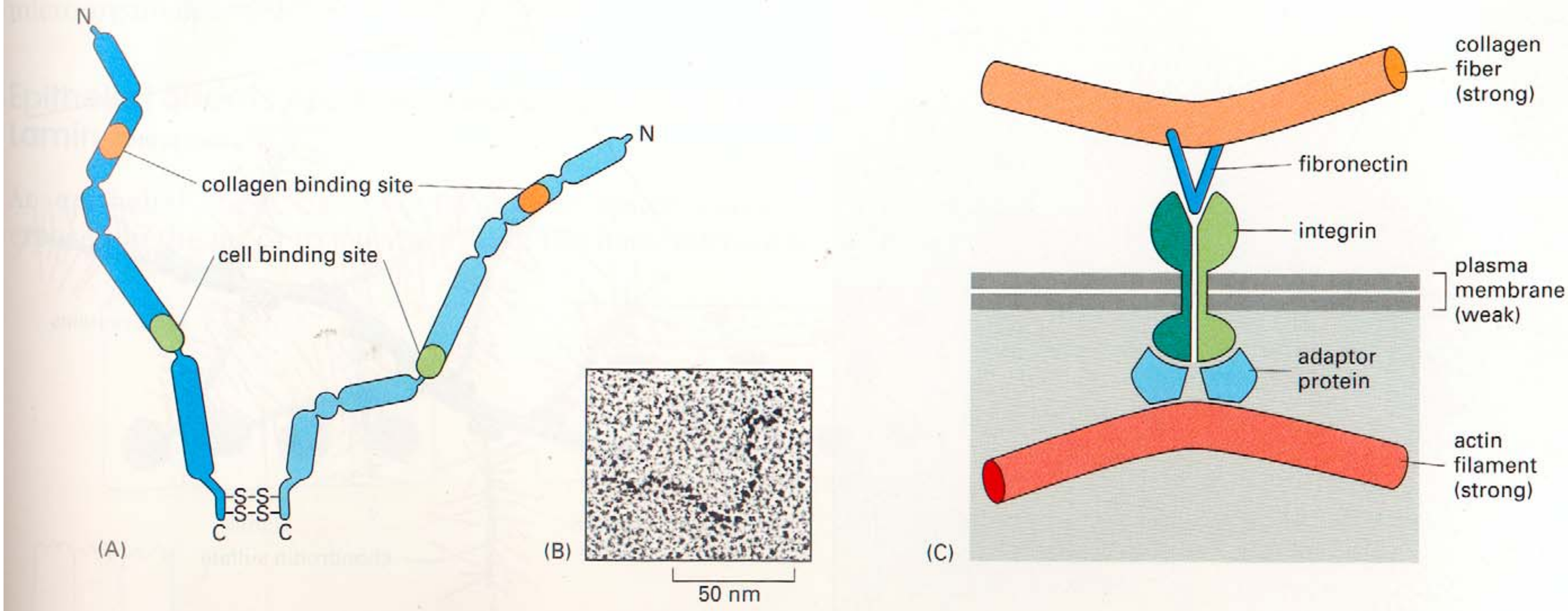


Figure 21–14 Integrins link the extracellular matrix to the cytoskeleton in an animal cell. (A) Diagram and (B) electron micrograph of a fibronectin molecule. (C) The transmembrane linkage mediated by an integrin molecule. The integrin molecule transmits tension across the plasma membrane: it is anchored inside the cell to the cytoskeleton and externally via fibronectin to the extracellular matrix. The plasma membrane itself does not have to be strong. The integrin shown links fibronectin to an actin filament inside the cell, but other integrins connect different extracellular proteins to the cytoskeleton (usually to actin filaments, but sometimes to intermediate filaments). (B, from J. Engel et al., *J. Mol. Biol.* 150:97–120, 1981. © Academic Press.)

Laminina

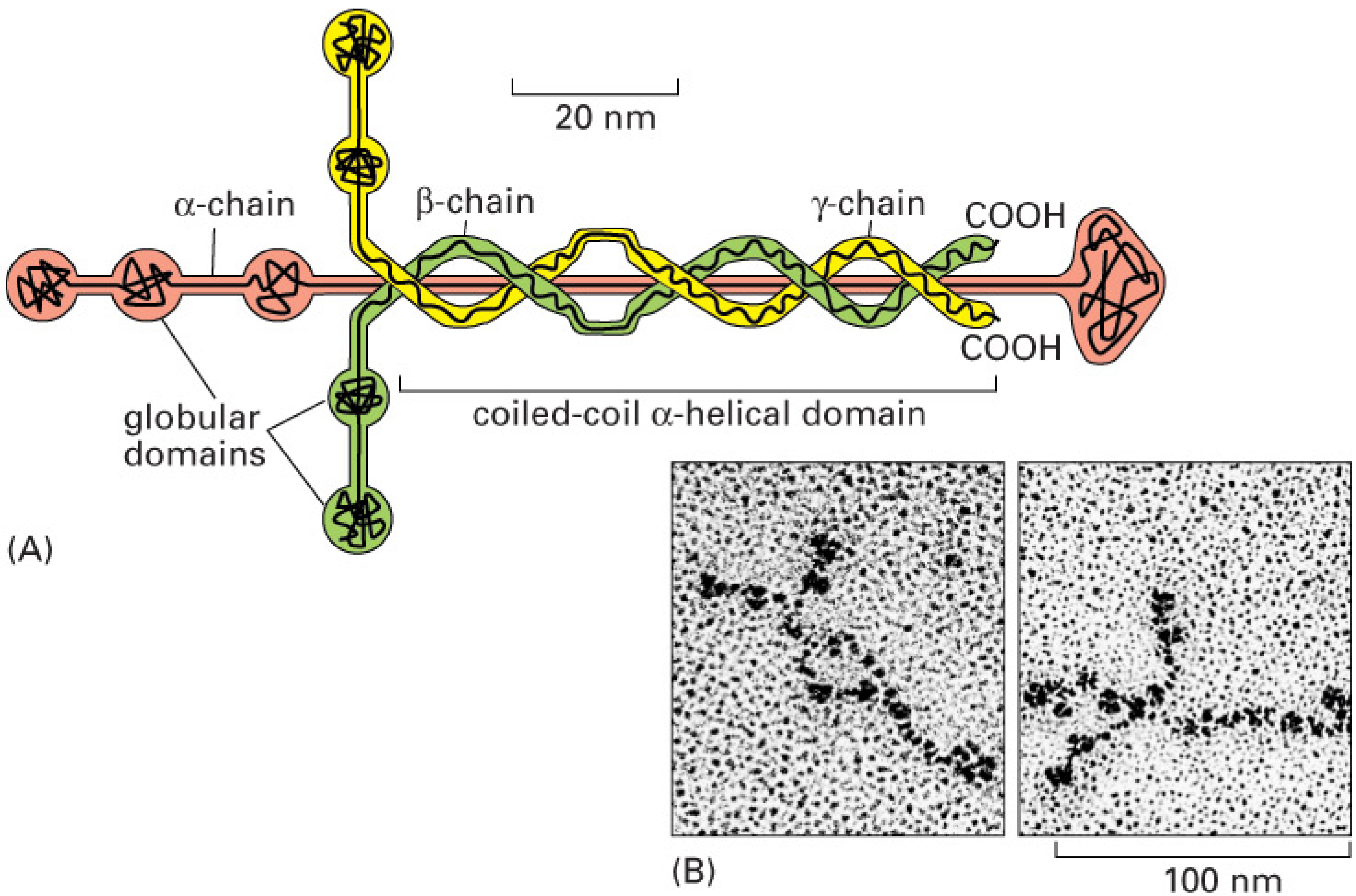
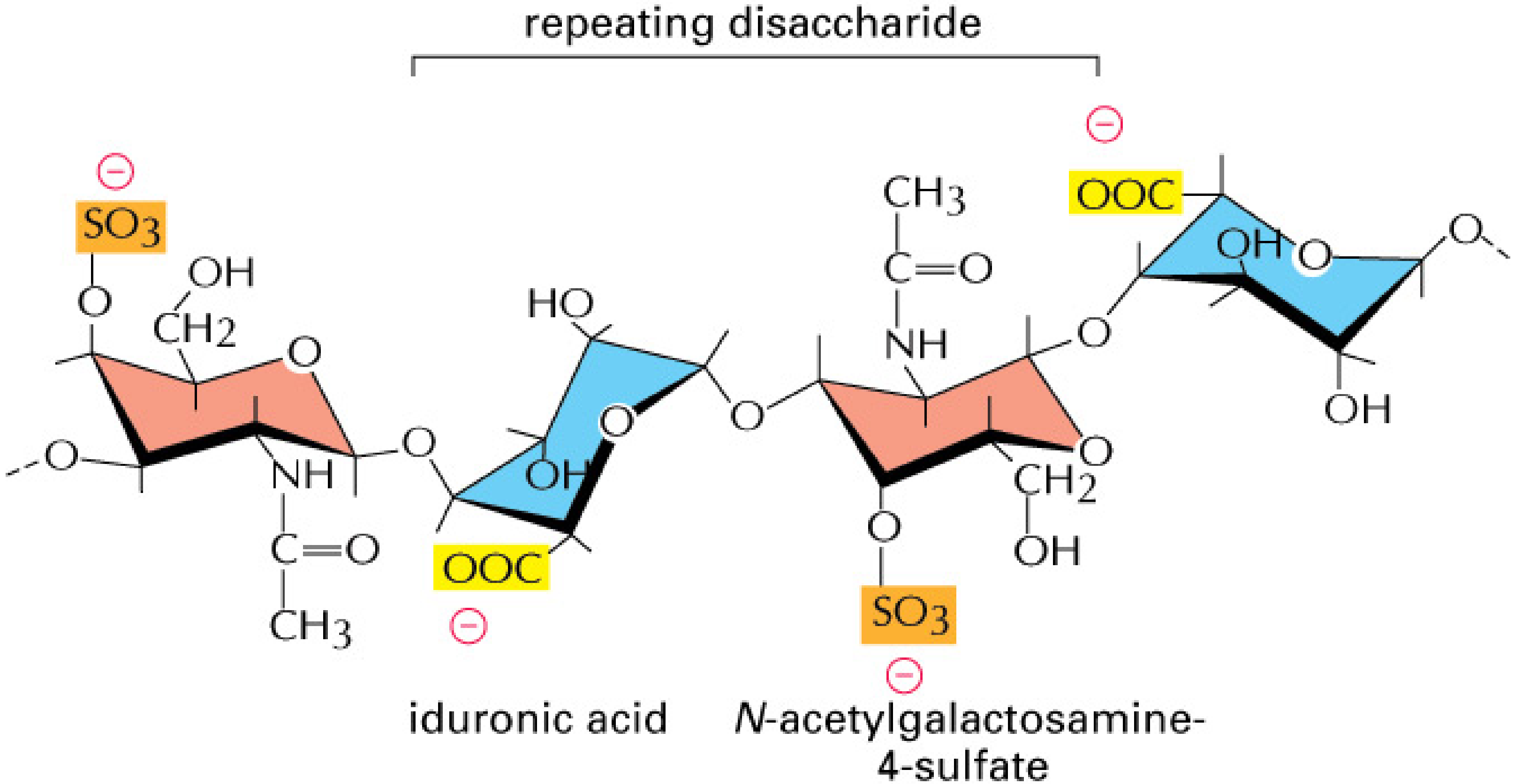
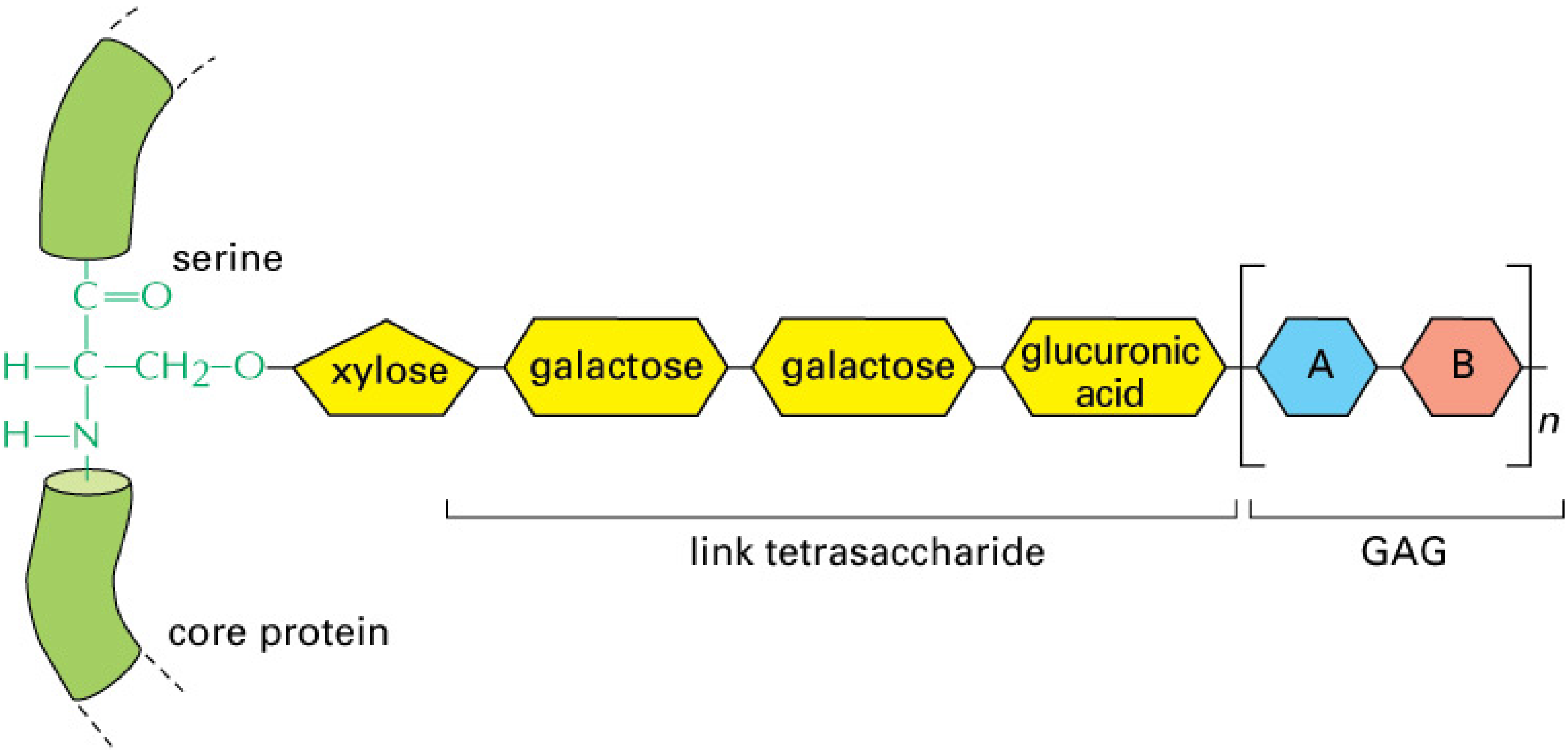


