CELL SURFACE SPECIALIZATION

Department of Histology, Embryology, and Cytology
of the General Medicine Faculty

CELL SURFACE SPECIALIZATIONS

By Function:

Mobile structure:

- Cilia (epithelial cells of the airways and genital tract)
- *Flagella* (spermatozoon)
- *Kinocilia* (receptor cells of the vestibular organ)

Structures increasing the cell surface:

- Microvilli (in the epithelial cells form a brush border, for example, the epithelium of the small intestine)
- *Stereocilia* (immobile microvilli in the hair cells of the inner ear)
- *Basal striation or basal labyrinth (basal invaginations or infoldings of the epithelial cells with a transport function*)

Structures providing the adhesion and communication of cells:

- *Cell junctions*

By localization (in epithelial cells)

- structures of the apical surface – microvilli, cilia, stereocilia, kinocilia
- structures of the lateral surface – cell junctions
- structures of the basal surface – basal labyrinth, hemidesmosomes, focal adhesions

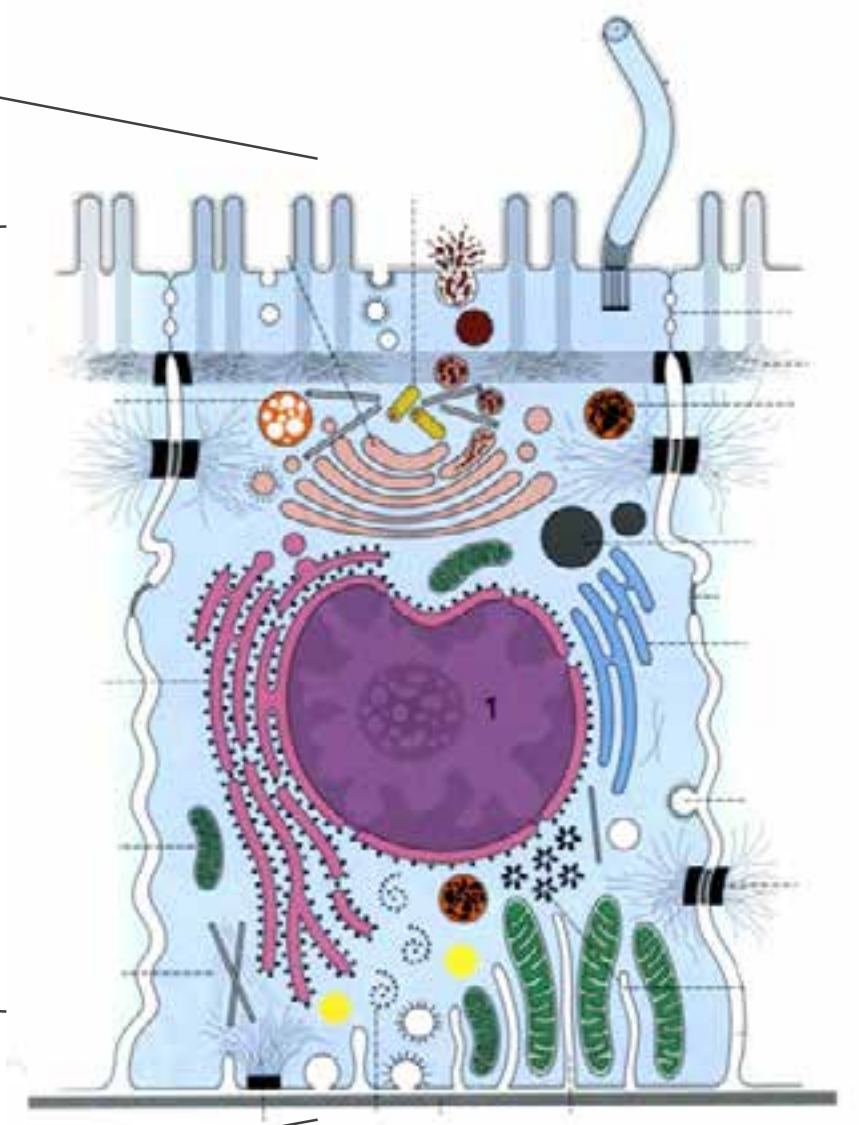
CELL SURFACE SPECIALIZATIONS

Apical:
- cilia
- microvilli

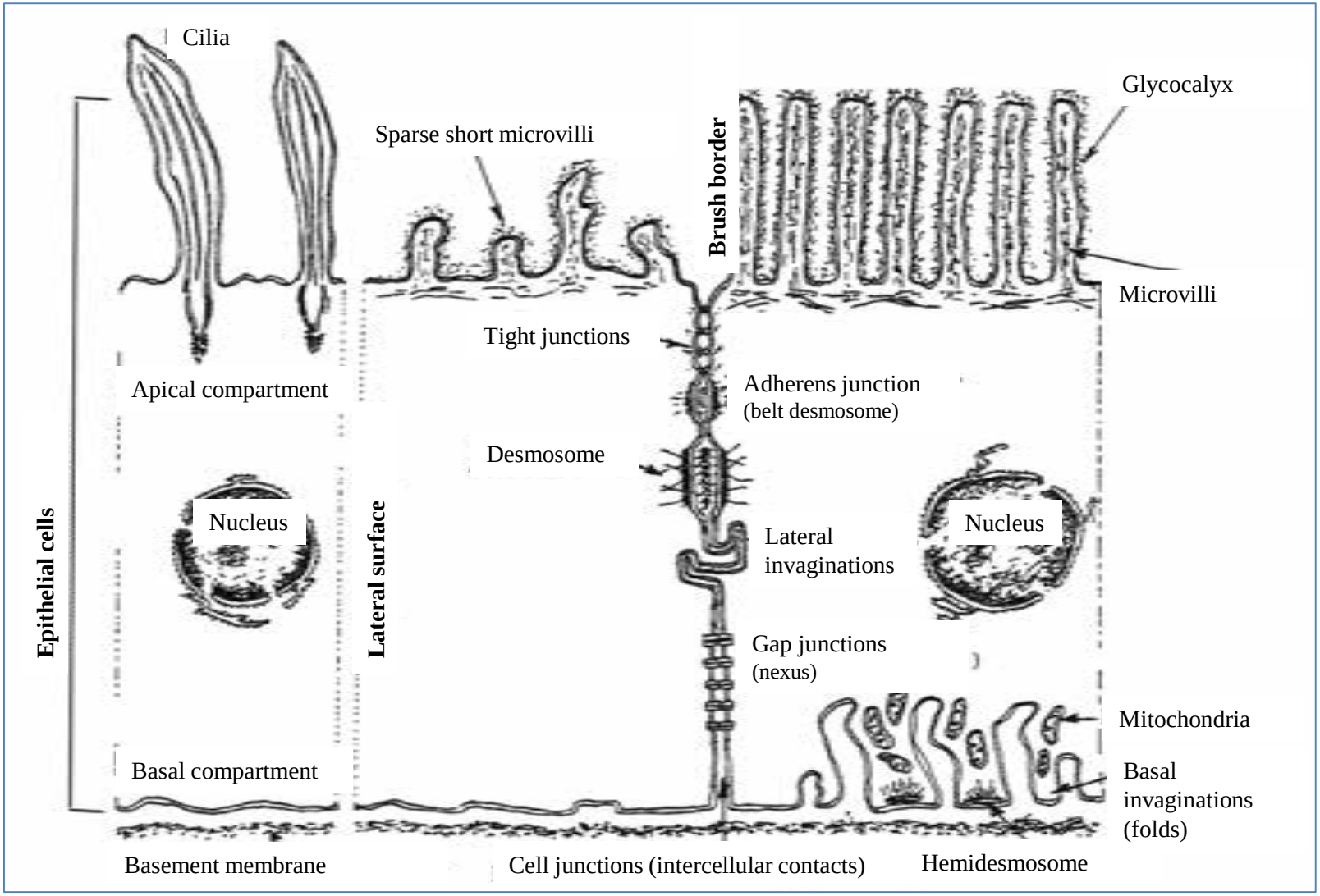
- *stereocilia* (in sensory cells)
- *kinocilia* (in sensory cells)

Lateral:
- cell junctions

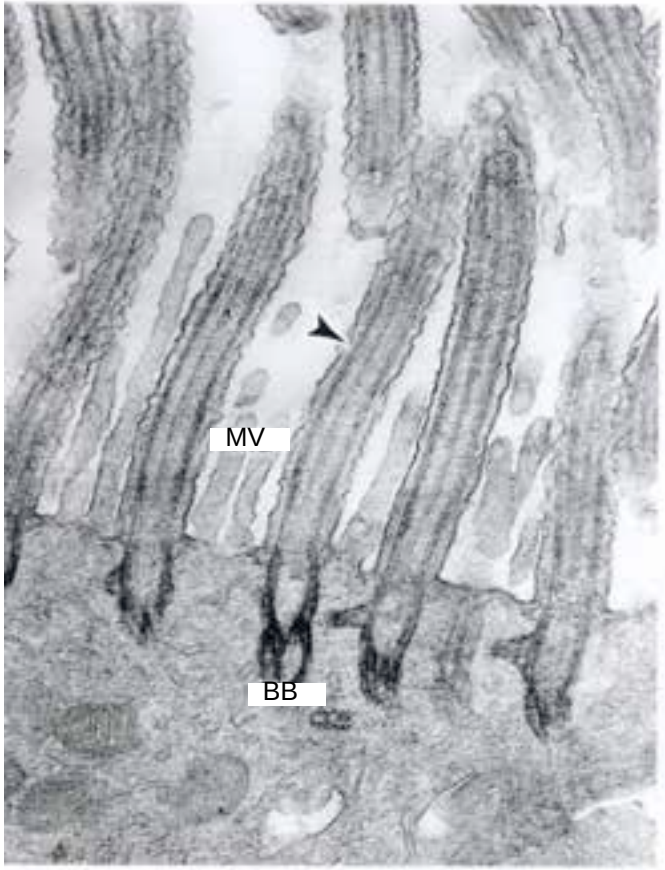
Basal:
- basal invaginations
- Anchoring junctions

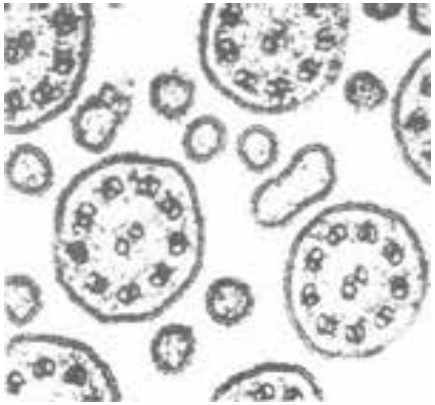


CELL SURFACE SPECIALIZATIONS



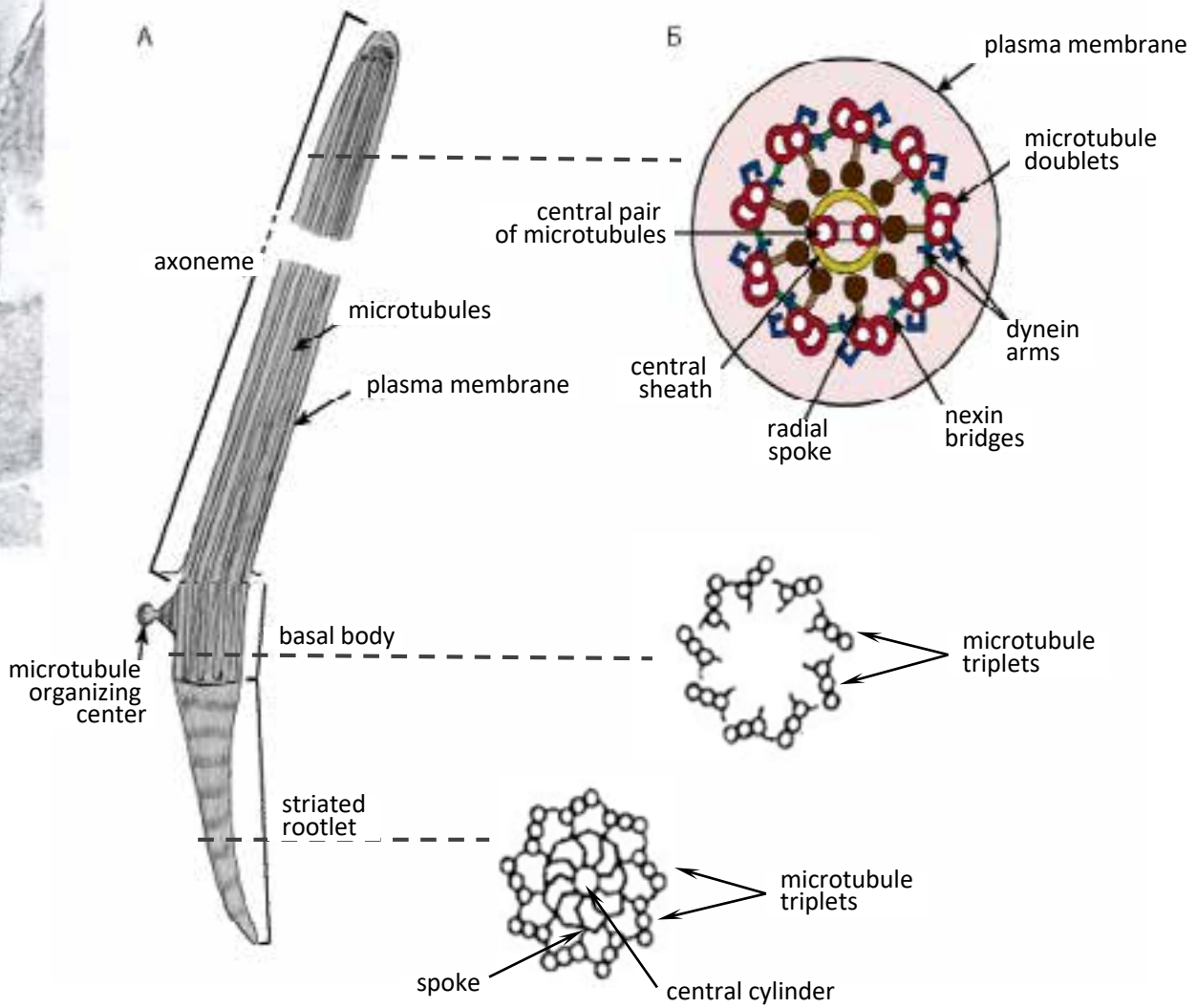
STRUCTURE OF CILIA



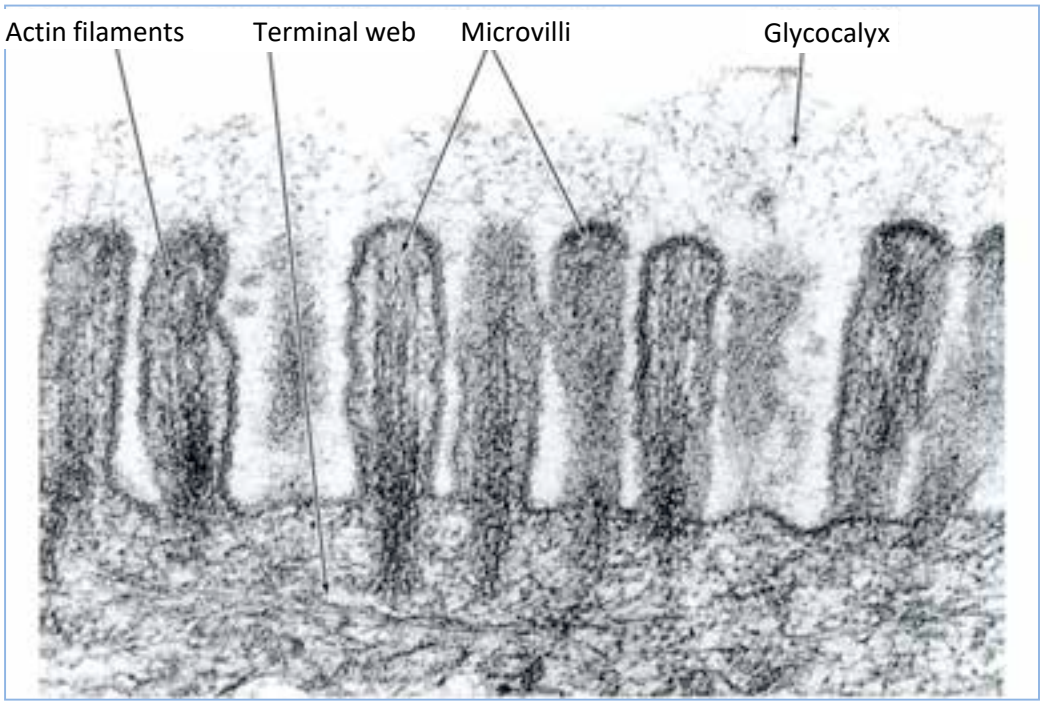


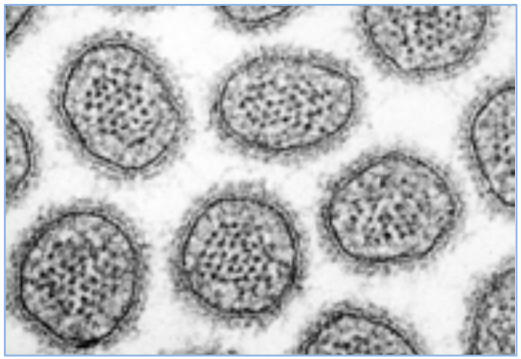
Longitudinal section

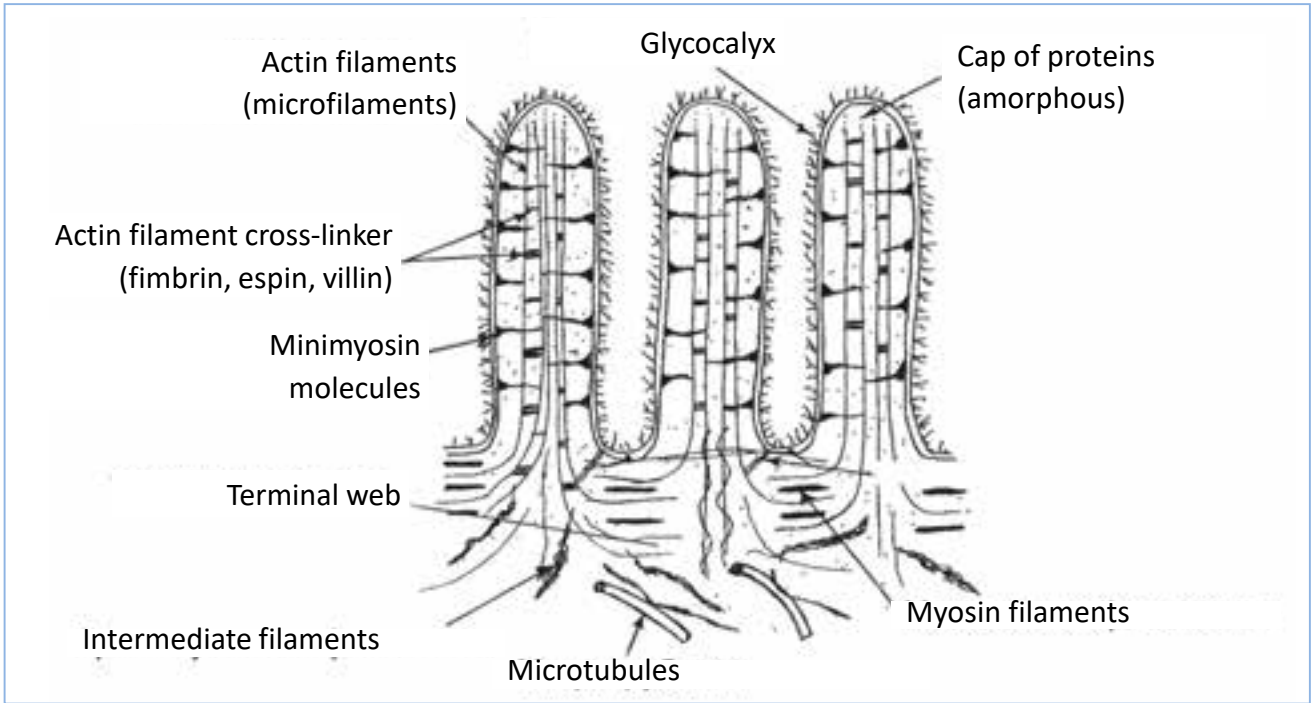
Transverse section



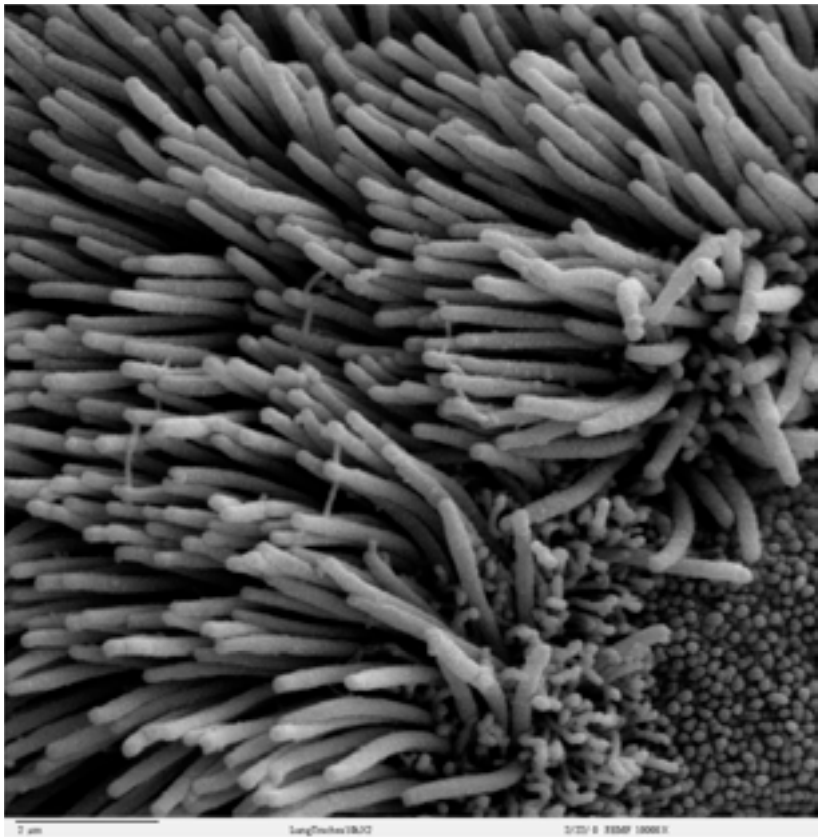
STRUCTURE OF MICROVILLI

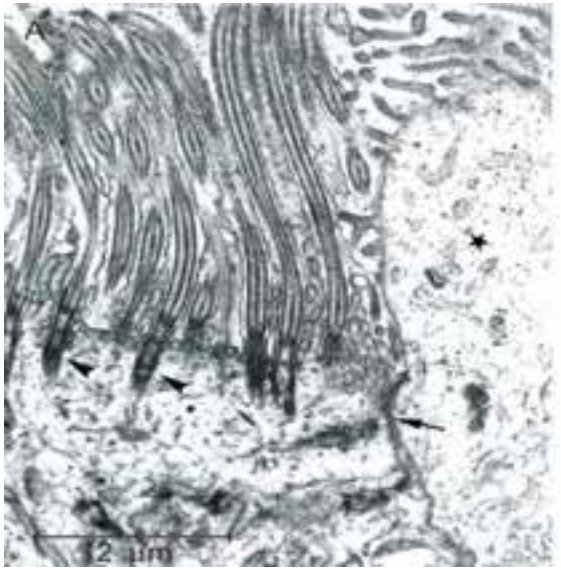




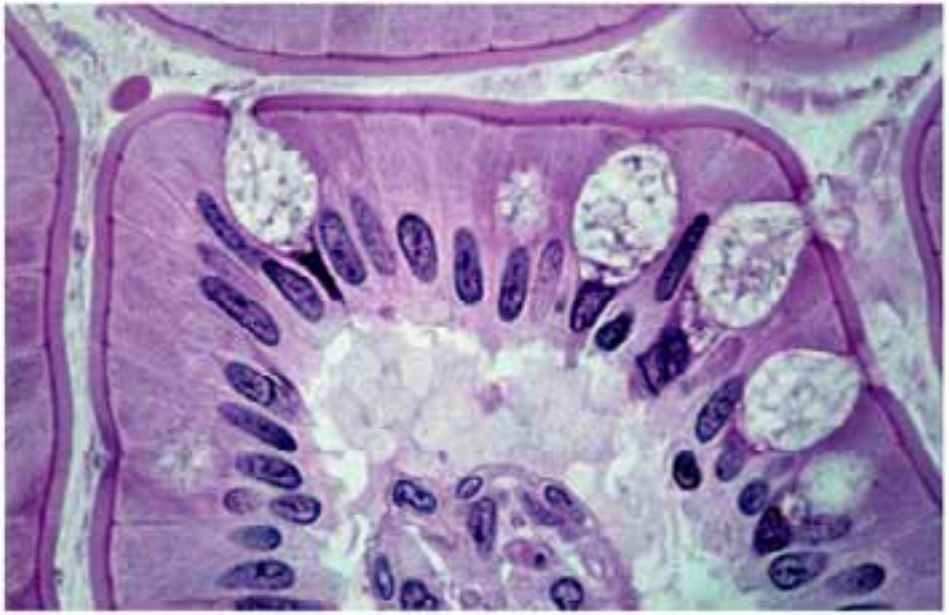