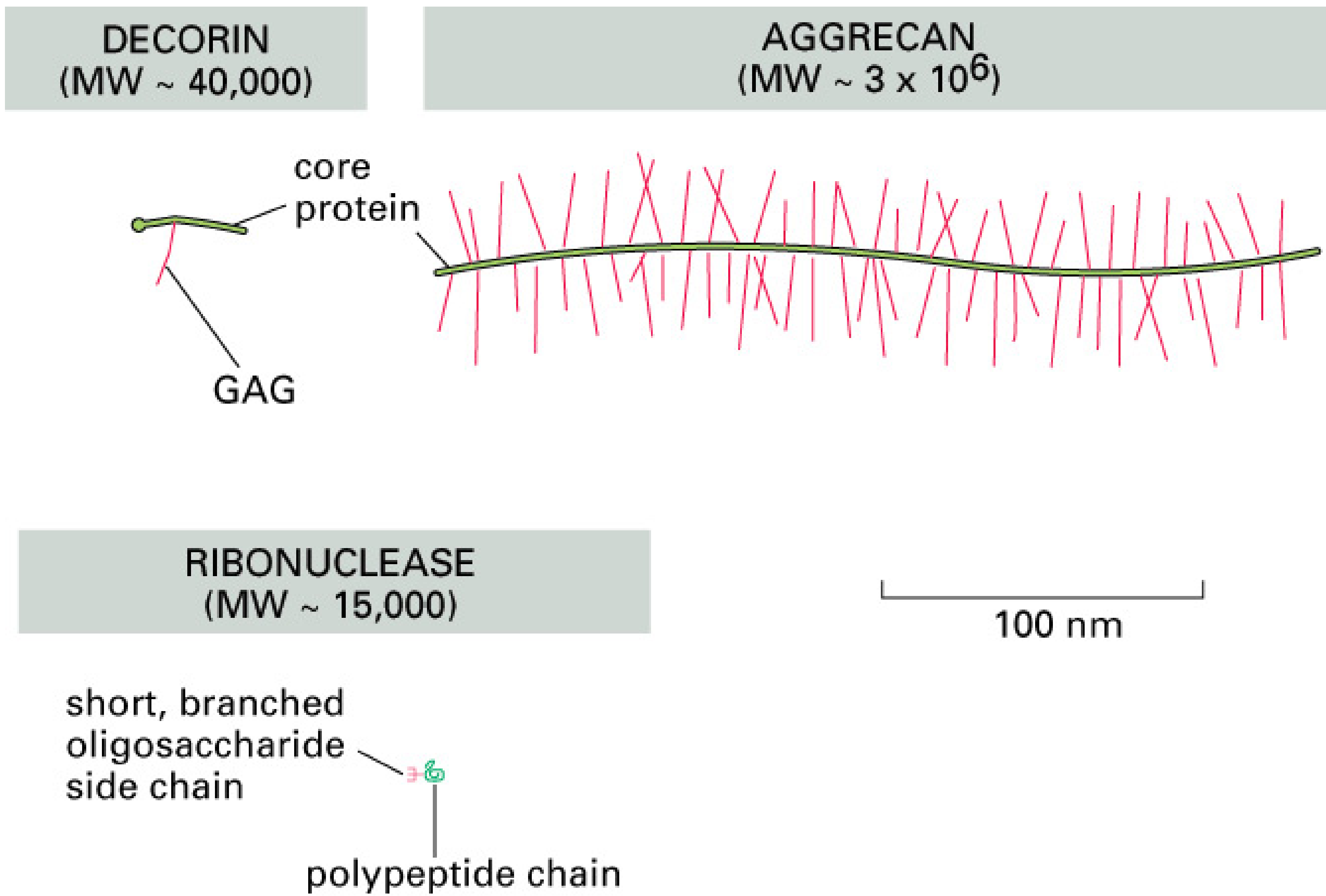
Figure 19–57. Molecular Biology of the Cell, 4th Edition.

Glicosaminoglicanos





serine
C=O
H—C—CH2—O
H—N
xylose
galactose
galactose
glucuronic acid
A
B
n
link tetrasaccharide
GAG
core protein



DECORIN
(MW ~ 40,000)
AGGRECAN
(MW ~ 3 x 10^6)
core protein
GAG
RIBONUCLEASE
(MW ~ 15,000)
100 nm
short, branched oligosaccharide side chain
polypeptide chain

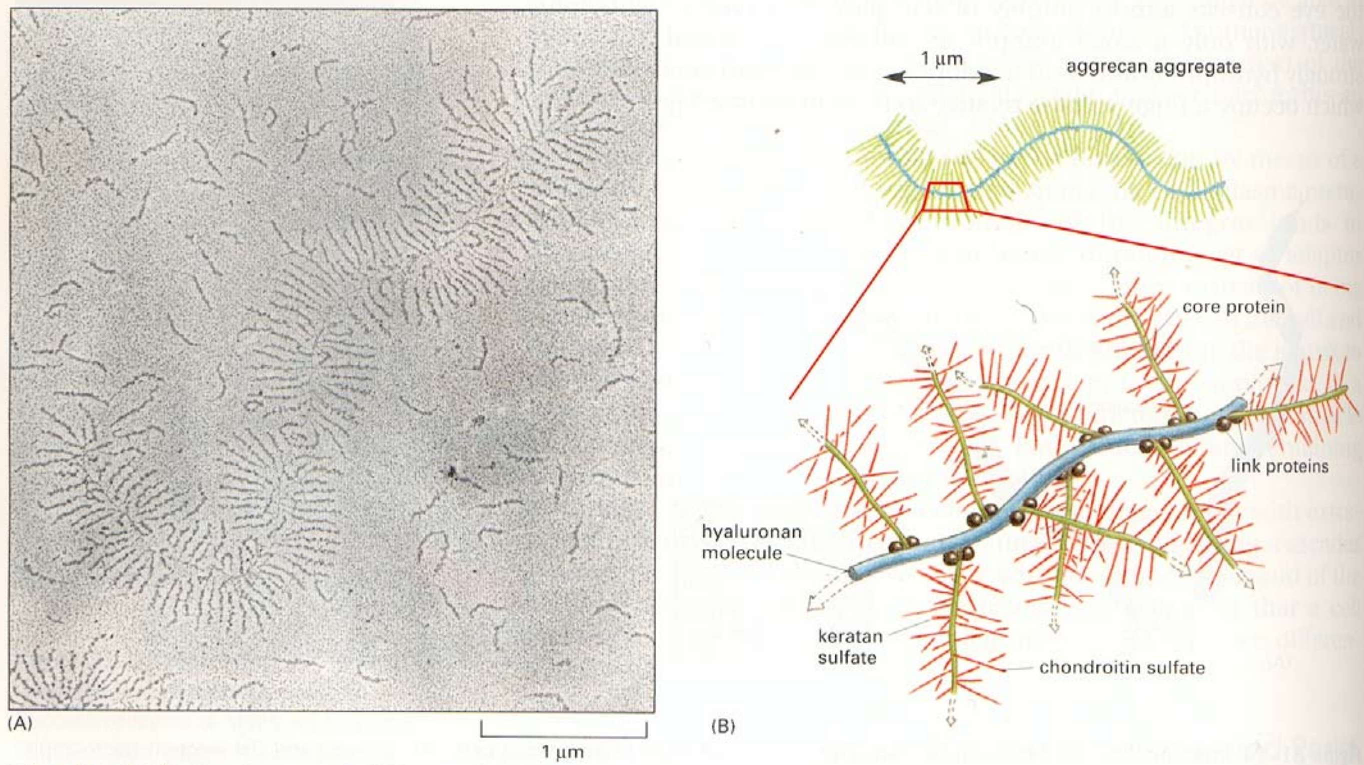
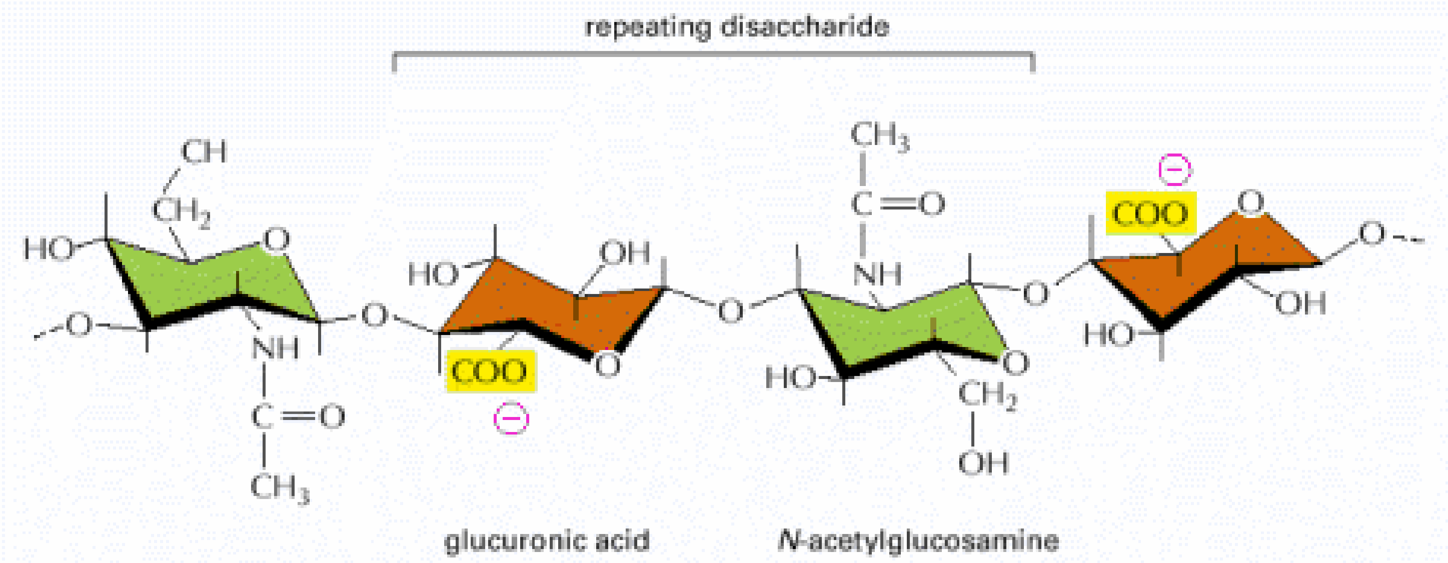


Figure 21–16 Proteoglycans and GAGs can form large aggregates. (A) Electron micrograph of an aggregate from cartilage spread out on a flat surface. Many free subunits—themselves large proteoglycan molecules—are also seen. (B) Schematic drawing of the giant aggregate illustrated in (A), showing how it is built up from GAGs and proteins. The molecular weight of such a complex can be 10^8 daltons or more, and it occupies a volume equivalent to that of a bacterium, which is about 2×10^{-12} cm^3. (A, courtesy of Lawrence Rosenberg.)

Hialorunano (Ac. Hialouronico)