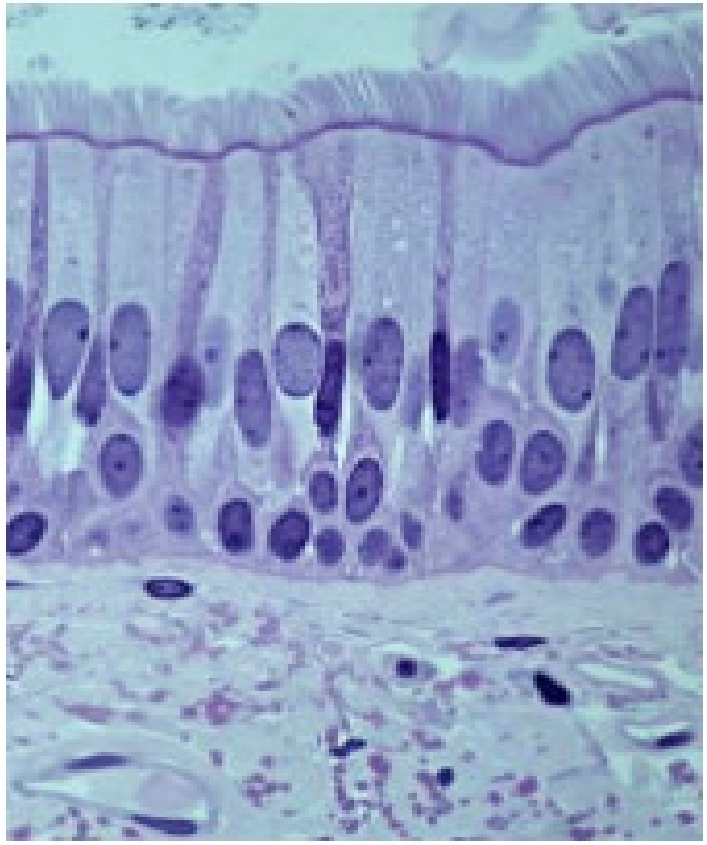
APICAL SURFACE SPECIALIZATIONS



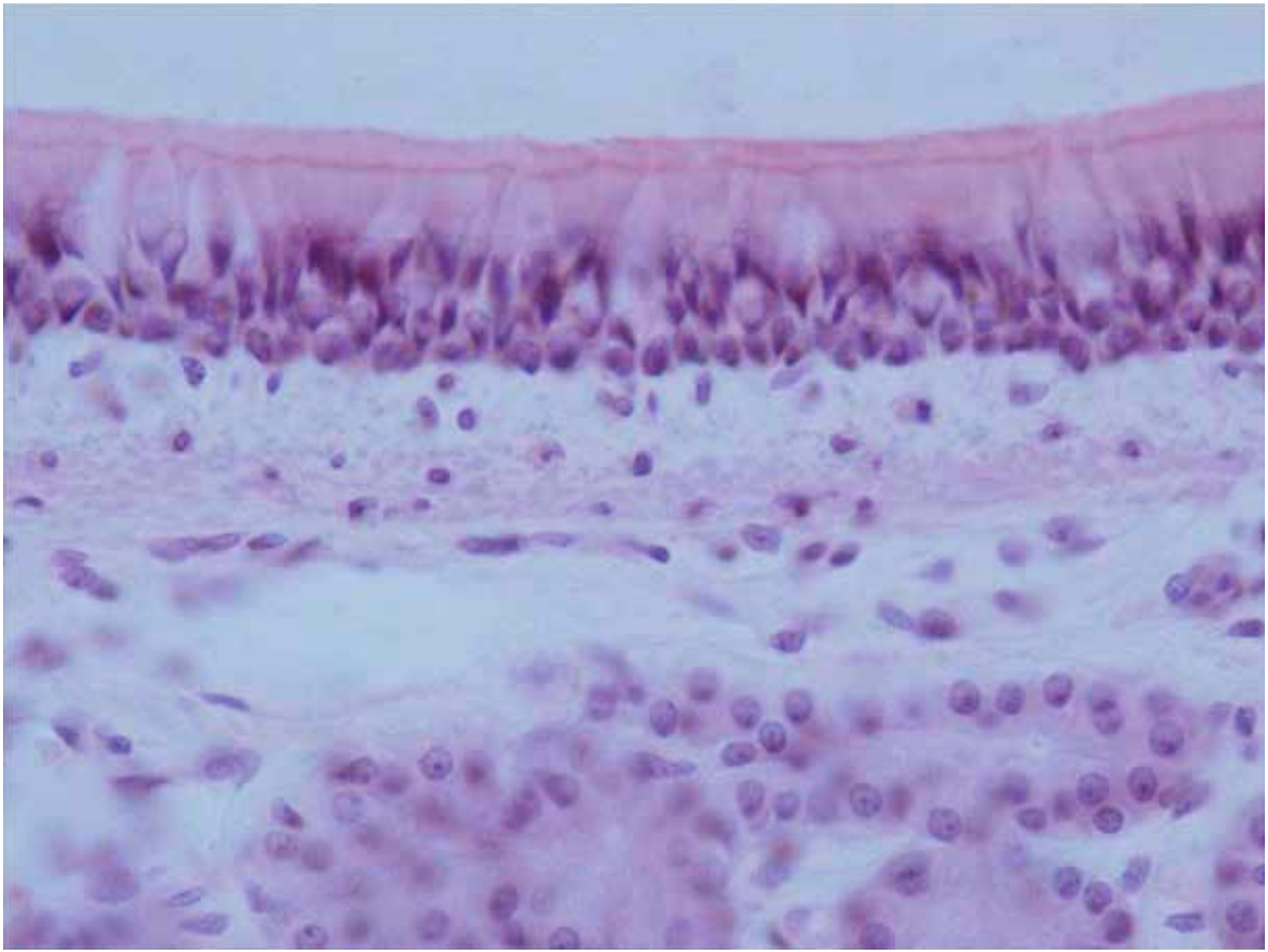


MICROVILLI. CILIA





Slide №44 «**Ciliated pseudostratified epithelium.** Section of trachea»
Staining: hematoxylin-eosin



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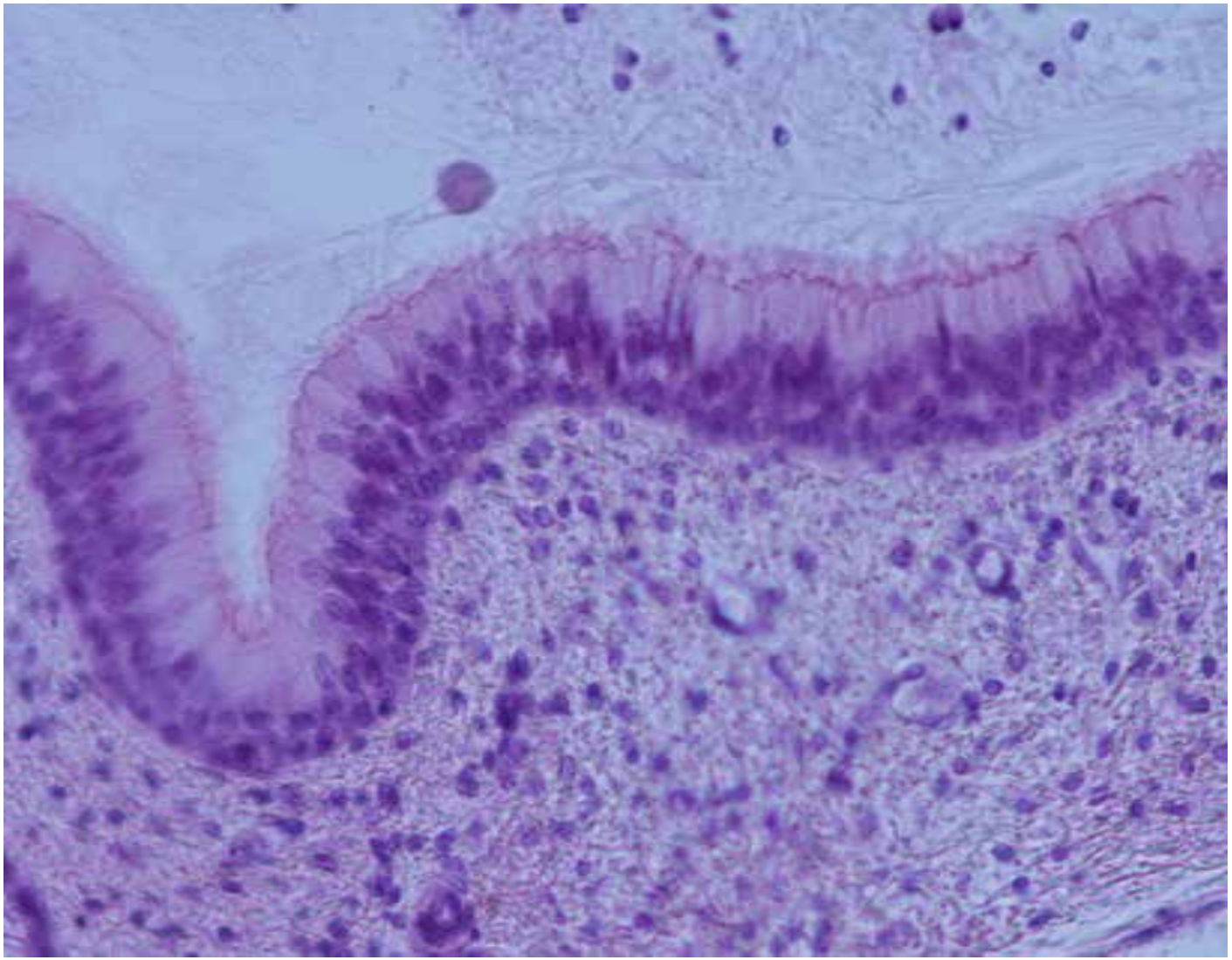
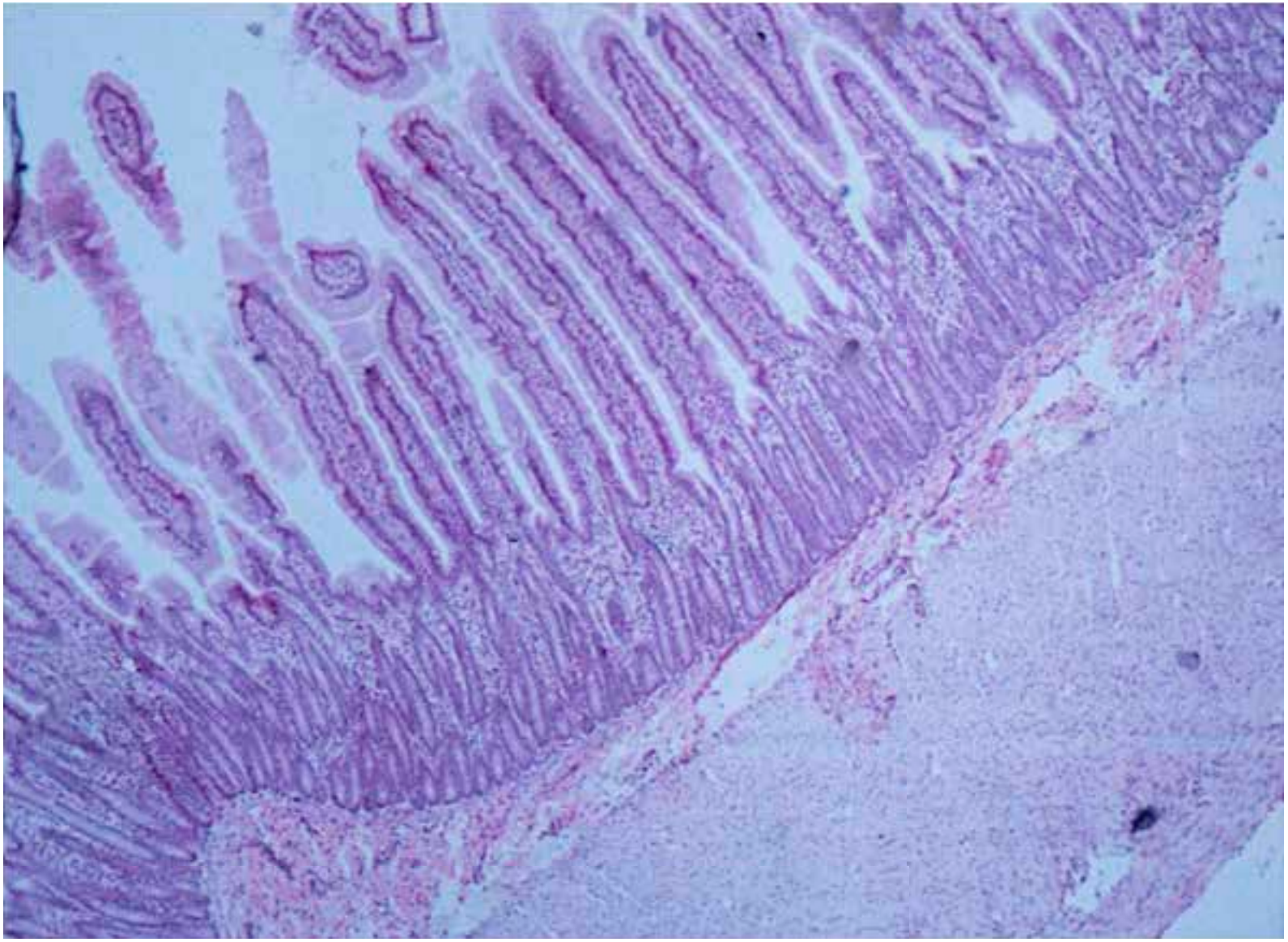


Slide №43 «**Simple columnar epithelium with brush border.** Section of small intestine»
Staining: hematoxylin-eosin