-Mas simple
-No sulfato
-No unido a proteínas

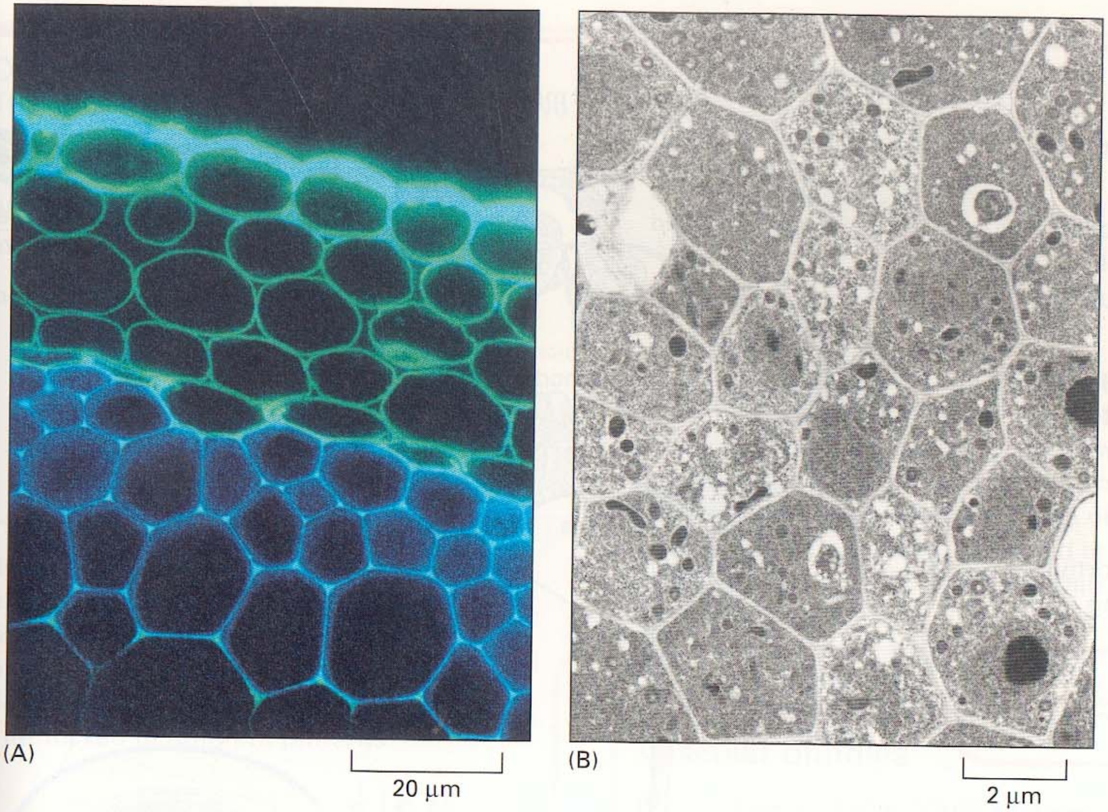
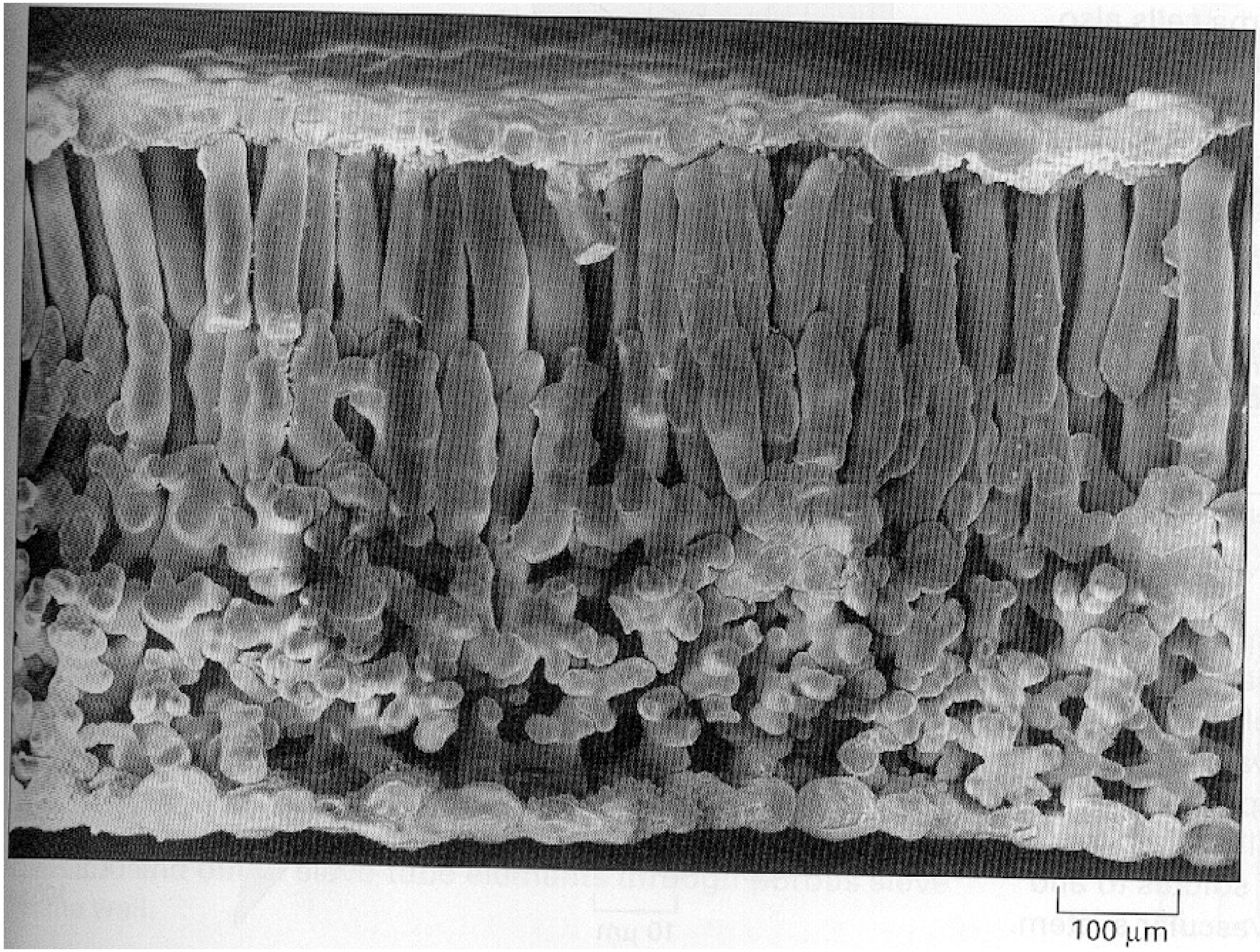
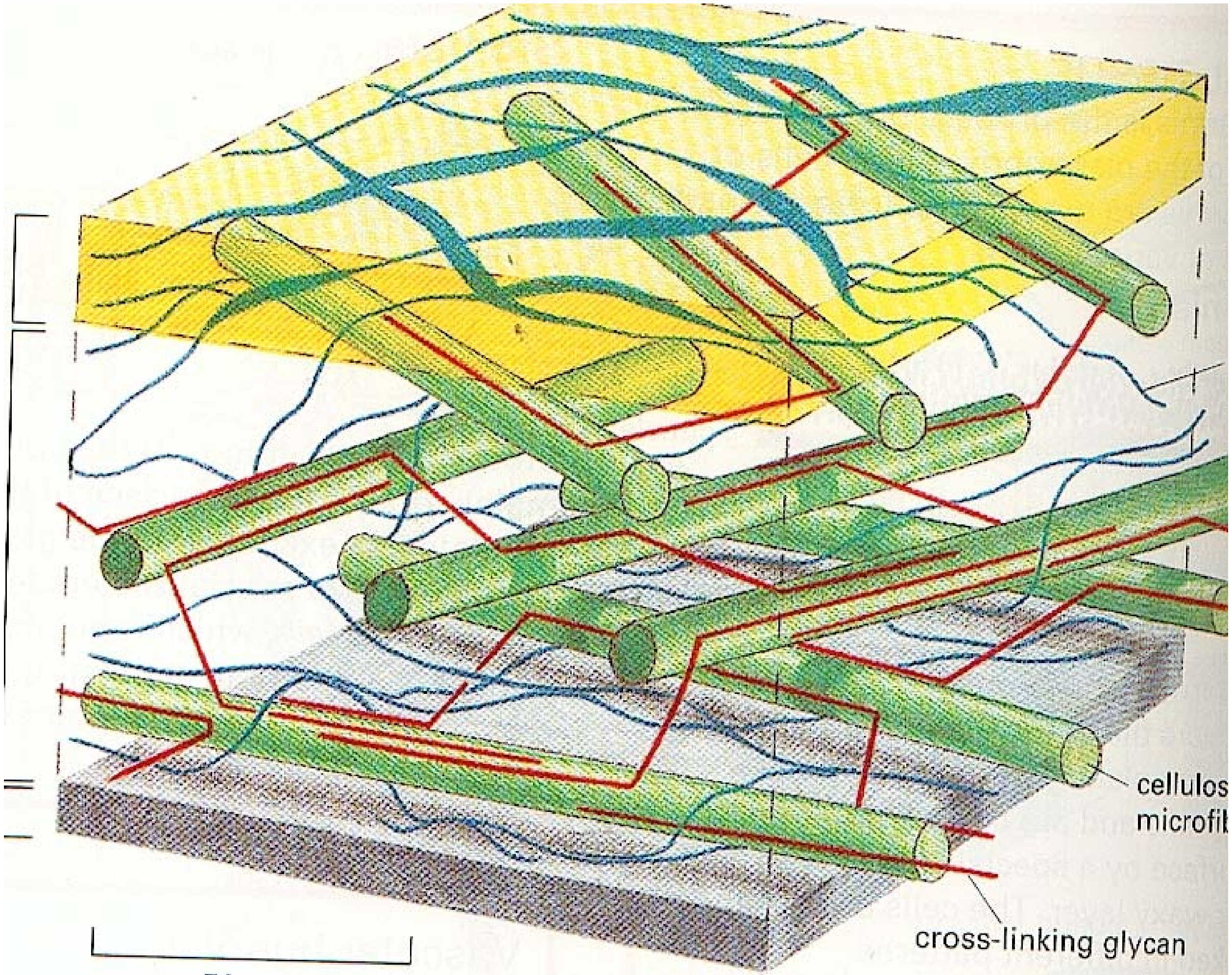
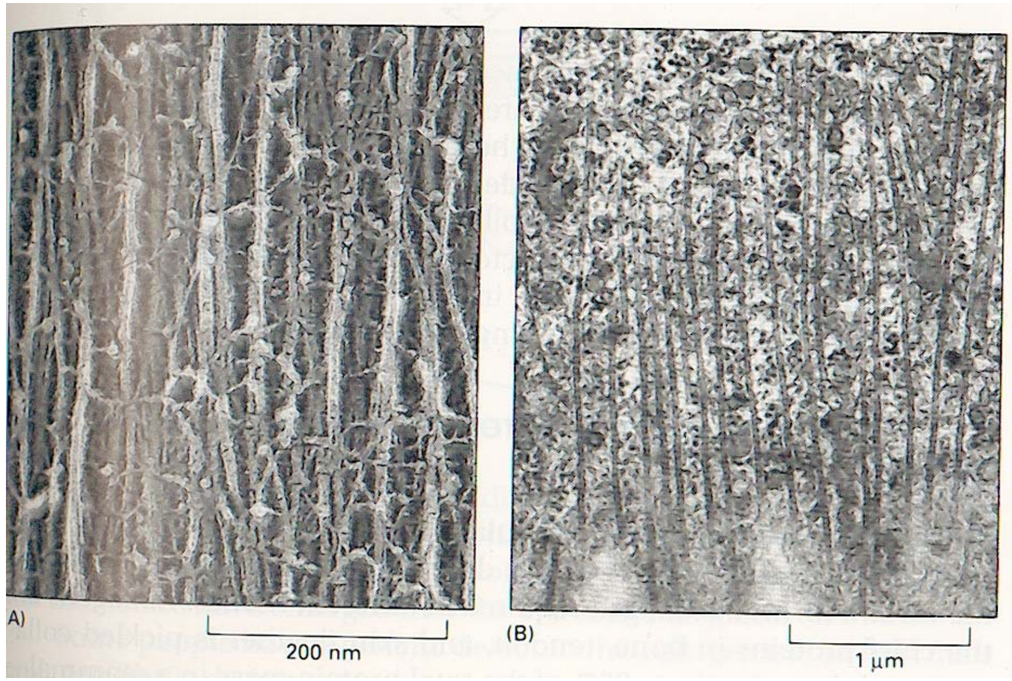


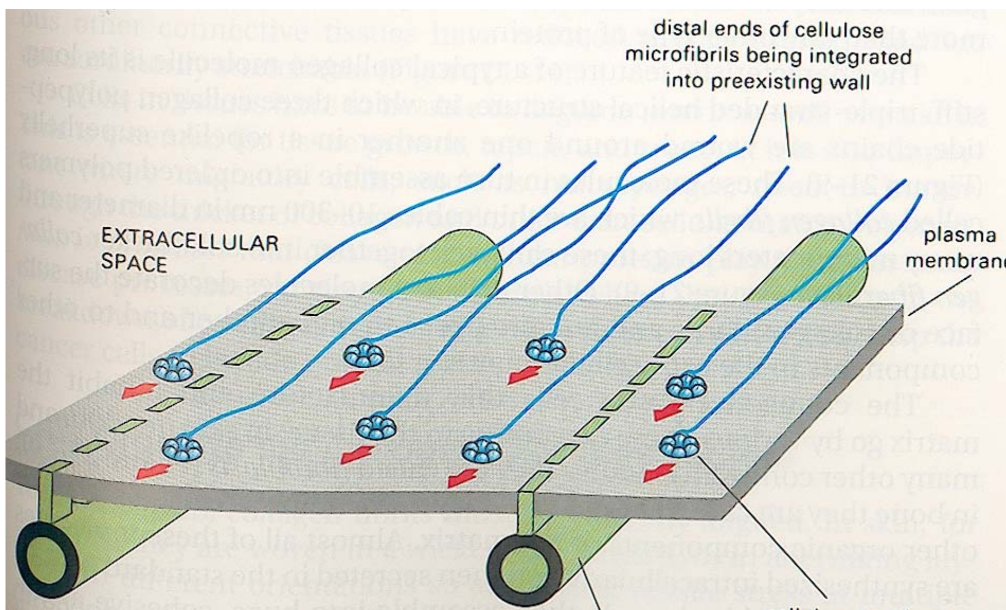
Figure 21–3 Plant tissues are strengthened by the plant cell wall. (A) A cross section of part of the stem of the flowering plant *Arabidopsis* is shown, stained with fluorescent dyes that label two different cell wall components—cellulose in *blue,* and another polysaccharide (pectin) in *green.* The cells themselves are unstained and invisible in this preparation. Regions rich in both cellulose and pectin appear white. Pectin predominates in the outer layers of cells, which have only primary cell walls (deposited while the cell is still growing). Cellulose is more plentiful in the inner layers, which have thicker, more rigid secondary cell walls (deposited after cell growth has ceased). (B) The cells and their walls are clearly seen in this electron micrograph of young cells in the root of the same plant. (Courtesy of Paul Linstead.)


100 μm


cellulos
microfib
cross-linking glycan

TIP:
Sintesis es
extracelular





Lo que vamos a ver....

1.- Matrix extracelular animal y vegetal

2.- Uniones celulares

3.- Resúmen

Tipos de Uniones

- Uniones Ocludentes:
  - -Uniones Estrechas (Tight Junctions)
  - -Uniones Septadas (solo en insectos)
- Uniones de Anclaje:
  - -Uniones Adherentes (uniones celula-celula)
  - -Desmosomas (uniones celula-celula)
  - -Hemidesmosomas (uniones celula-MEC)
  - -Contactos Focales (uniones celula-MEC)
- Uniones Comunicantes:
  - -Uniones en Hendidura (Gap Junctions)
  - - Sinápsis químicas
  - -Plasmodesmos (solo en plantas)