Slide №43 «**Simple columnar epithelium with brush border.** Section of small intestine»
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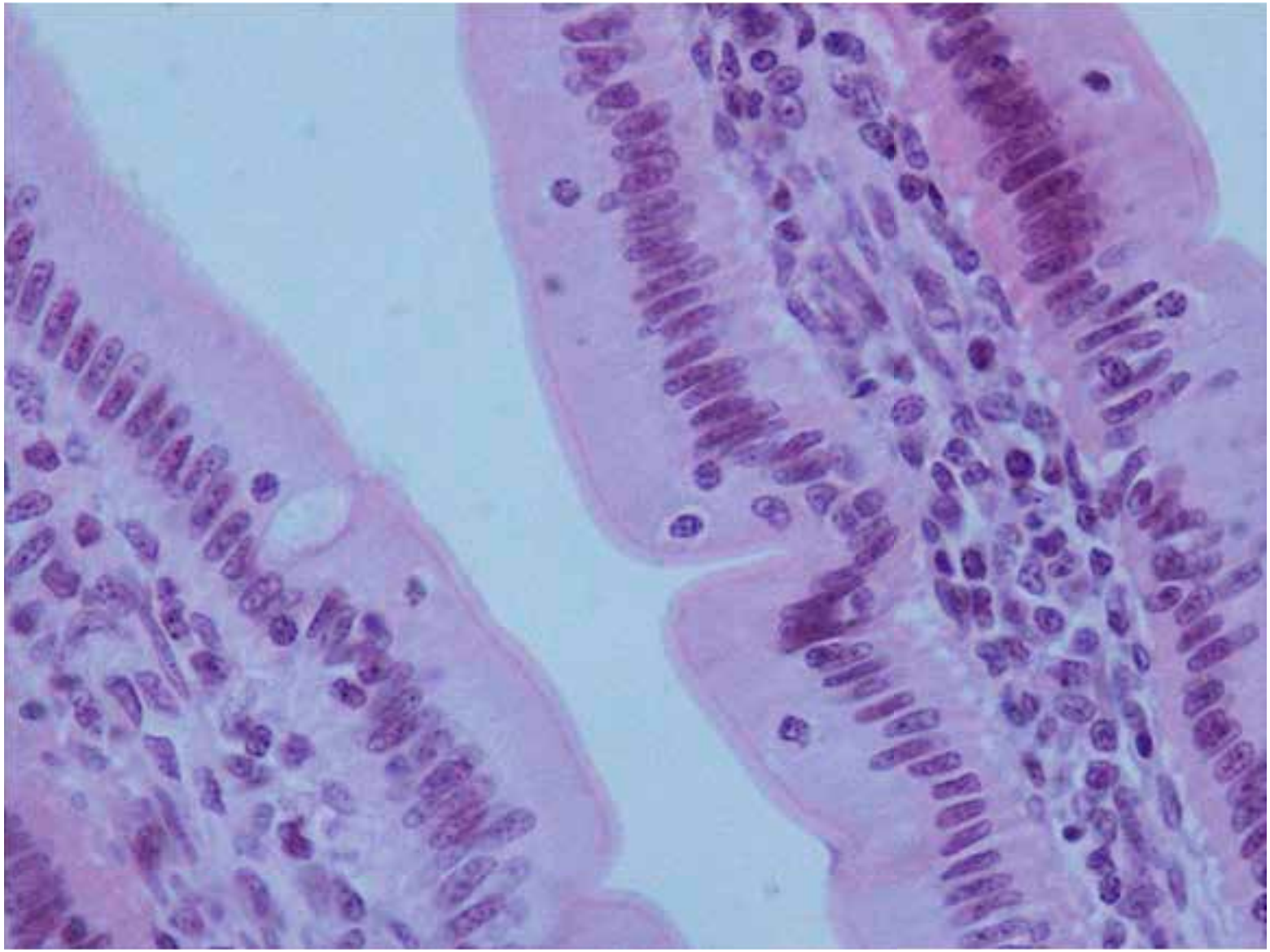
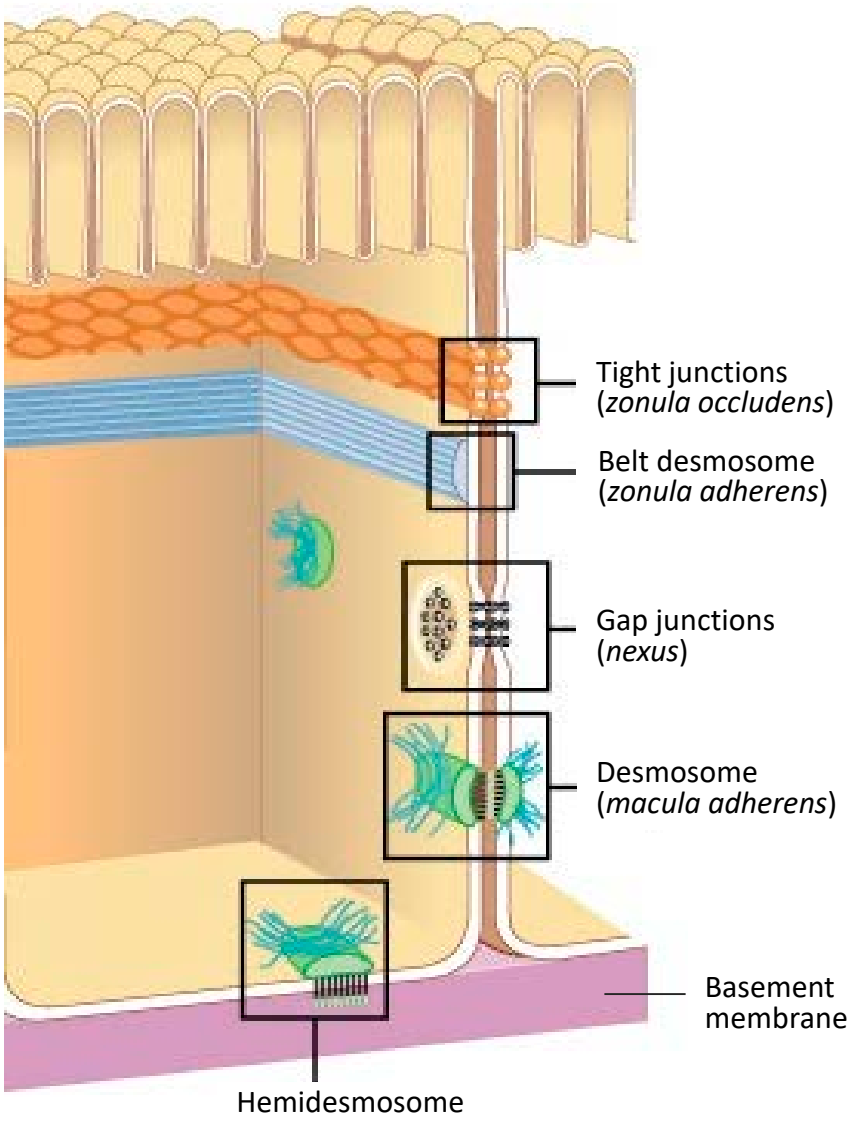


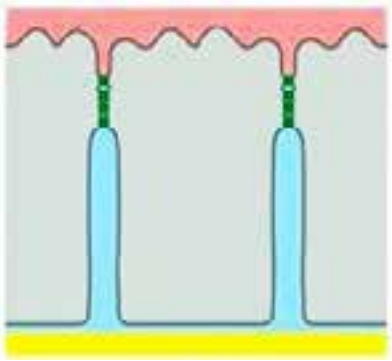
LATERAL SURFACE SPECIALIZATIONS

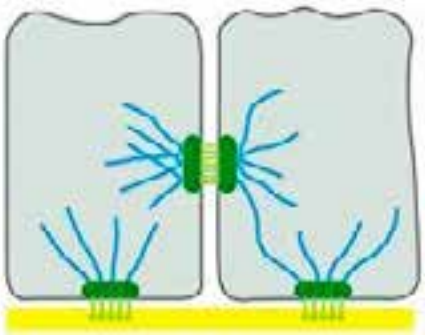


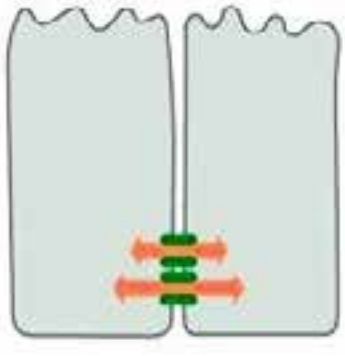
CELL JUNCTIONS

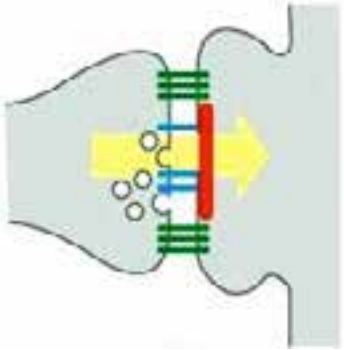
CELL JUNCTIONS

- Occluding junctions
  - *Tight junction*
- Mechanical attachments
  - Simple apposition:
    - *lateral interdigitation*
  - Adherent (anchoring) junctions:
    - *spot desmosome/macula adherentes*
    - *belt desmosome/zonula adherens;*
    - *hemidesmosome*
- Communicating junctions
  - *Synapse*
  - *Gap junction*









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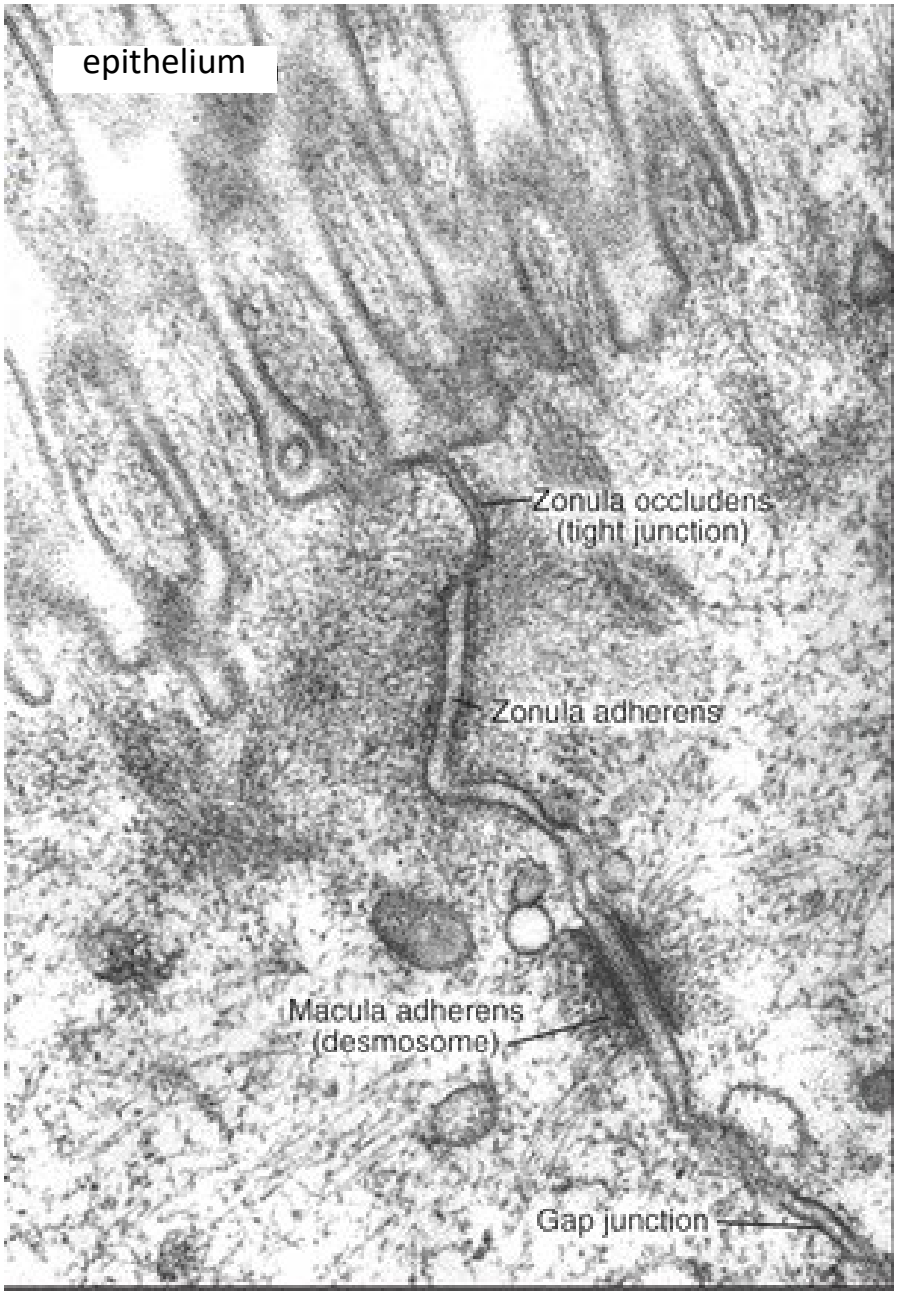

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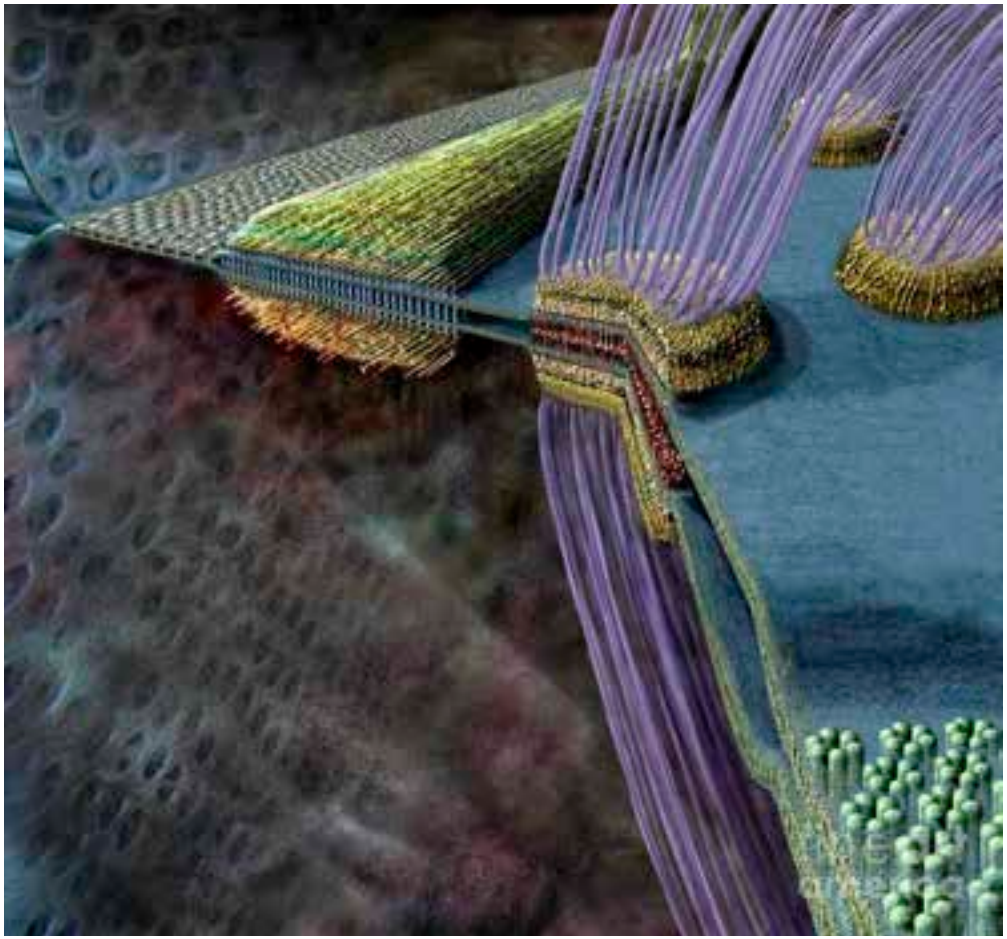