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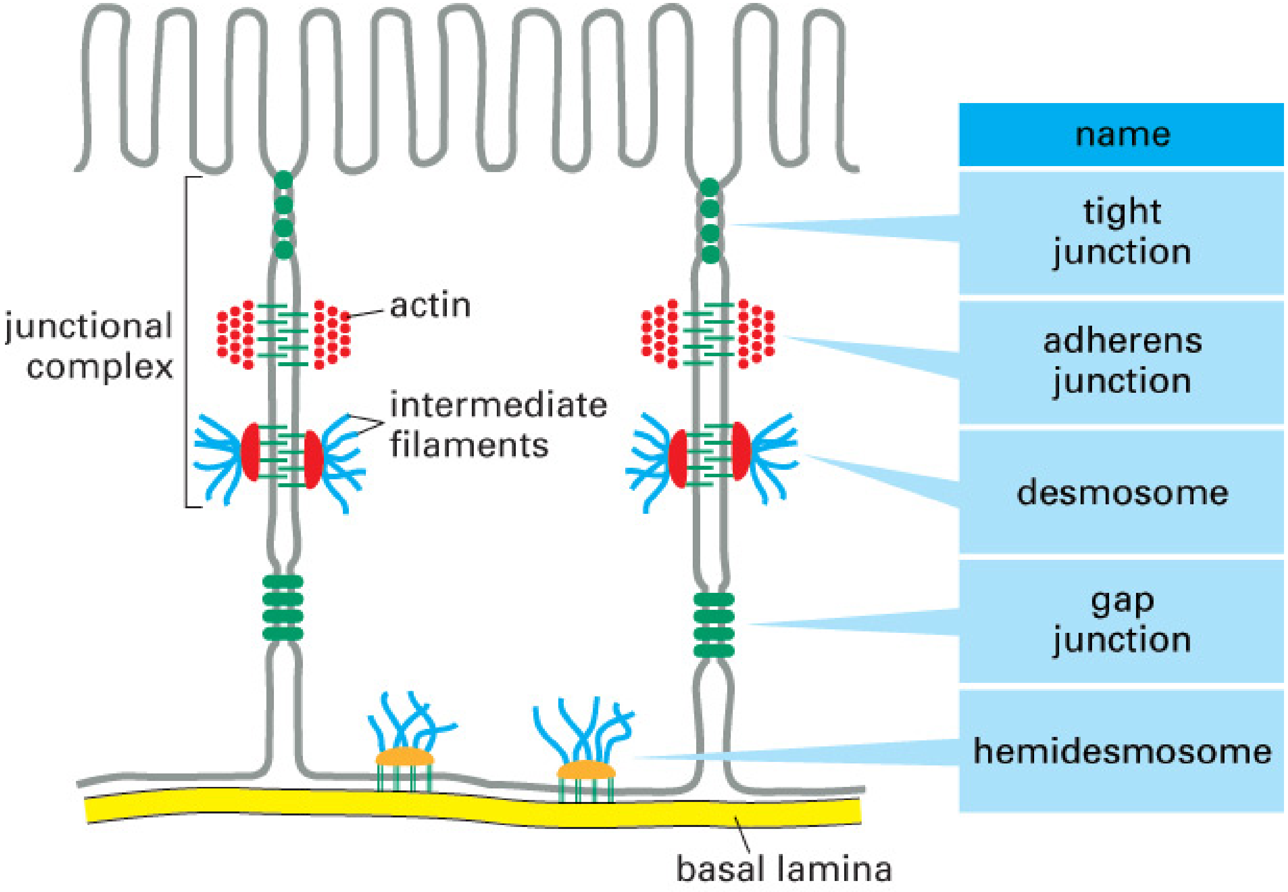
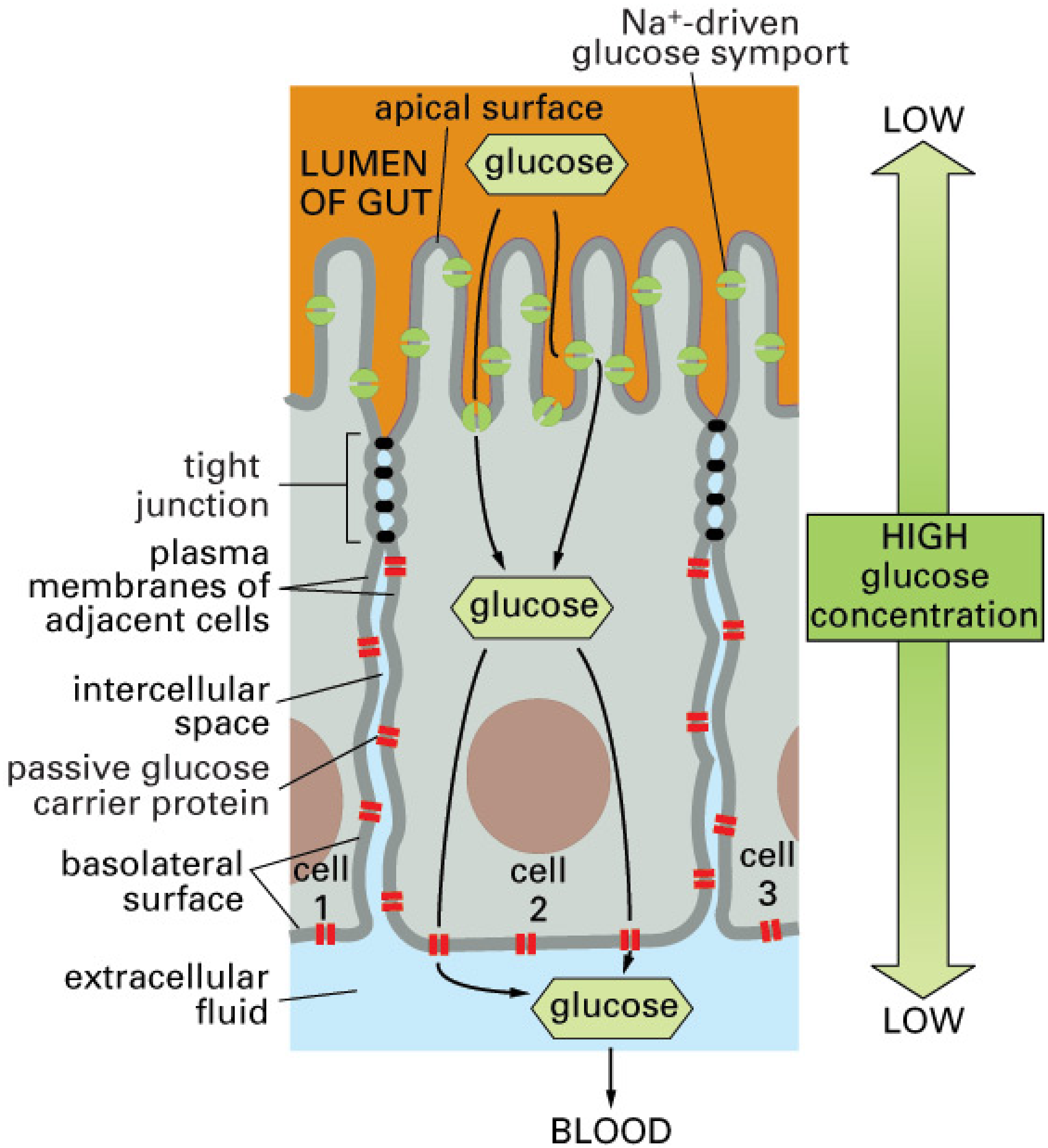
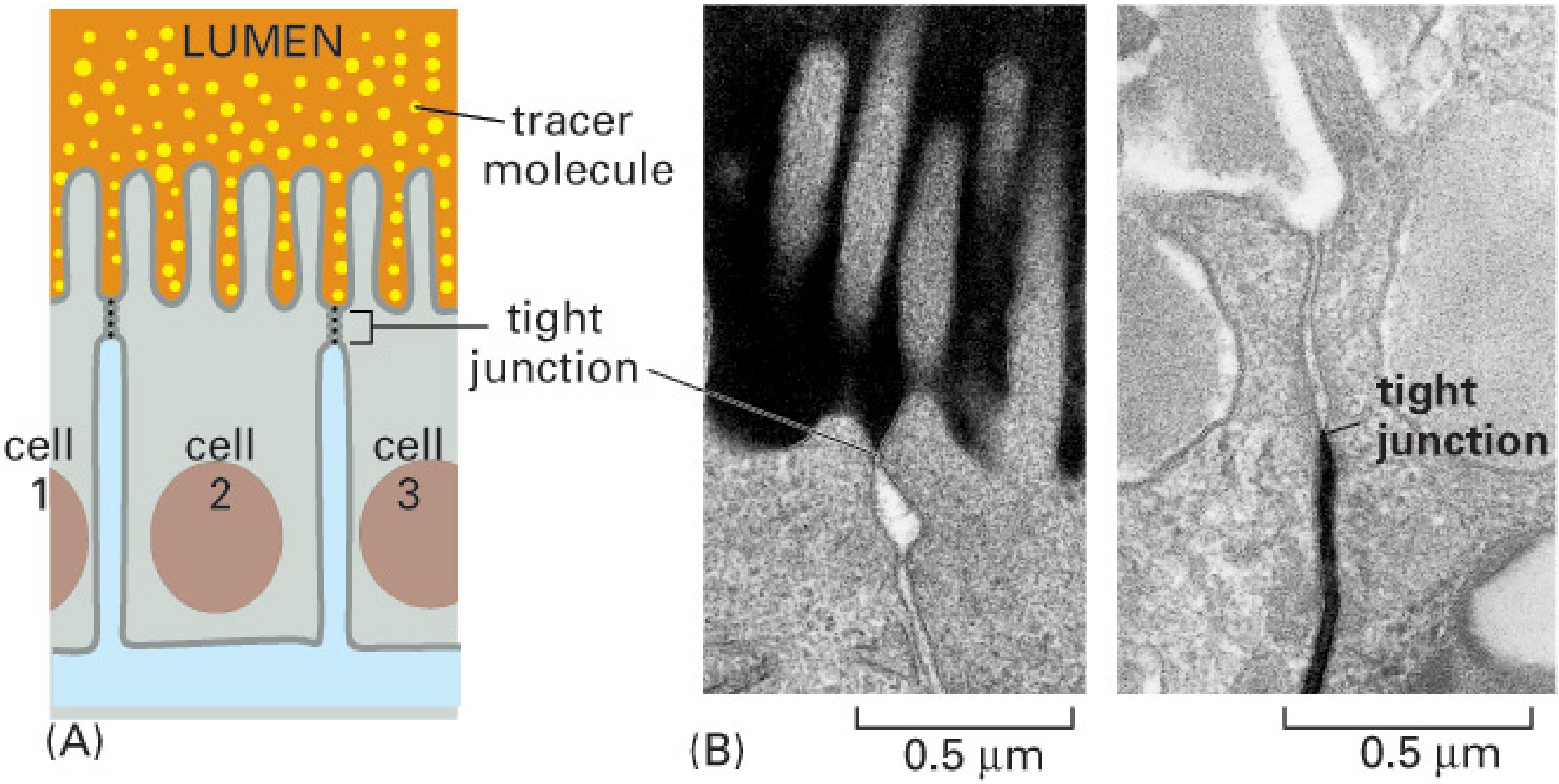
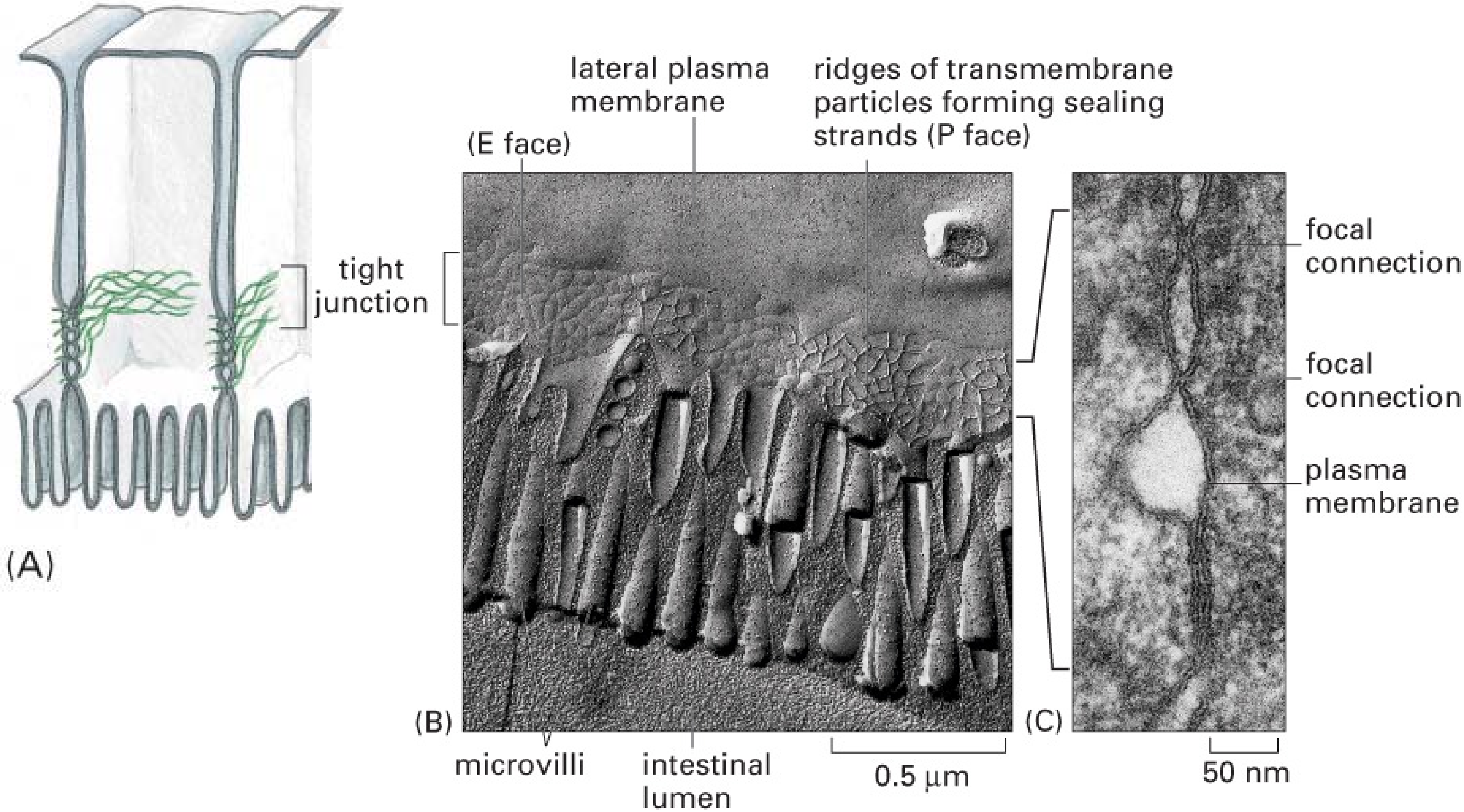

junctional
complex
actin
intermediate
filaments
basal lamina
name
tight
junction
adherens
junction
desmosome
gap
junction
hemidesmosome

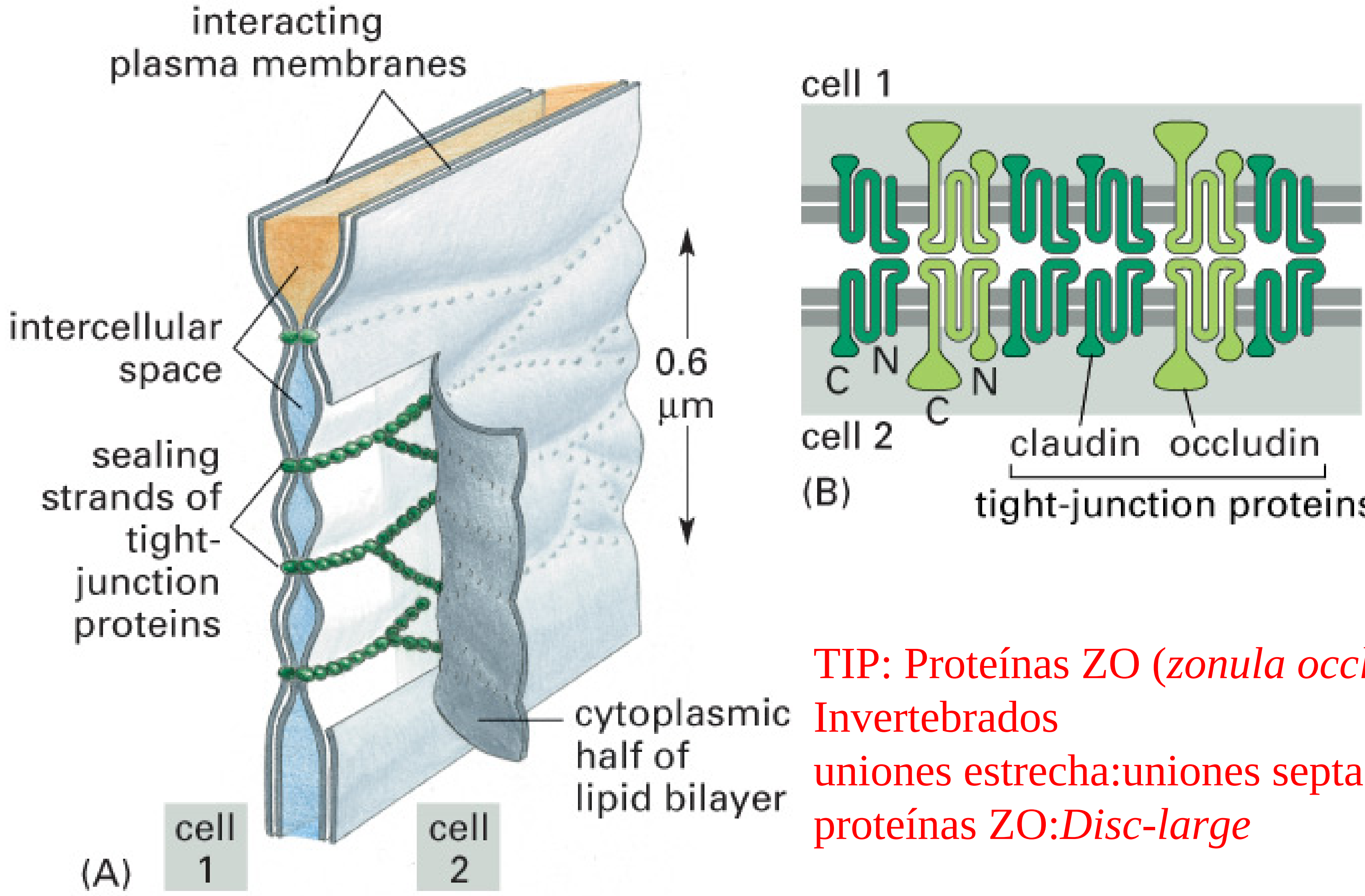


Na+-driven
glucose symport
apical surface
LUMEN
OF GUT
glucose
LOW
tight
junction
plasma
membranes of
adjacent cells
glucose
HIGH
glucose
concentration
intercellular
space
passive glucose
carrier protein
basolateral
surface
cell
1
cell
2
cell
3
extracellular
fluid
glucose
LOW
BLOOD