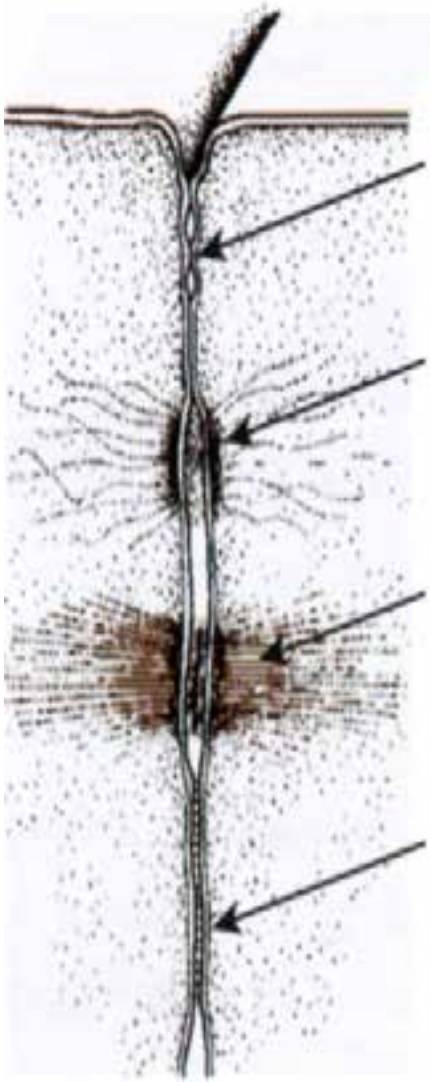

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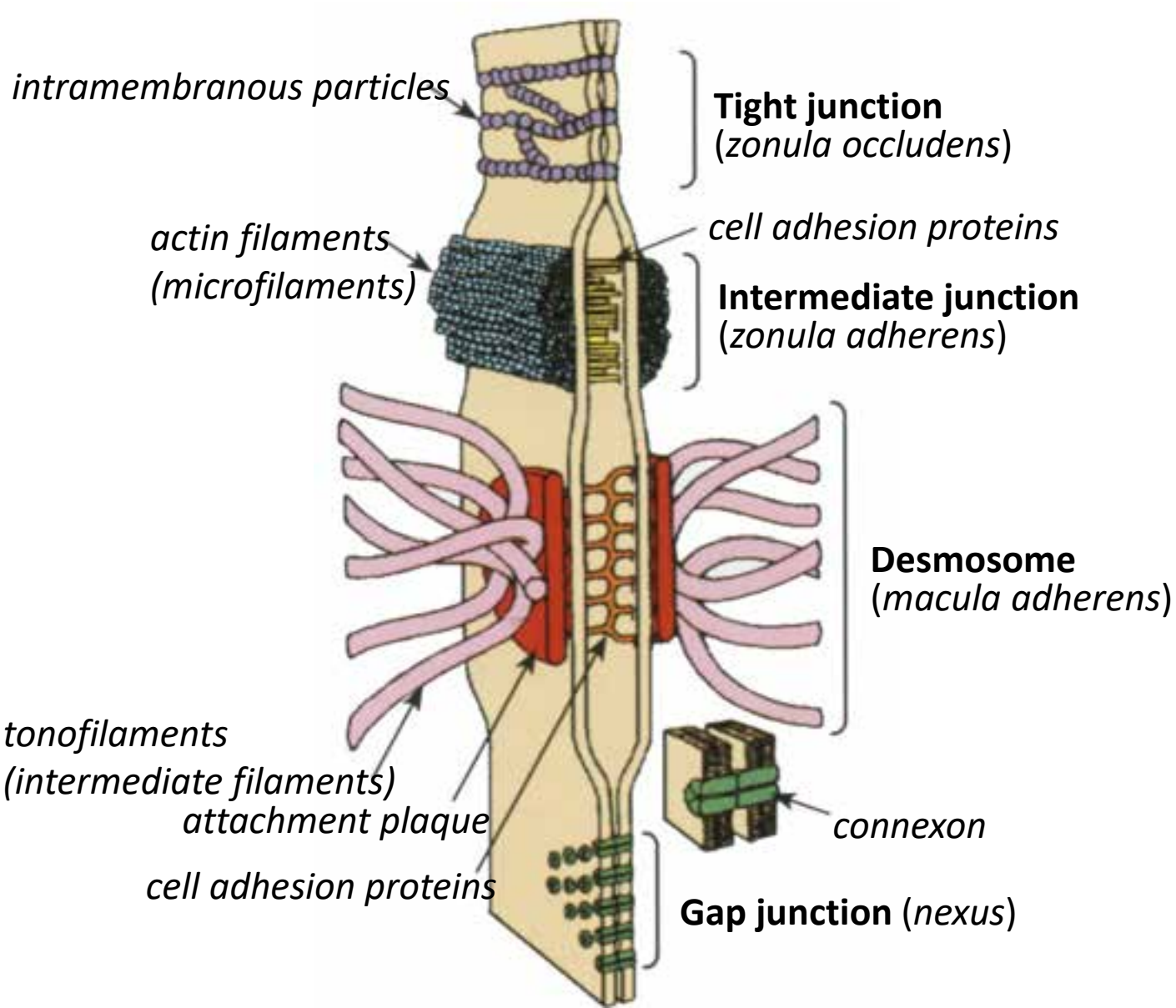
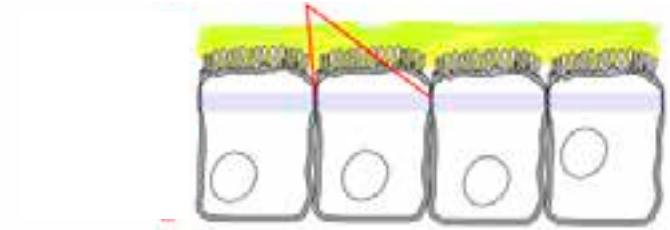
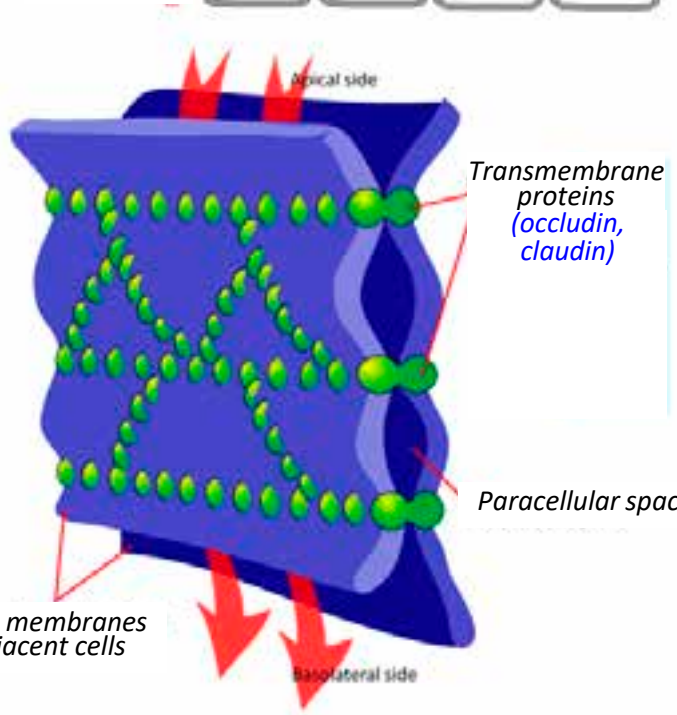
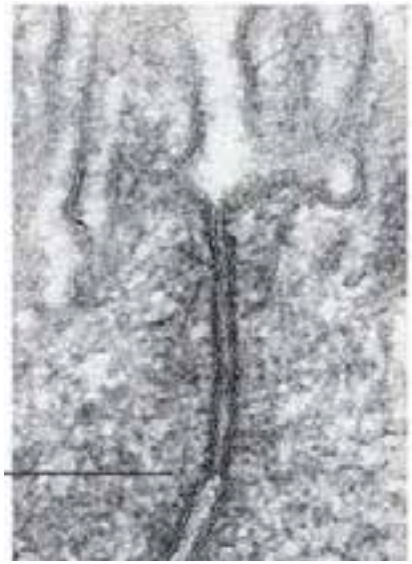
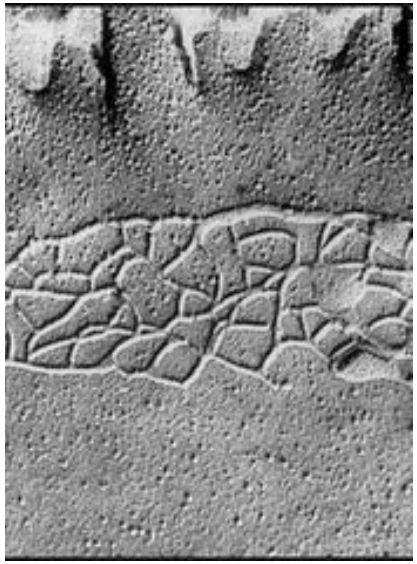