LUMEN
tracer molecule
tight junction
cell 1
cell 2
cell 3
(A)
tight junction
tight junction
(B)
0.5 μm
0.5 μm


lateral plasma membrane
ridges of transmembrane particles forming sealing strands (P face)
(E face)
tight junction
focal connection
focal connection
plasma membrane
(A)
(B)
(C)
microvilli
intestinal lumen
0.5 μm
50 nm



TIP: Proteínas ZO (*zonula occludens*)
Invertebrados
uniones estrecha:uniones septadas=
proteínas ZO:*Disc-large*

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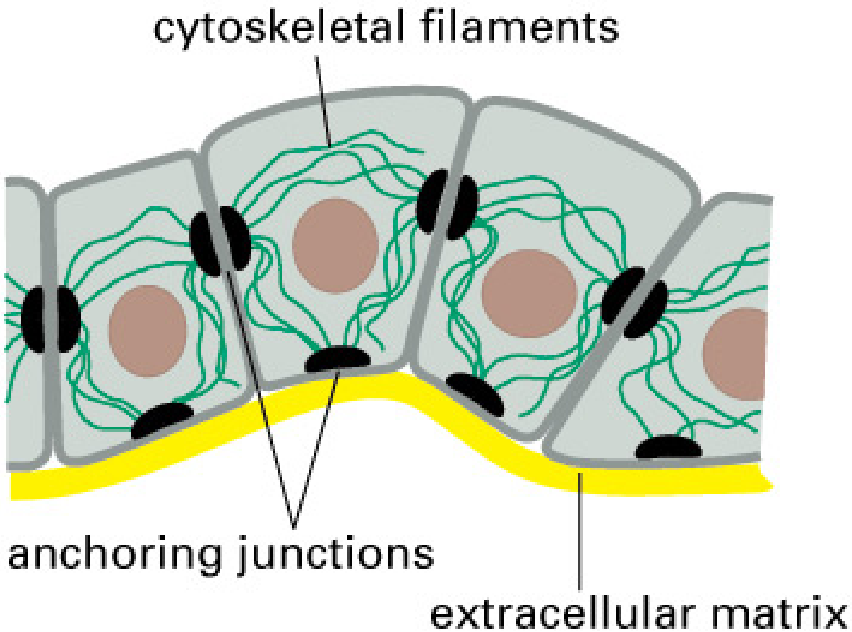
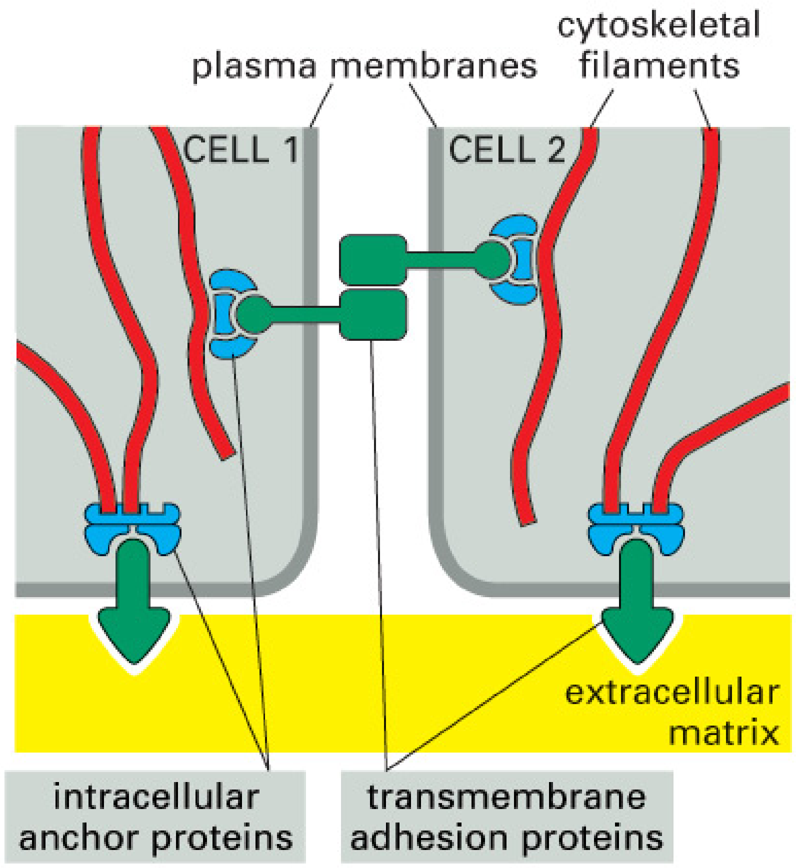
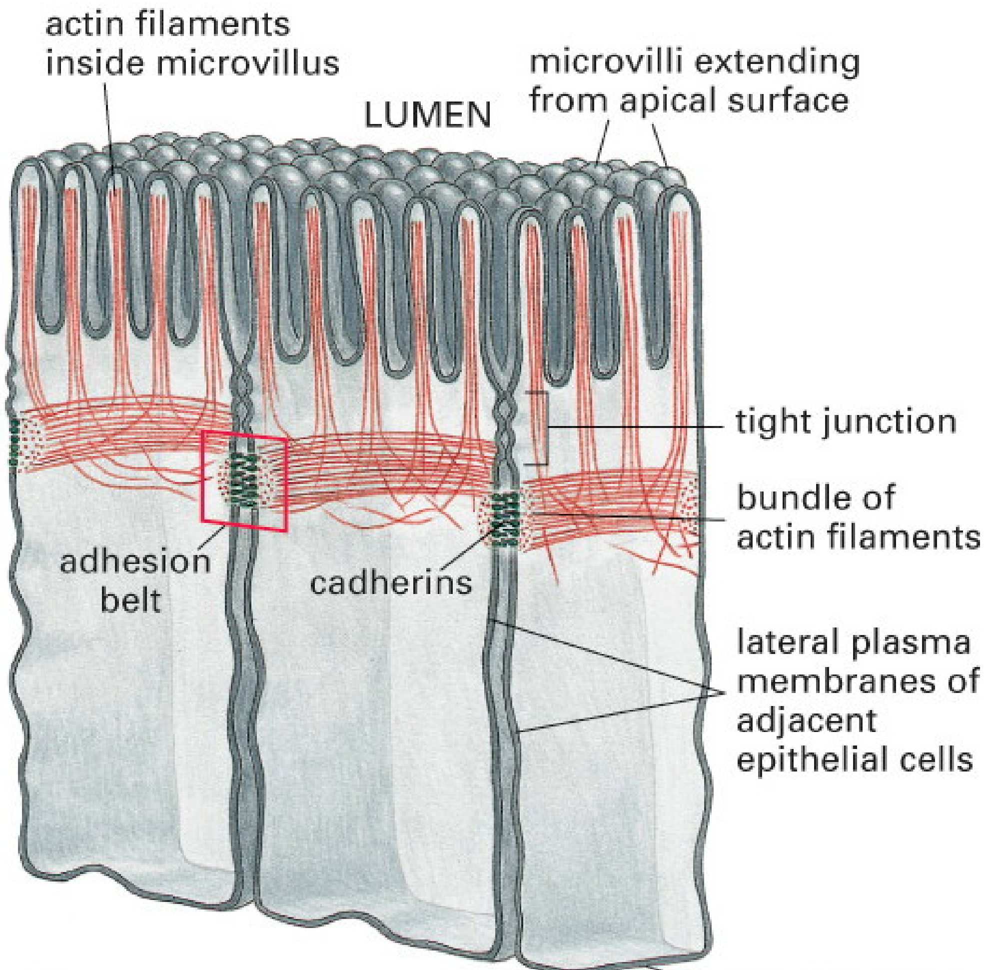
Uniones de Anclaje



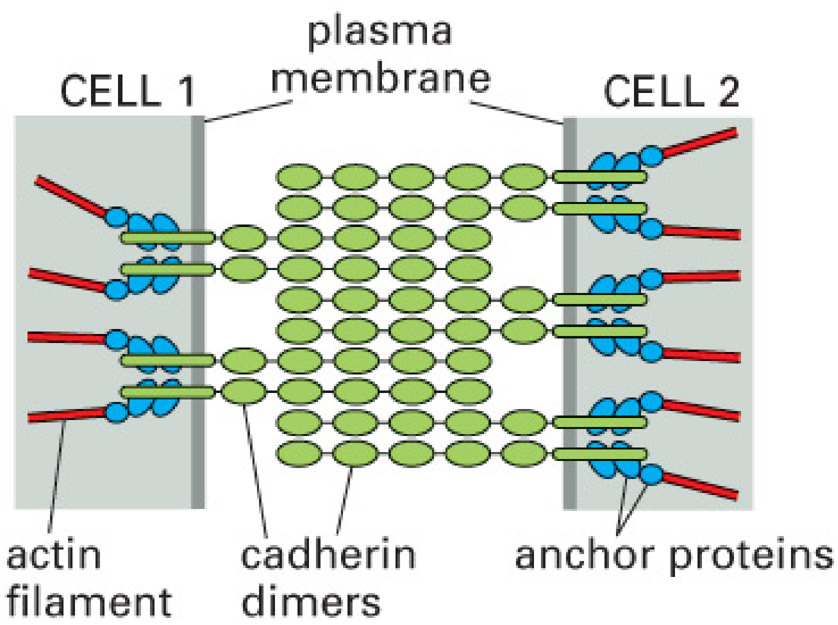


Uniones Adherentes

TIP: cinturon de adhesión o *zonula adherens*

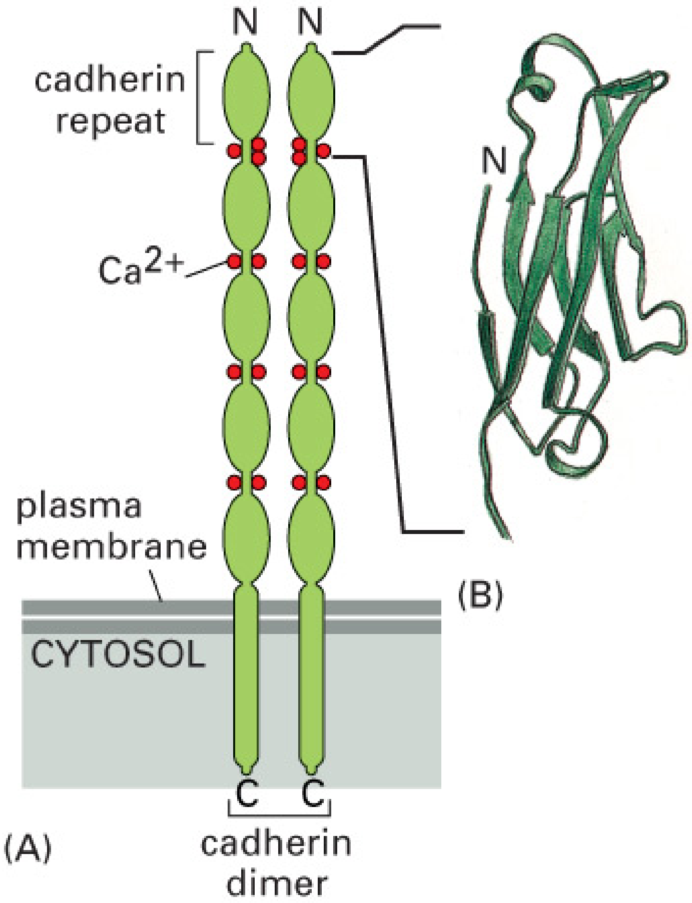


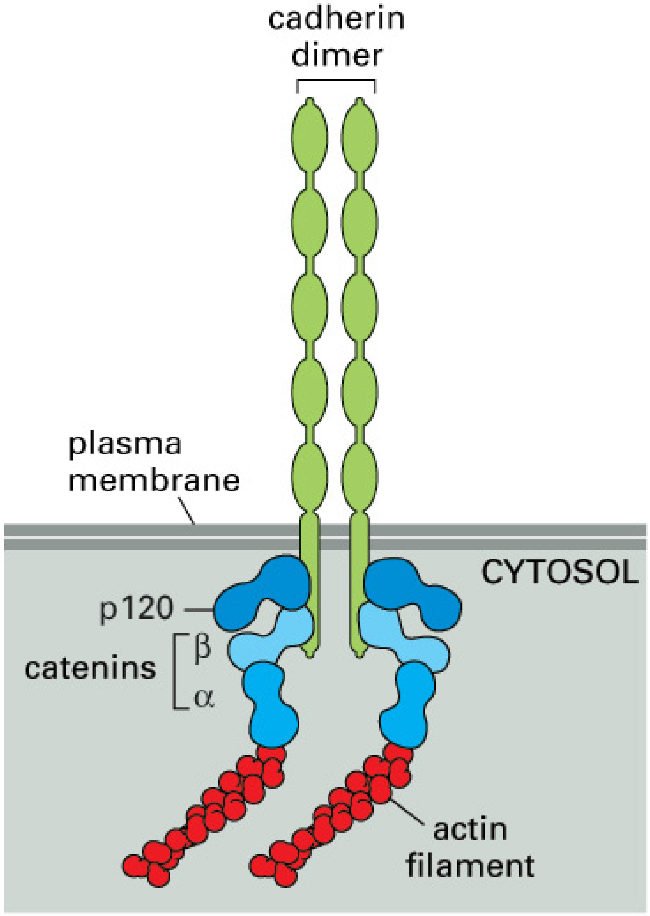
(A)

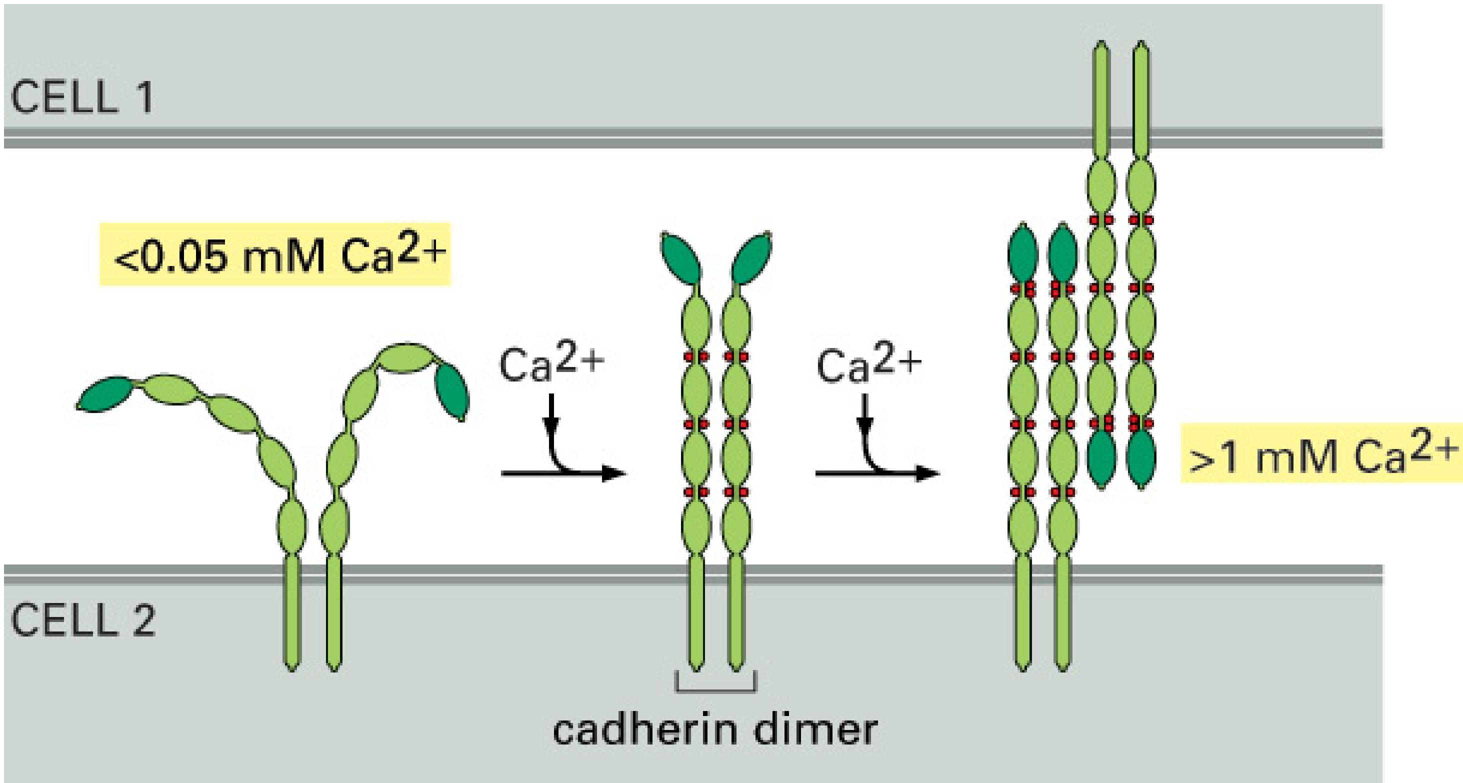


(B)

Cadherinas

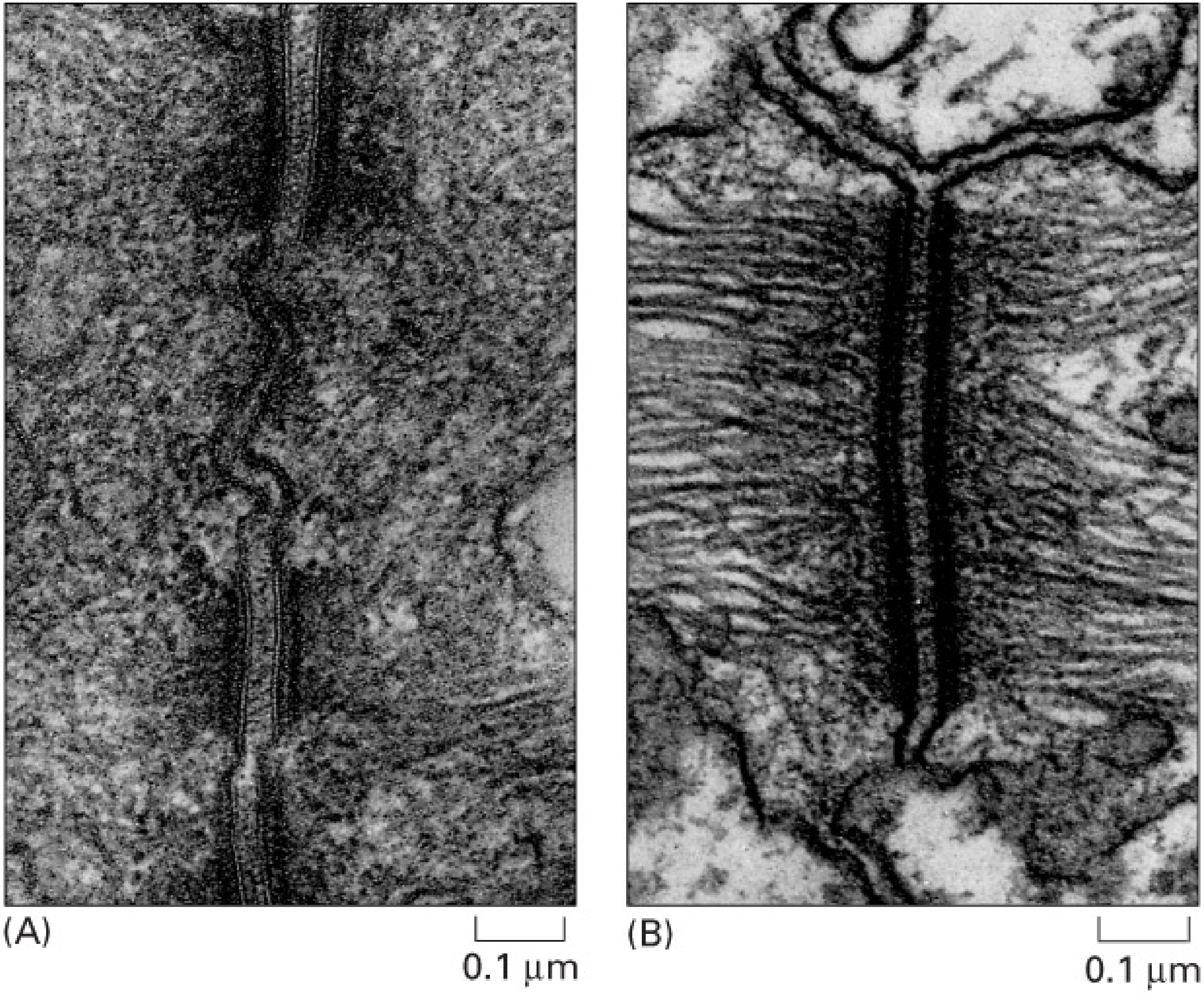

N N
cadherin repeat
Ca2+
plasma membrane
CYTOSOL
C C
(A)
cadherin dimer
N
(B)


cadherin dimer
plasma membrane
CYTOSOL
p120
catenins
β
α
actin filament

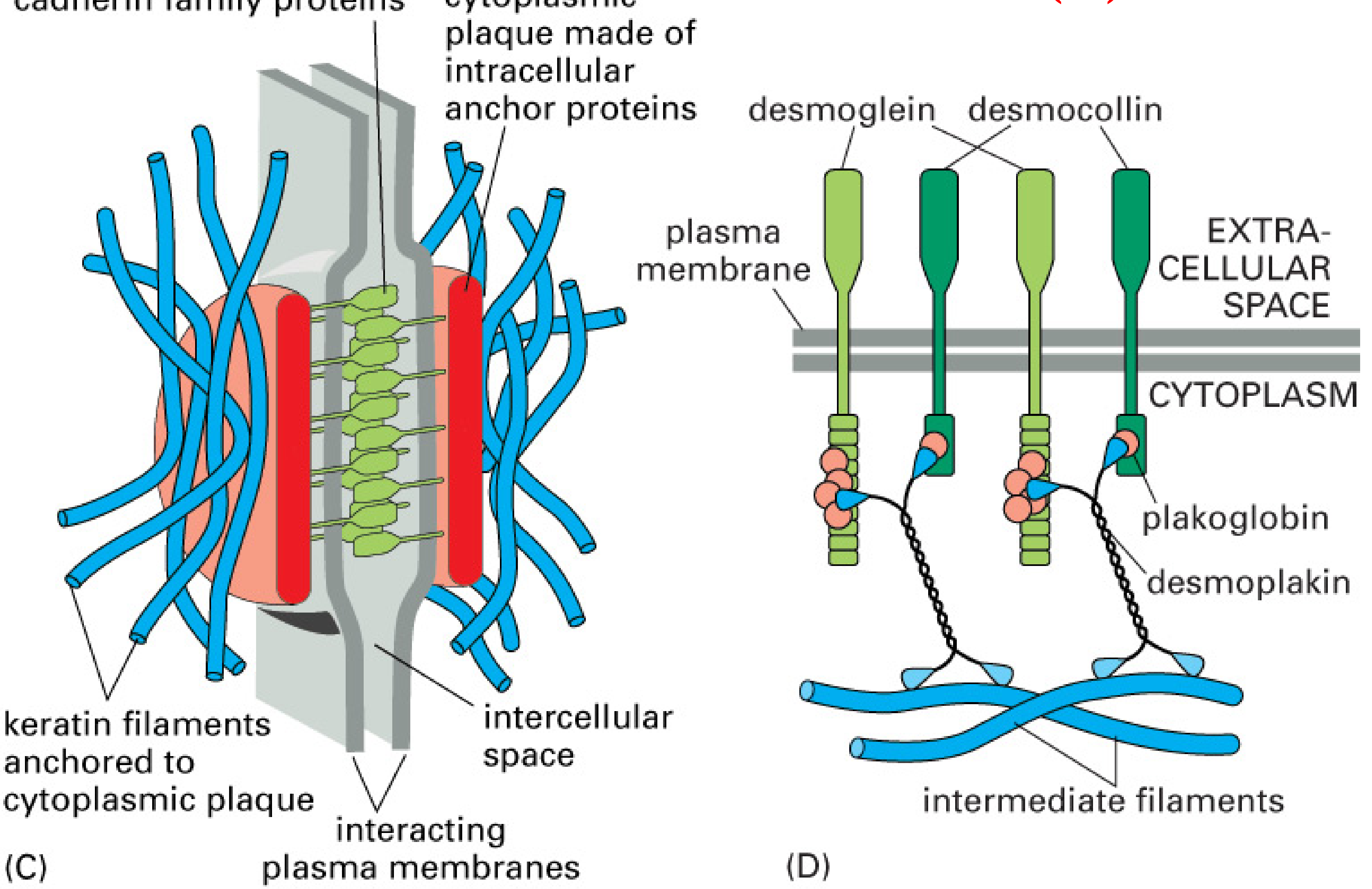


(C)