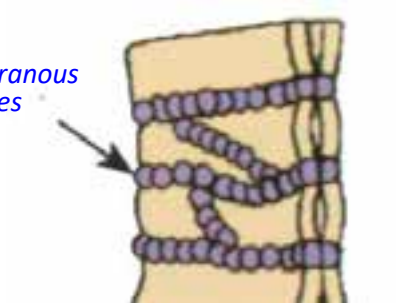
STRUCTURE OF TIGHT JUNCTION



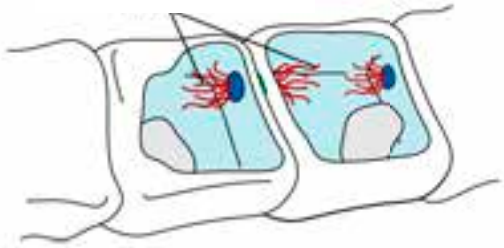


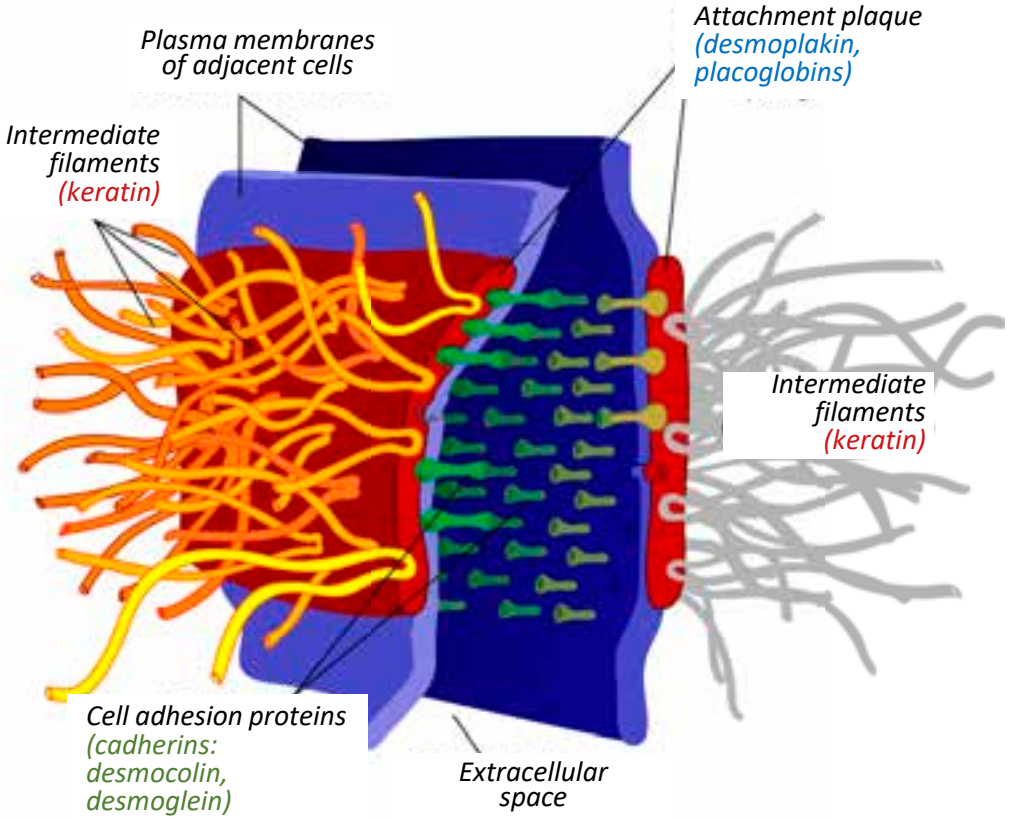


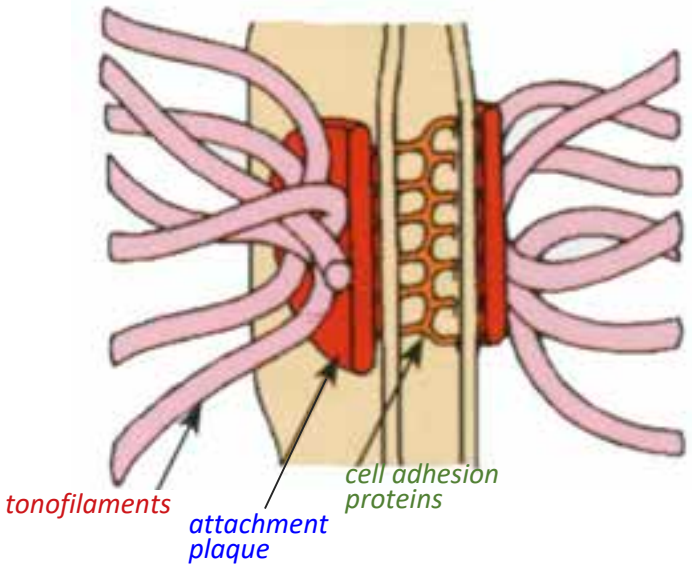




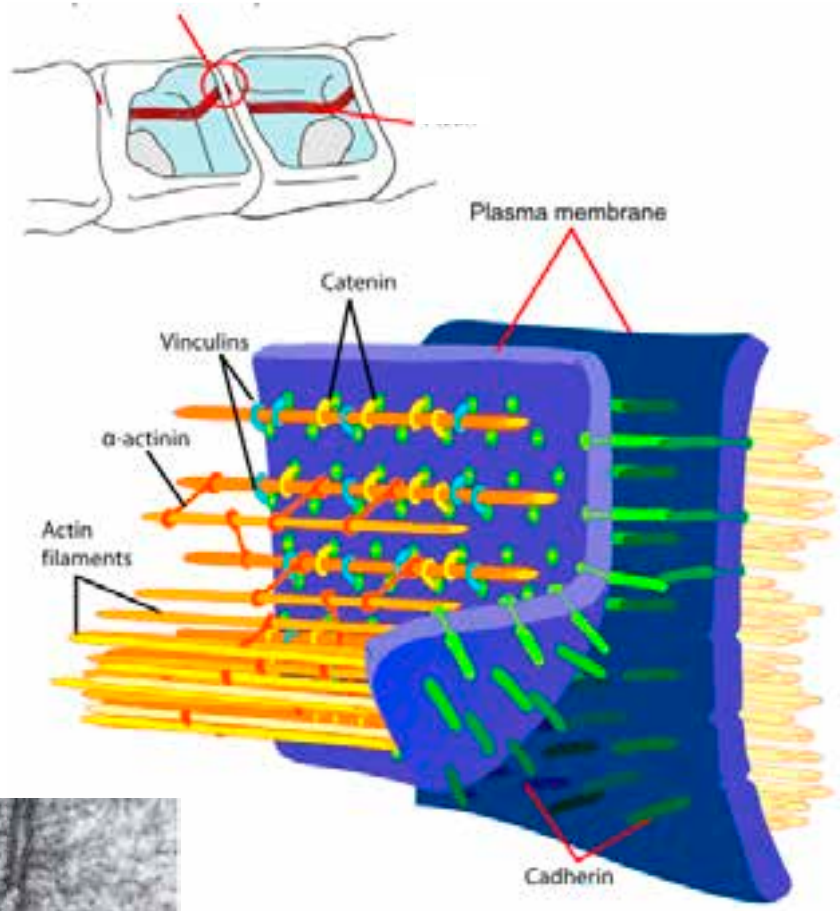
STRUCTURE OF SPOT DESMOSOME





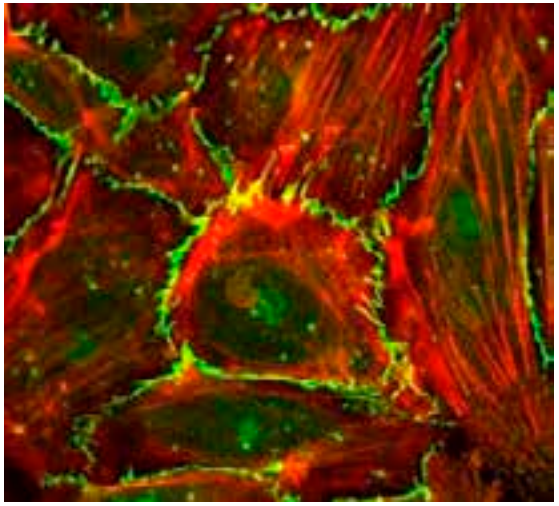


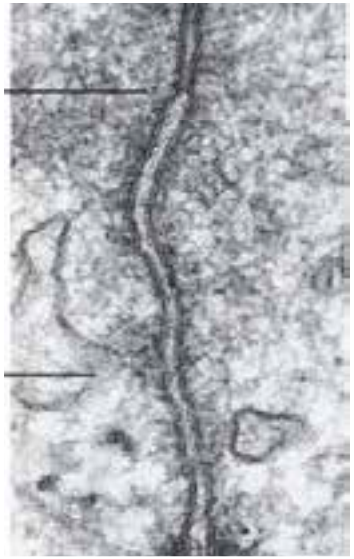
STRUCTURE OF BELT DESMOSOME

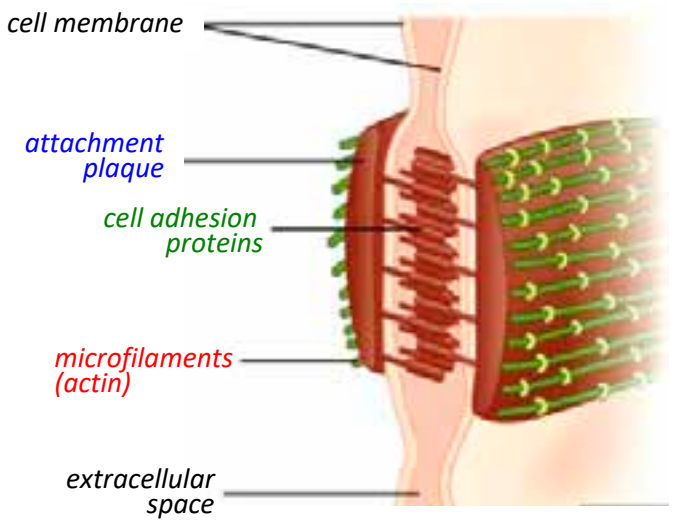


Cadherins

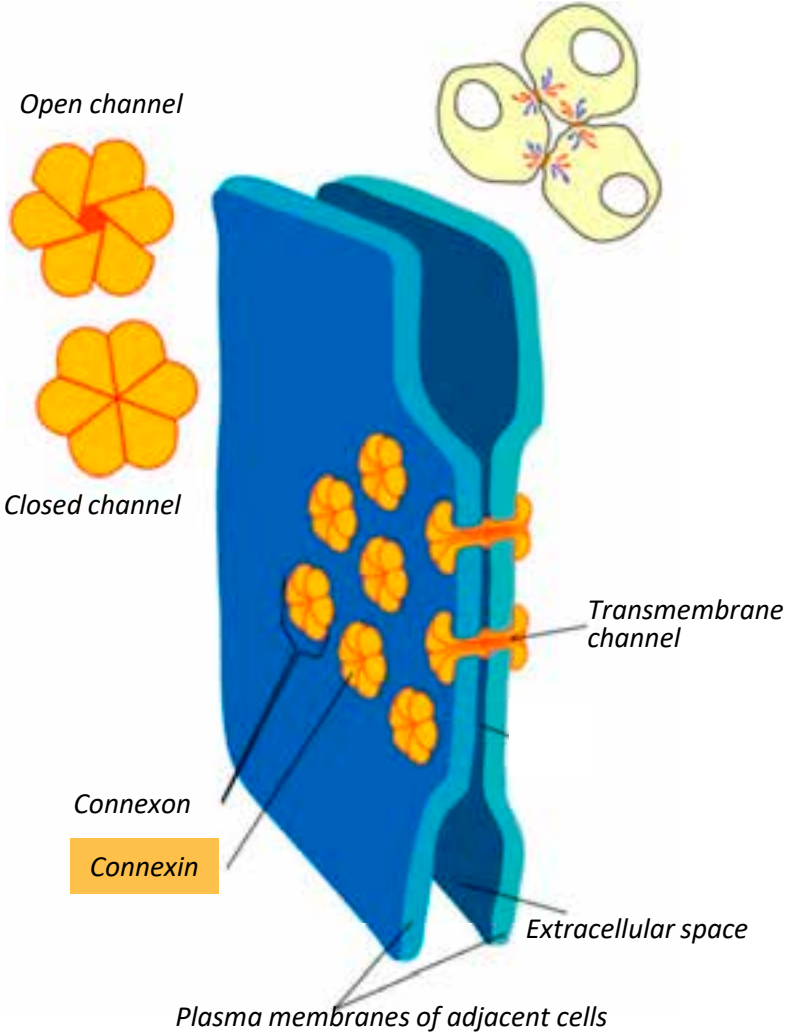
Actin microfilaments

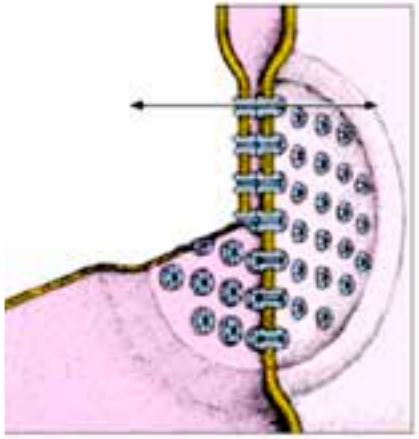


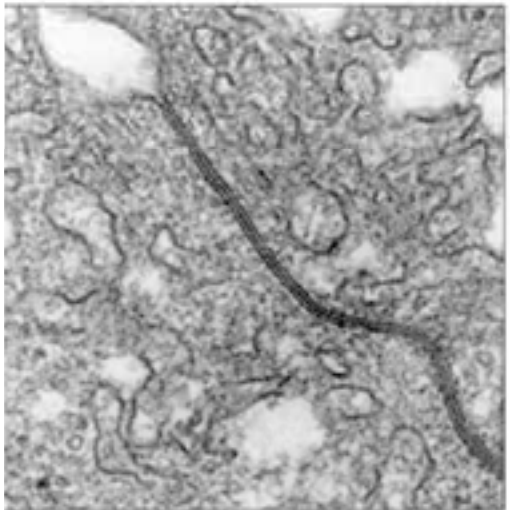


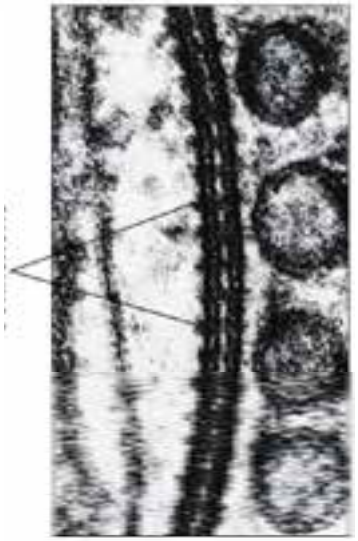


STRUCTURE OF NEXUS

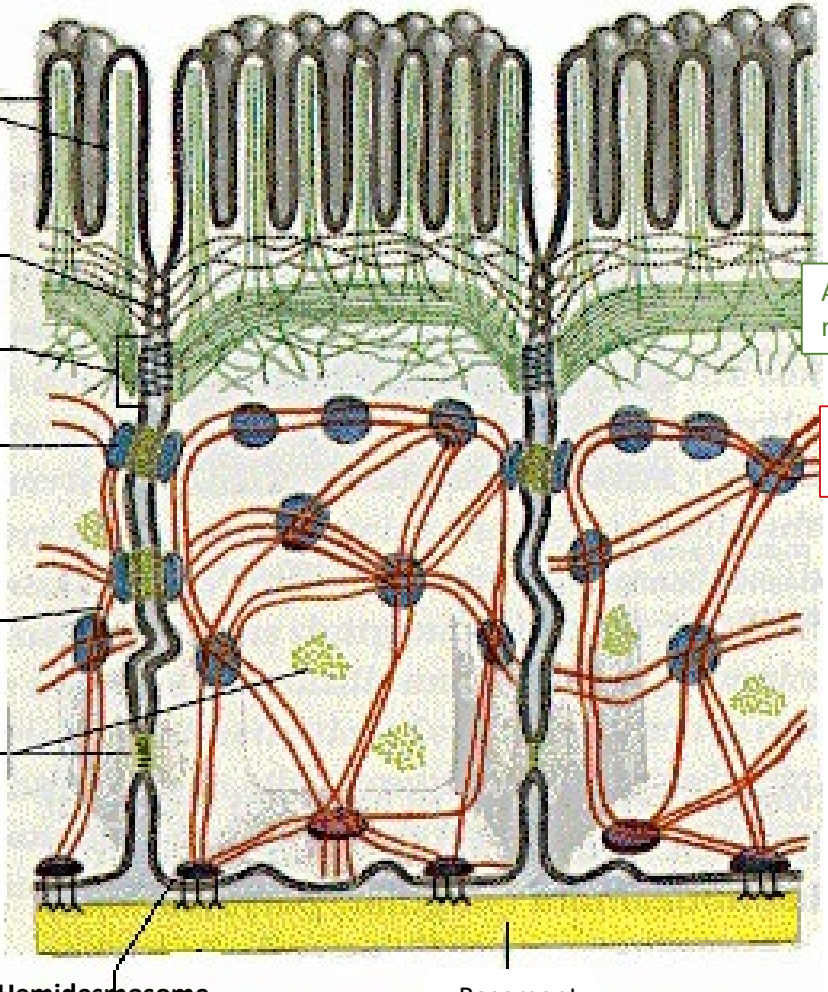


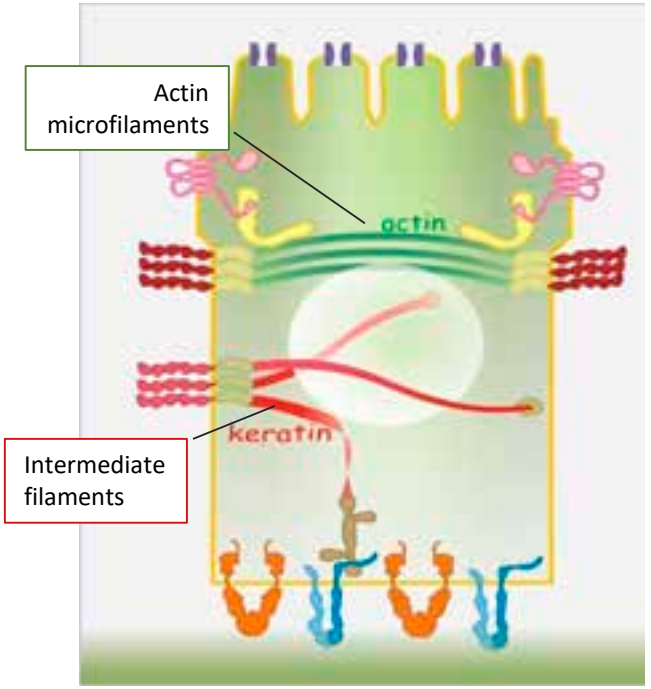






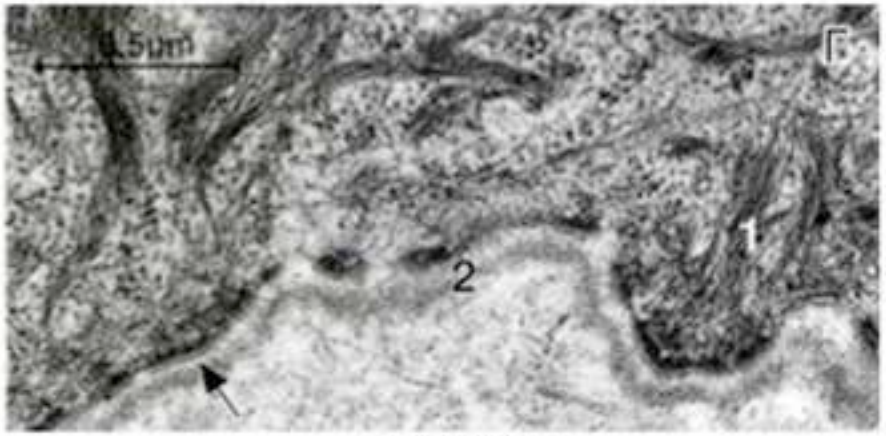