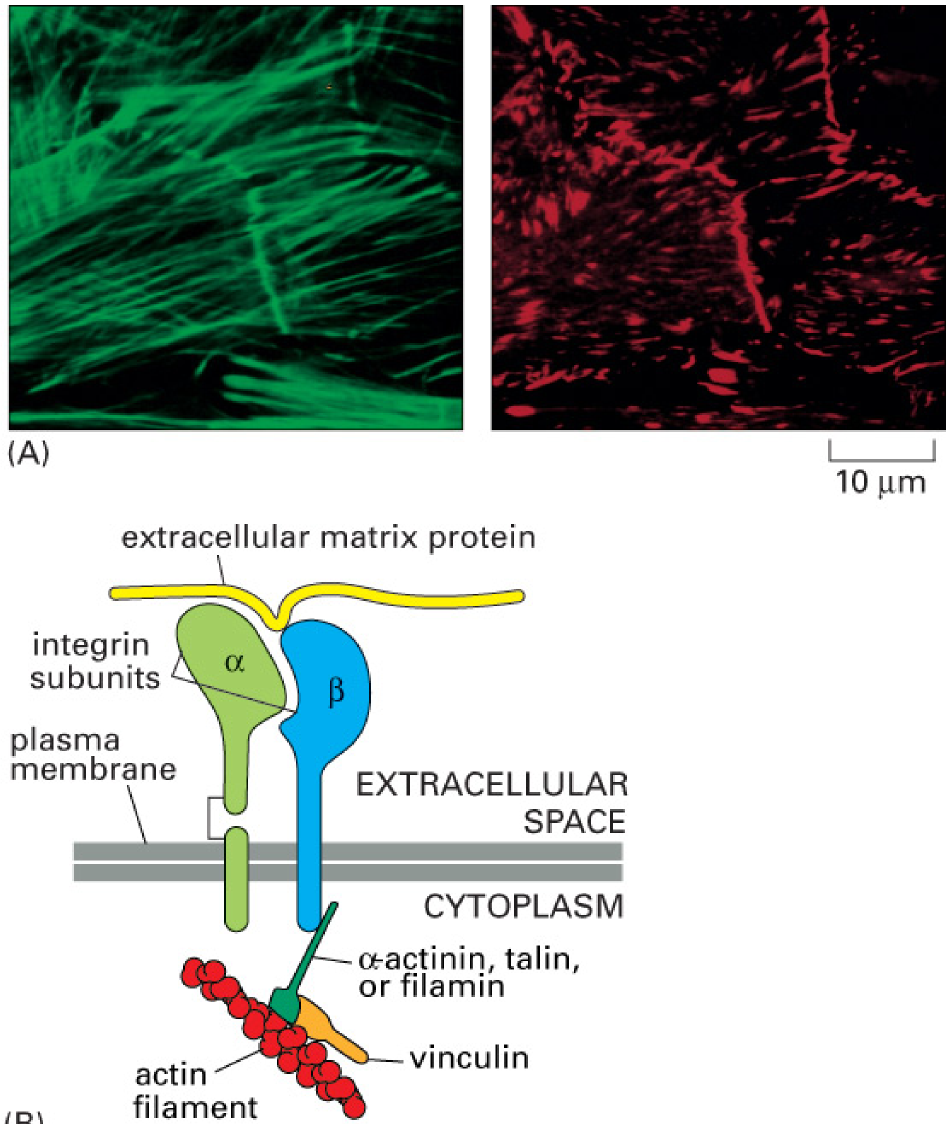
Desmosomas



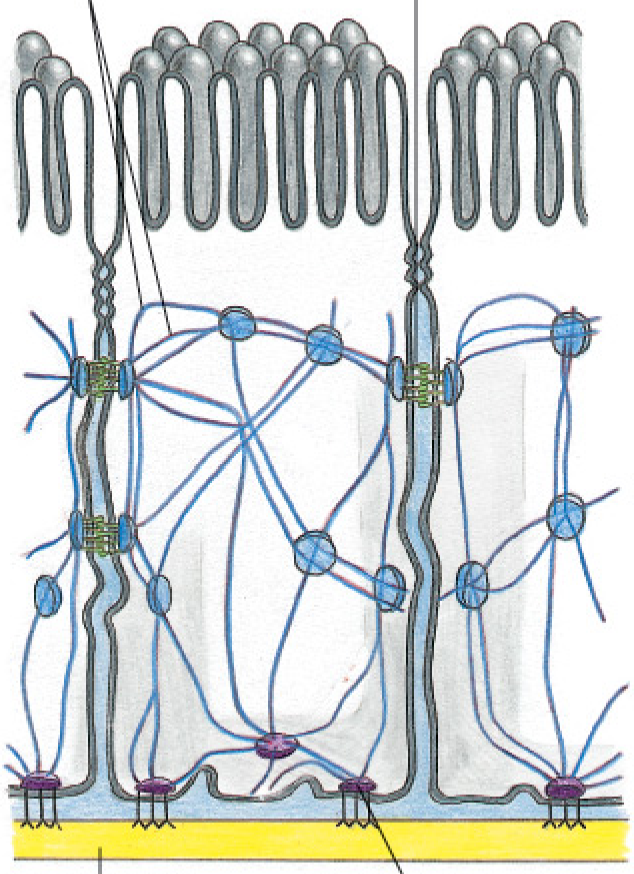
TIP: **desmina (FI)** musculo cardiaco



Contactos Focales



Hemidesmosomas



TIP: Desmosomas/Hemidesmosomas
Desmocolina, desmogleinas:
Placoglobinas,Desmoplaquinas:
Filamentos Intermedios
Laminina:Integrinas:
Plectinas:Filamentos intermedios

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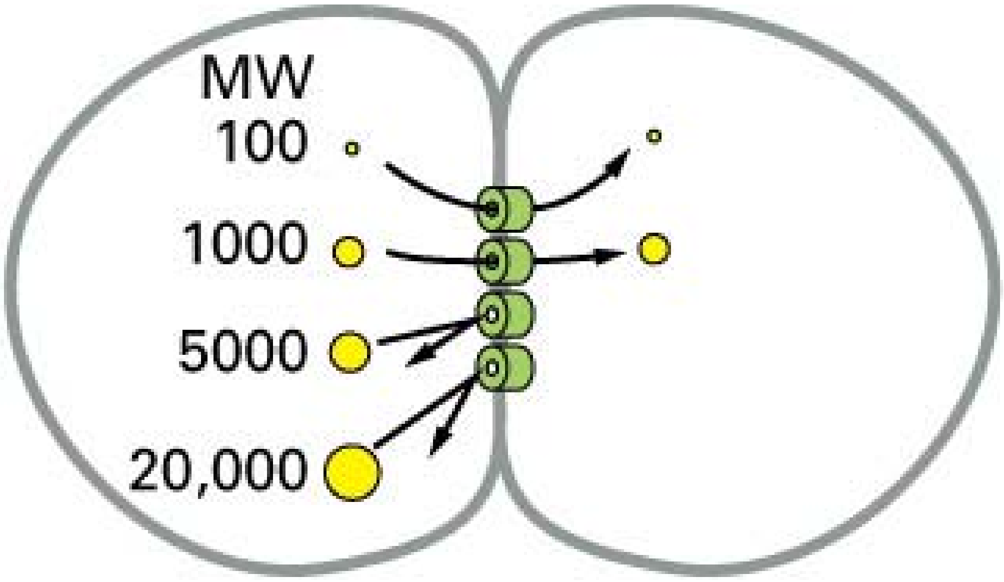
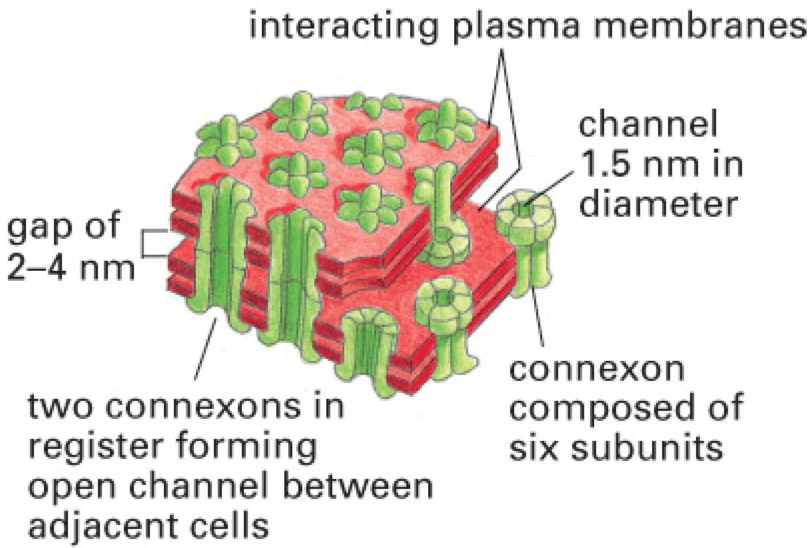
Uniones en Hendidura

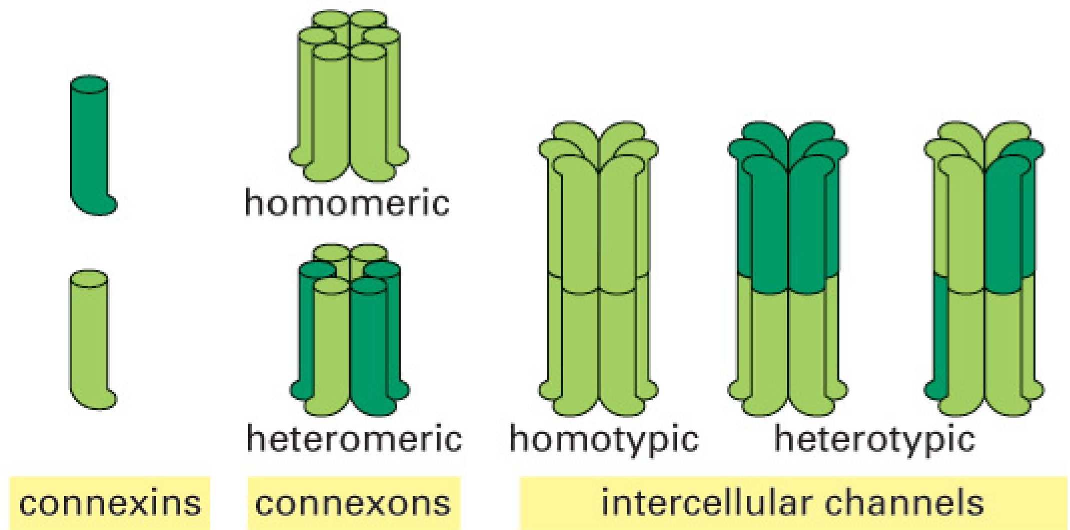


TIP: iones, azucares, aminoacidos, nucleotidos, cAMP e IP3)



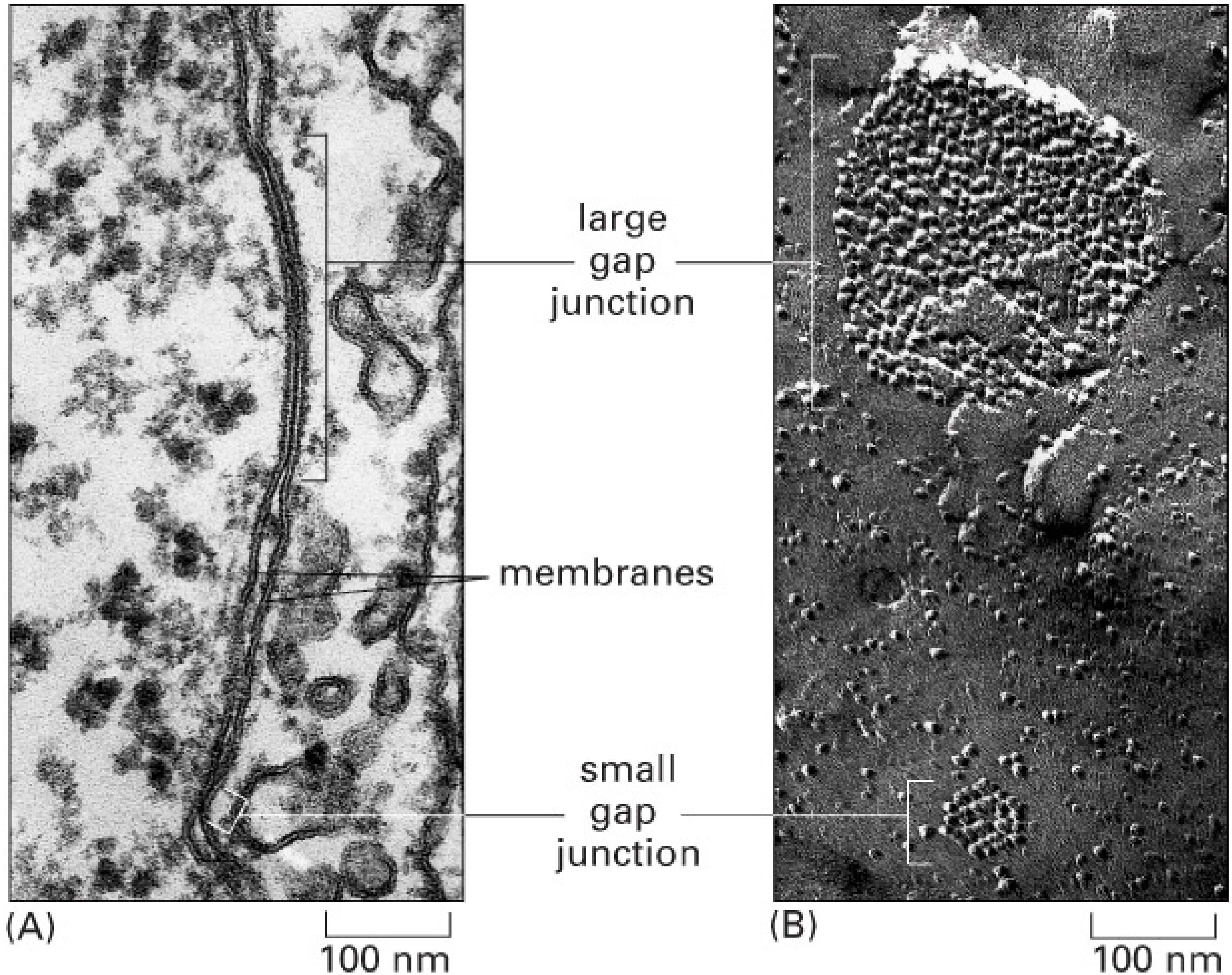
interacting plasma membranes
channel
1.5 nm in
diameter
gap of
2–4 nm
two connexons in
register forming
open channel between
adjacent cells
connexon
composed of
six subunits

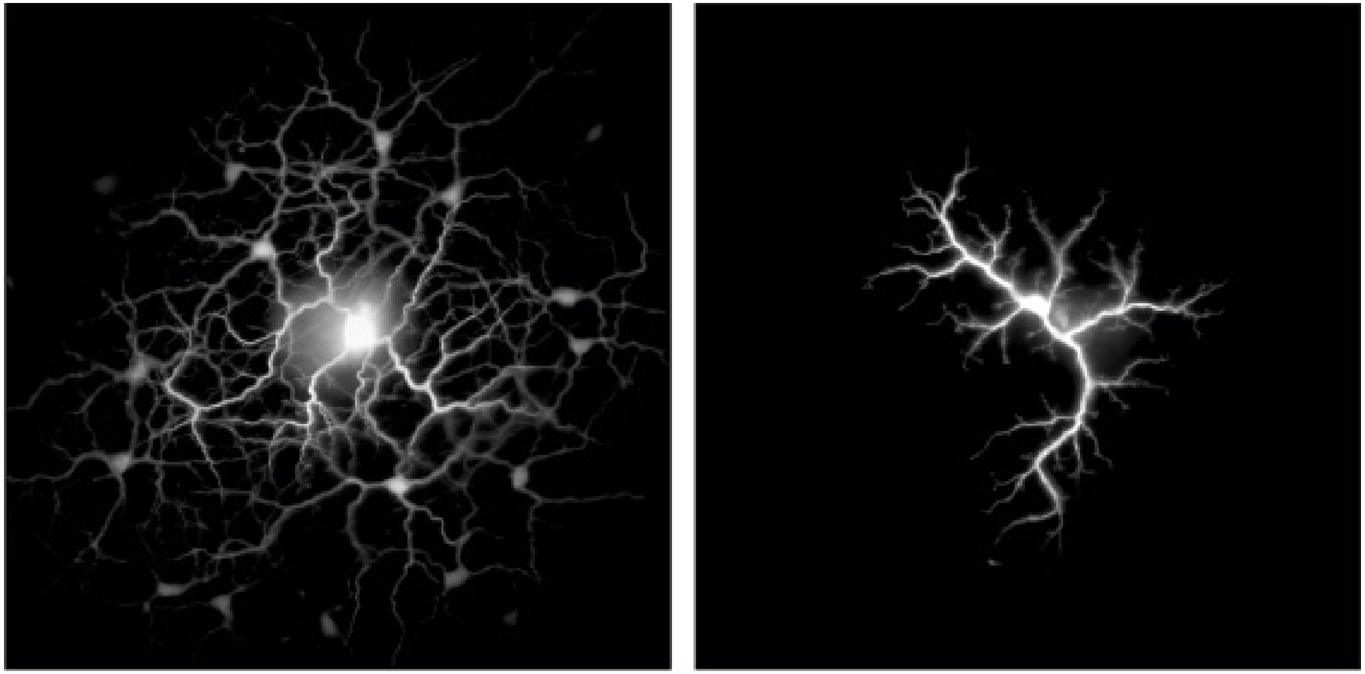
(A)



homomeric
heteromeric
homotypic
heterotypic
connexins
connexons
intercellular channels

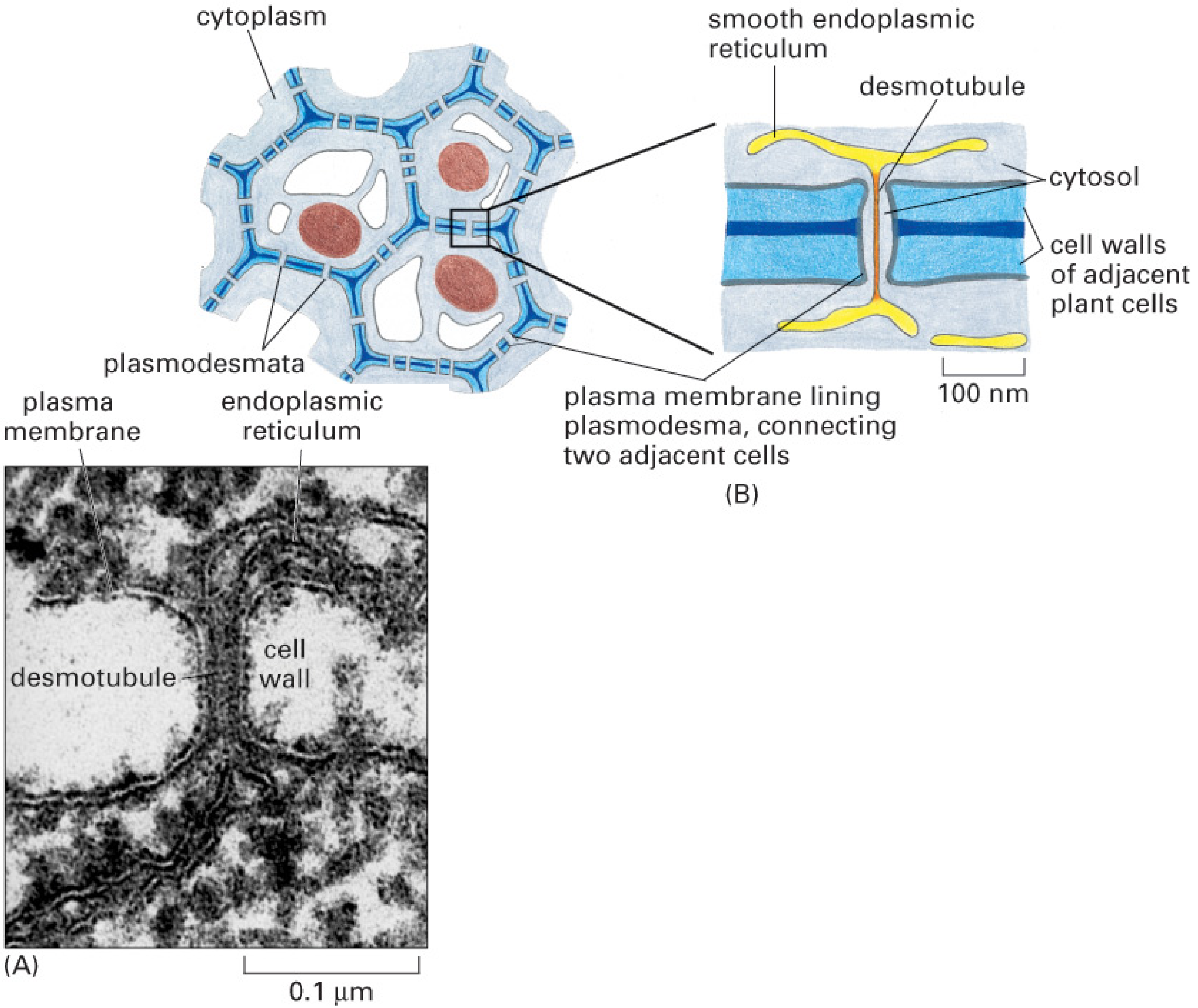
(B)


large
gap
junction
membranes
small
gap
junction
(A)
100 nm
(B)
100 nm



(A) (B)

Plasmodesmos



Lo que vamos a ver....

1.- Matrix extracelular animal y vegetal

2.- Uniones celulares

3.- Resúmen

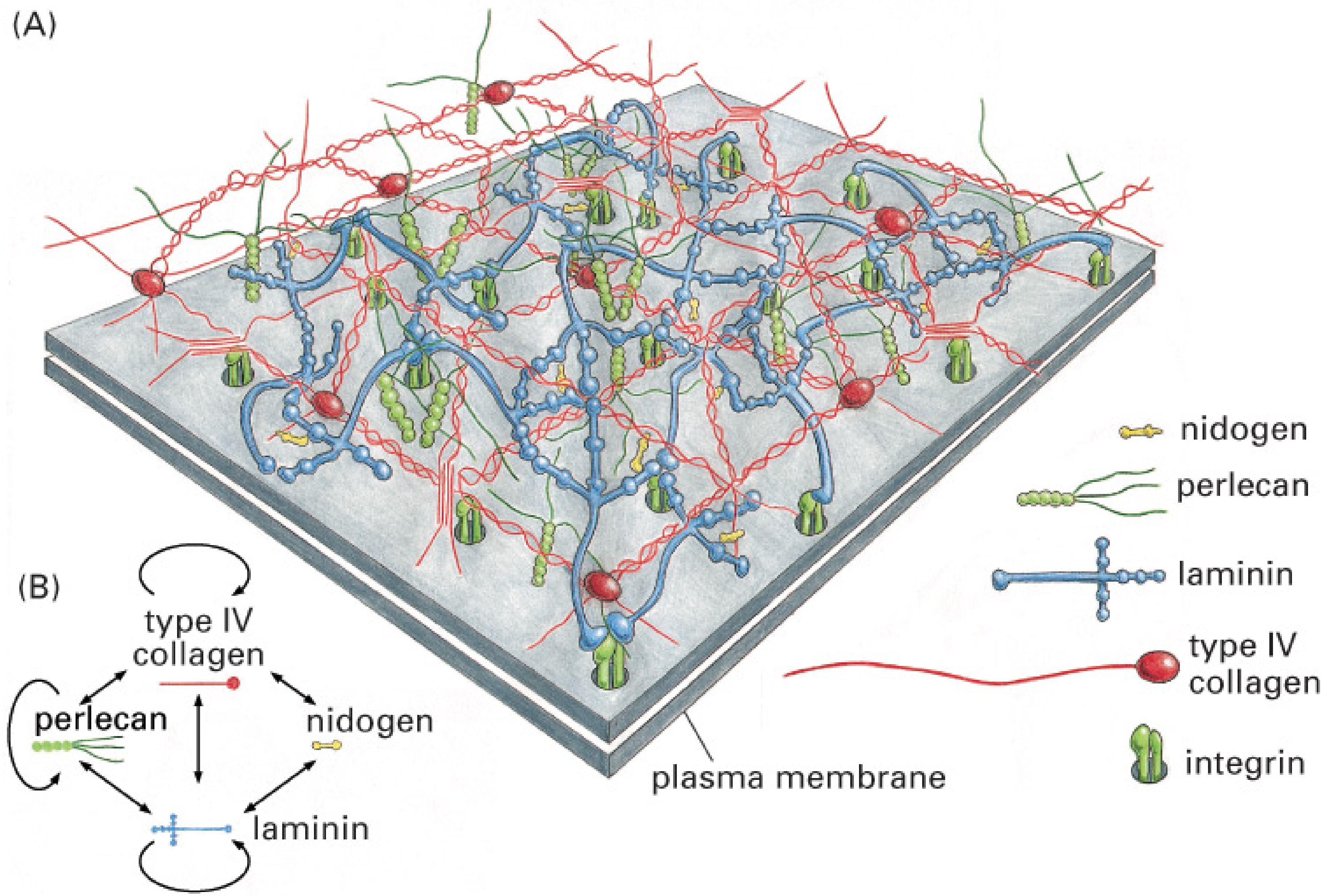
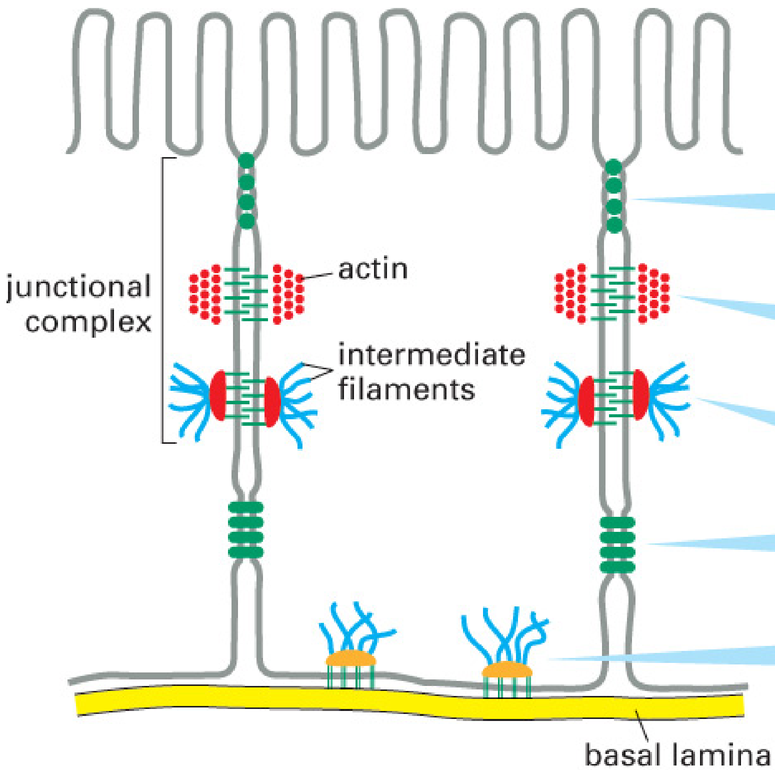
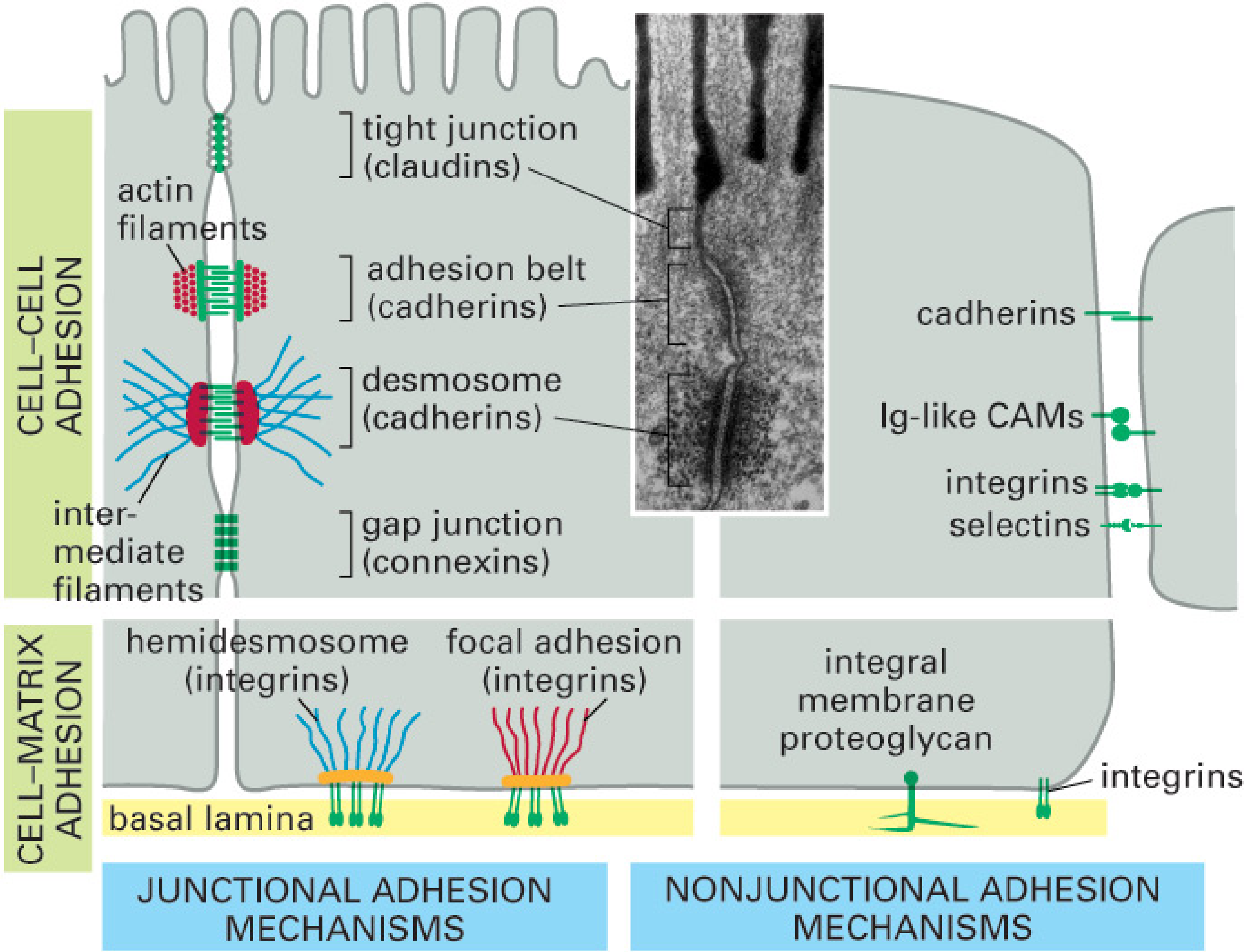


Figure 19–58. Molecular Biology of the Cell, 4th Edition.



name	function
tight junction	seals neighboring cells together in an epithelial sheet to prevent leakage of molecules between them
adherens junction	joins an actin bundle in one cell to a similar bundle in a neighboring cell
desmosome	joins the intermediate filaments in one cell to those in a neighbor
gap junction	allows the passage of small water-soluble ions and molecules
hemidesmosome	anchors intermediate filaments in a cell to the basal lamina



CELL–CELL ADHESION
tight junction (claudins)
actin filaments
adhesion belt (cadherins)
desmosome (cadherins)
inter-mediate filaments
gap junction (connexins)
cadherins
Ig-like CAMs
integrins
selectins
CELL–MATRIX ADHESION
hemidesmosome (integrins)
focal adhesion (integrins)
integral membrane proteoglycan
integrins
basal lamina
JUNCTIONAL ADHESION MECHANISMS
NONJUNCTIONAL ADHESION MECHANISMS

Bibliografía Clase

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-Essential Cell Biology (Bruce Alberts), 2nd Edition (2004)