INVOLVEMENT OF CYTOSKELETON IN CELL JUNCTIONS





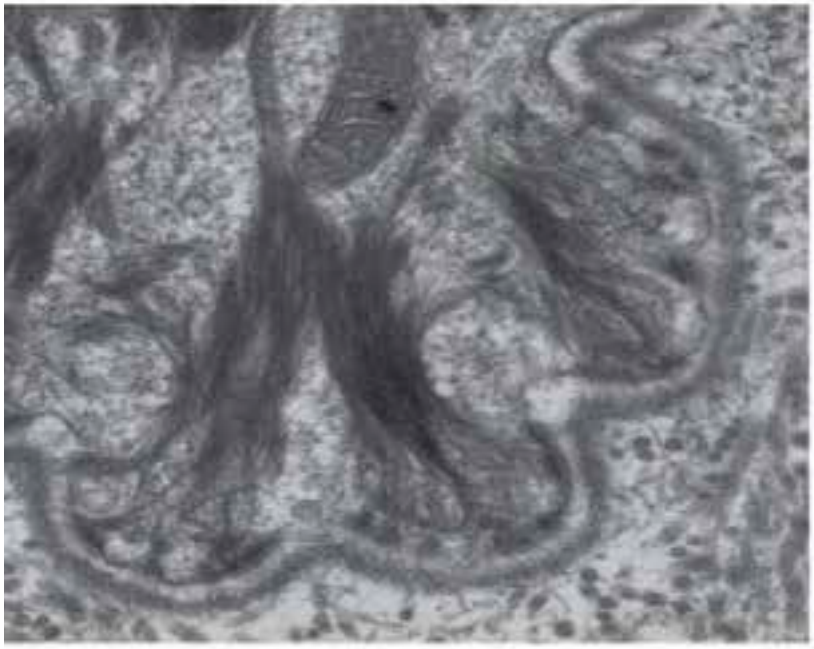
BASAL SURFACE SPECIALIZATIONS

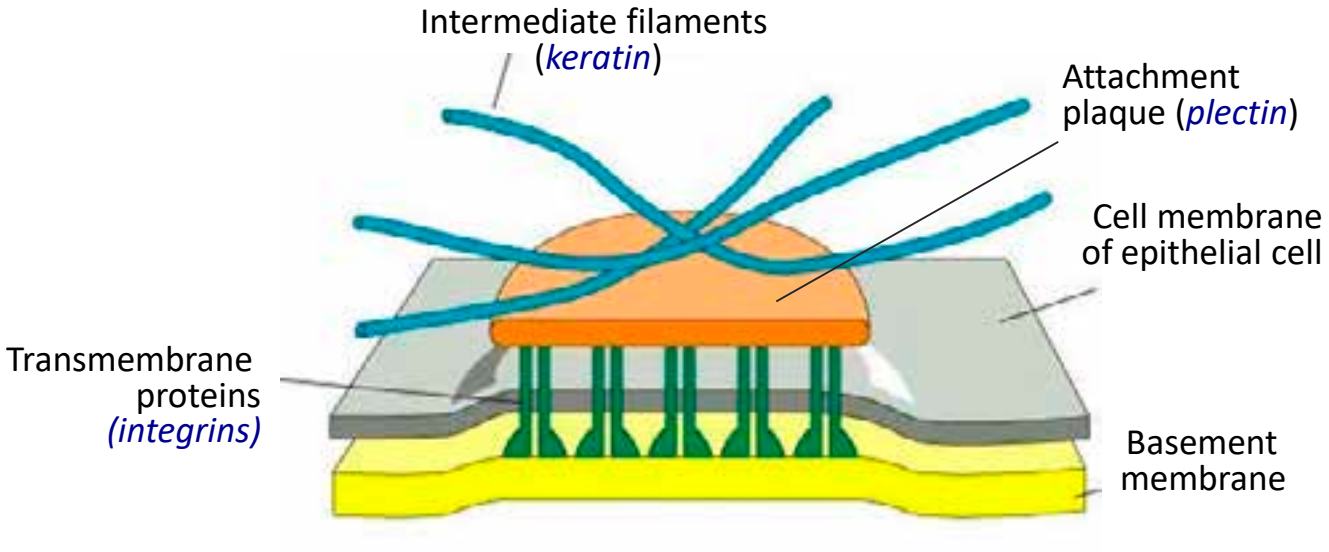
Basal infoldings



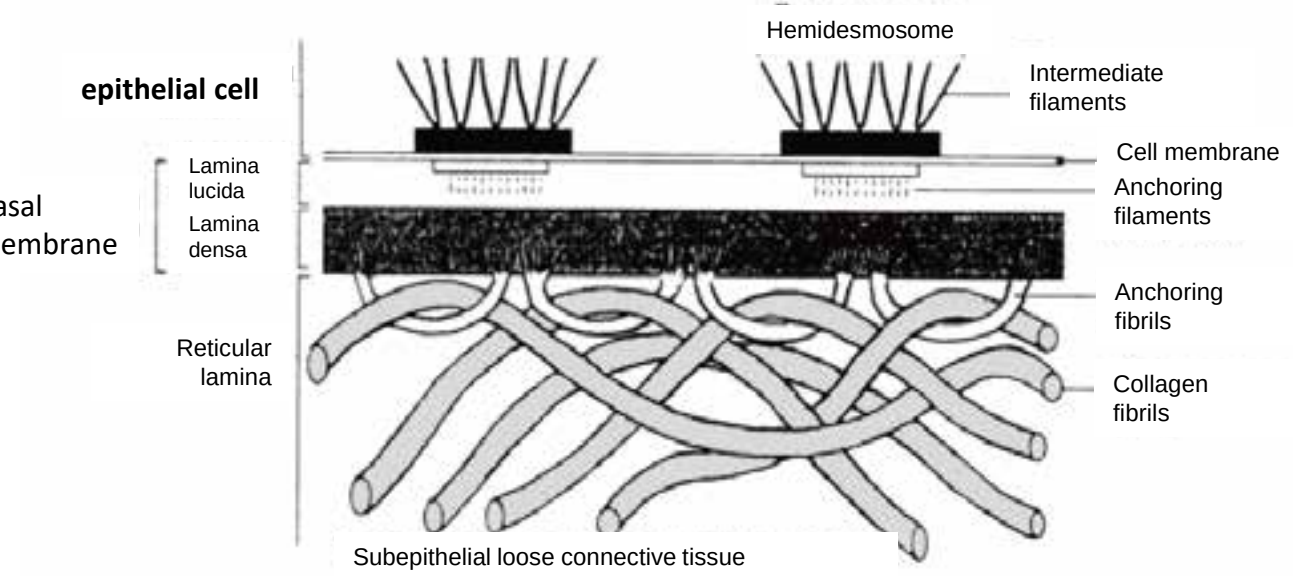
Hemidesmosome

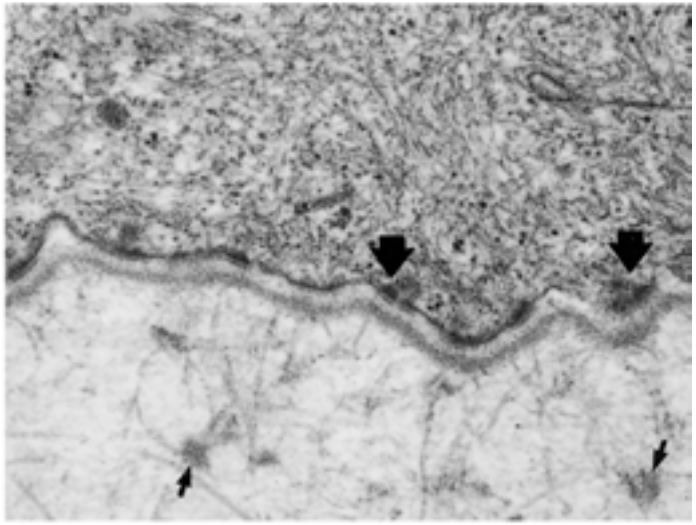
STRUCTURE OF HEMIDESMOSOME

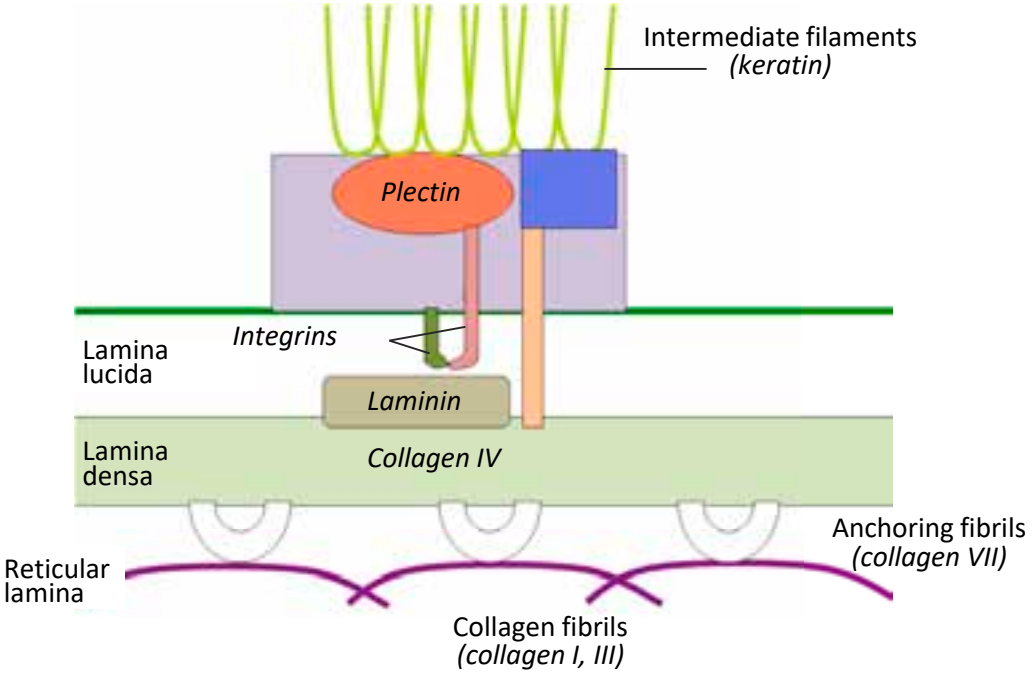




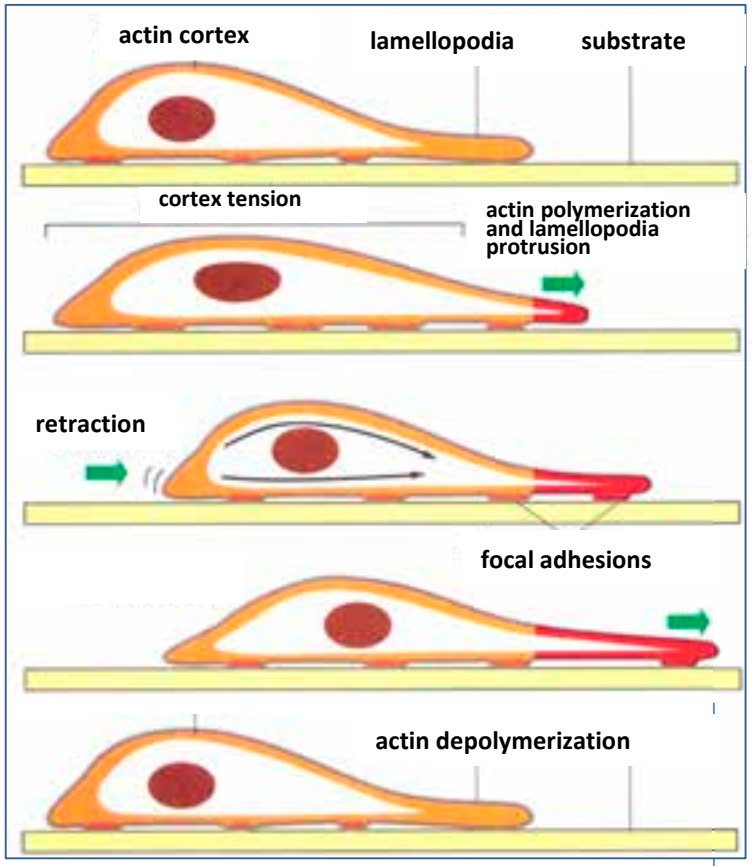
STRUCTURE OF BASEMENT MEMBRANE

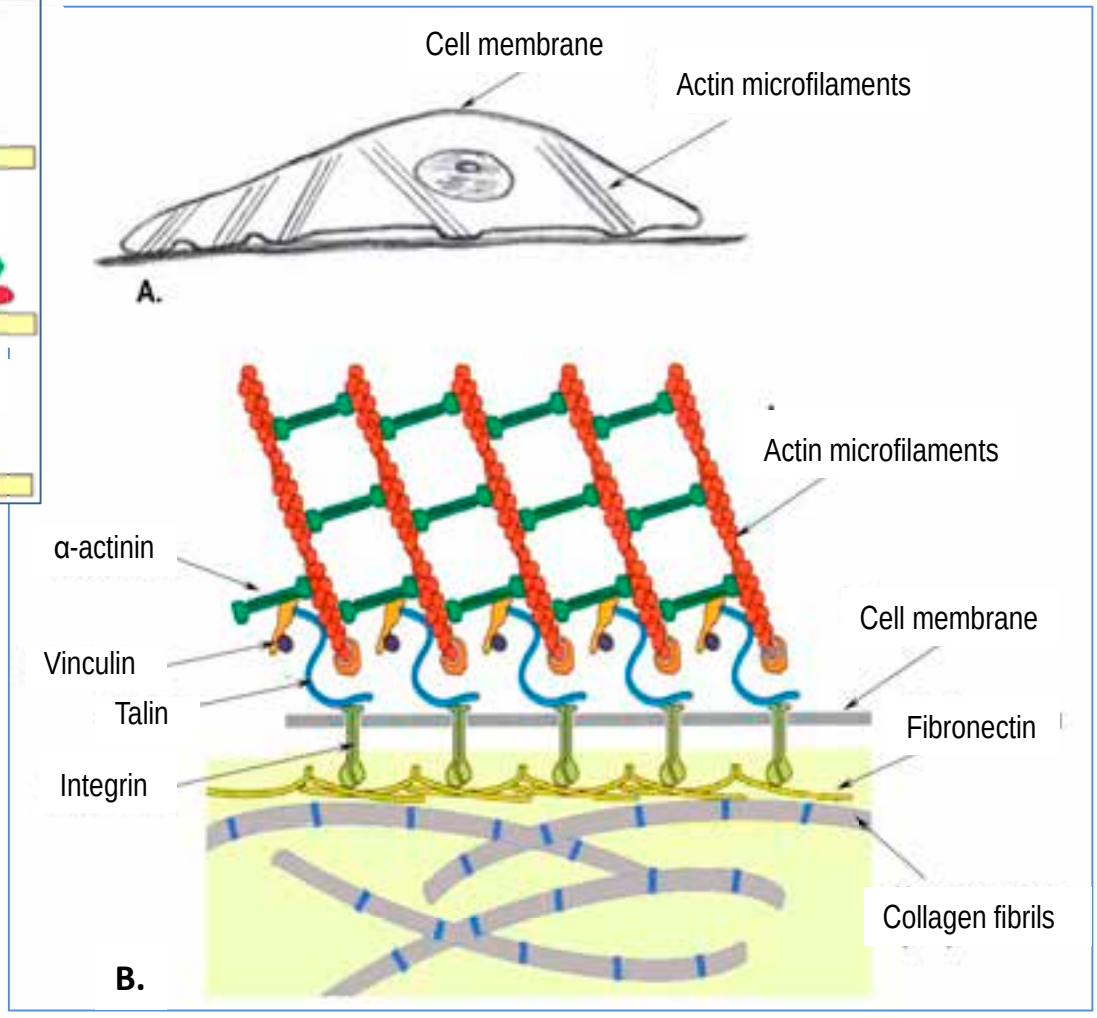




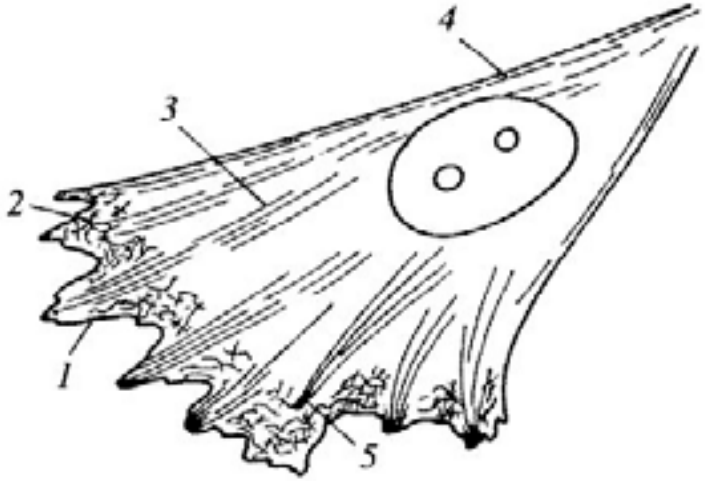


FOCAL ADHESION

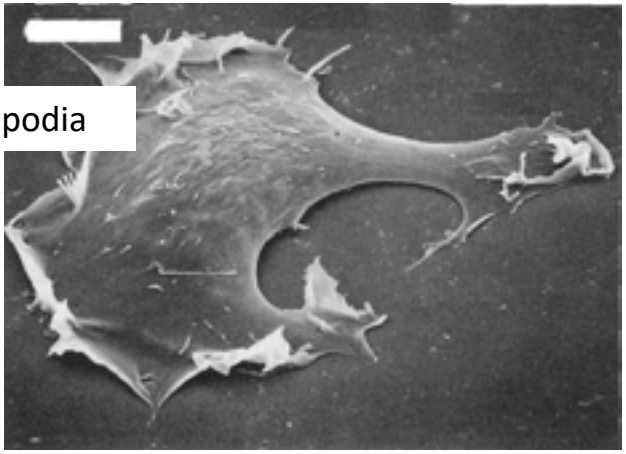




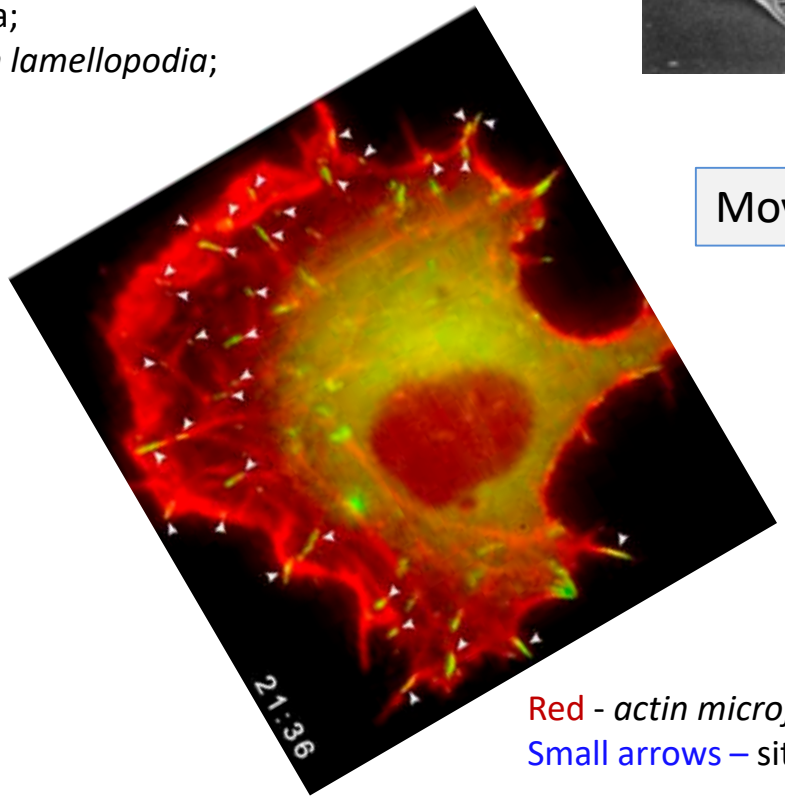
FOCAL ADHESION



1 — moving edge of lamellopodia;
2 — *network of actin filaments in lamellopodia*;
3 — bundles of microfilaments;
4 — *cortical microfilaments* ;
5 — focal adhesion



lamellopodia

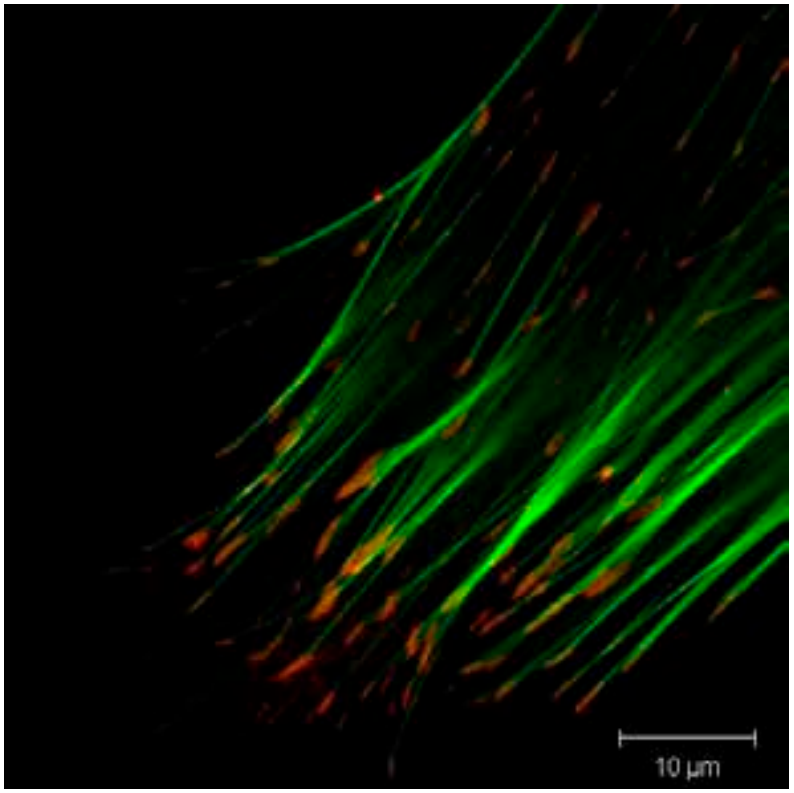


Moving fibroblast

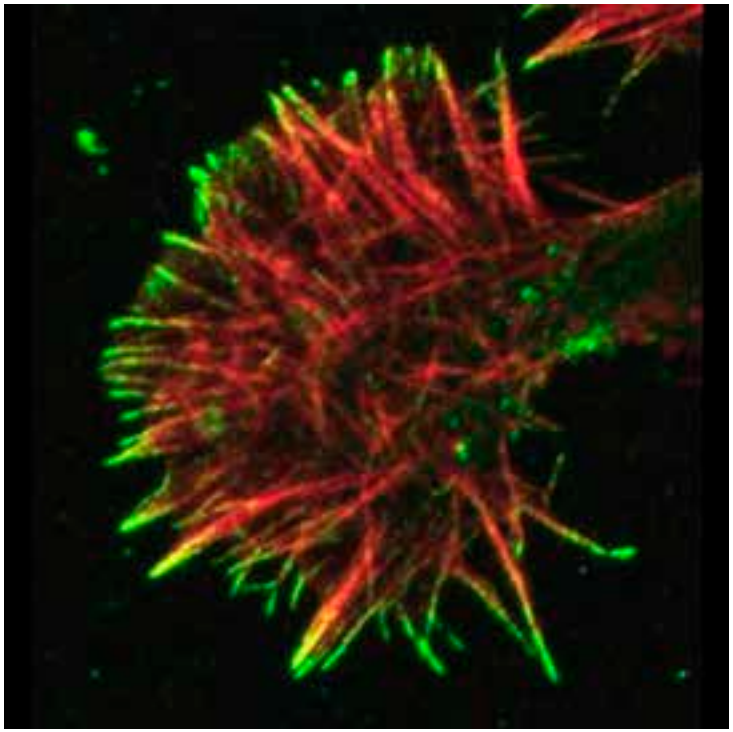
Red - *actin microfilaments*
Small arrows – sites of focal adhesion

FOCAL ADHESION

Migrating cells (immunofluorescence microscopy)

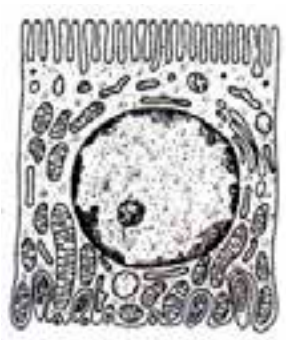


Actin filaments are green,
Vinculin of focal contacts is red.
Focal contacts seen as red dots at the end of long green strands.



Actin - red,
Integrins of focal junction — green.

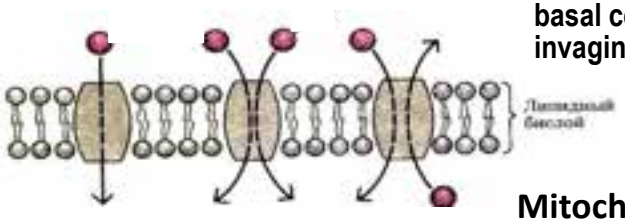
Light microscopy
BASAL STRIATION



Electron microscopy
BASAL INFOLDINGS

BASAL INFOLDINGS

Plasma membrane folds =>
cell surface enlargement =>
increase in the number of integral proteins (channels, carriers...),
performing a transport function

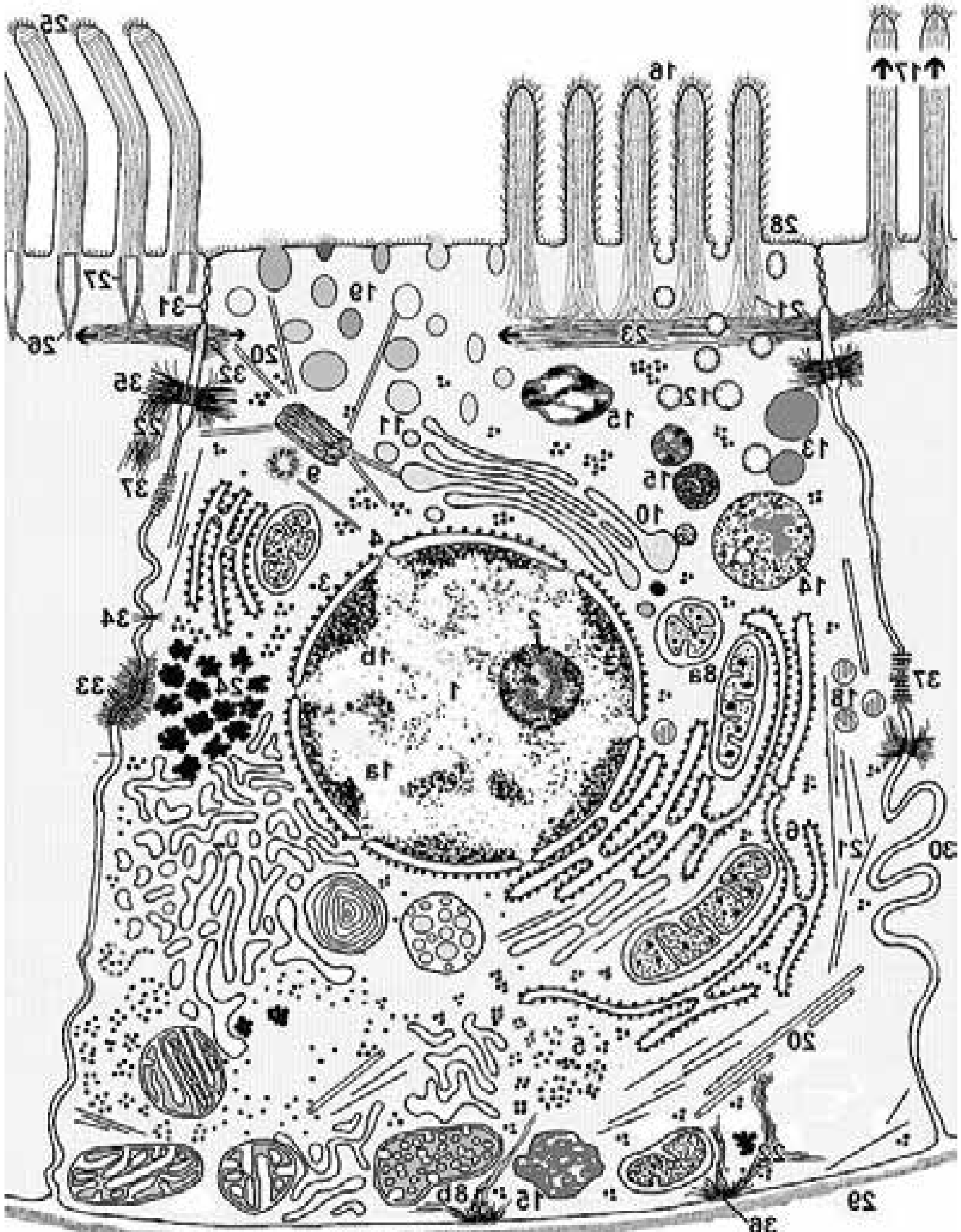


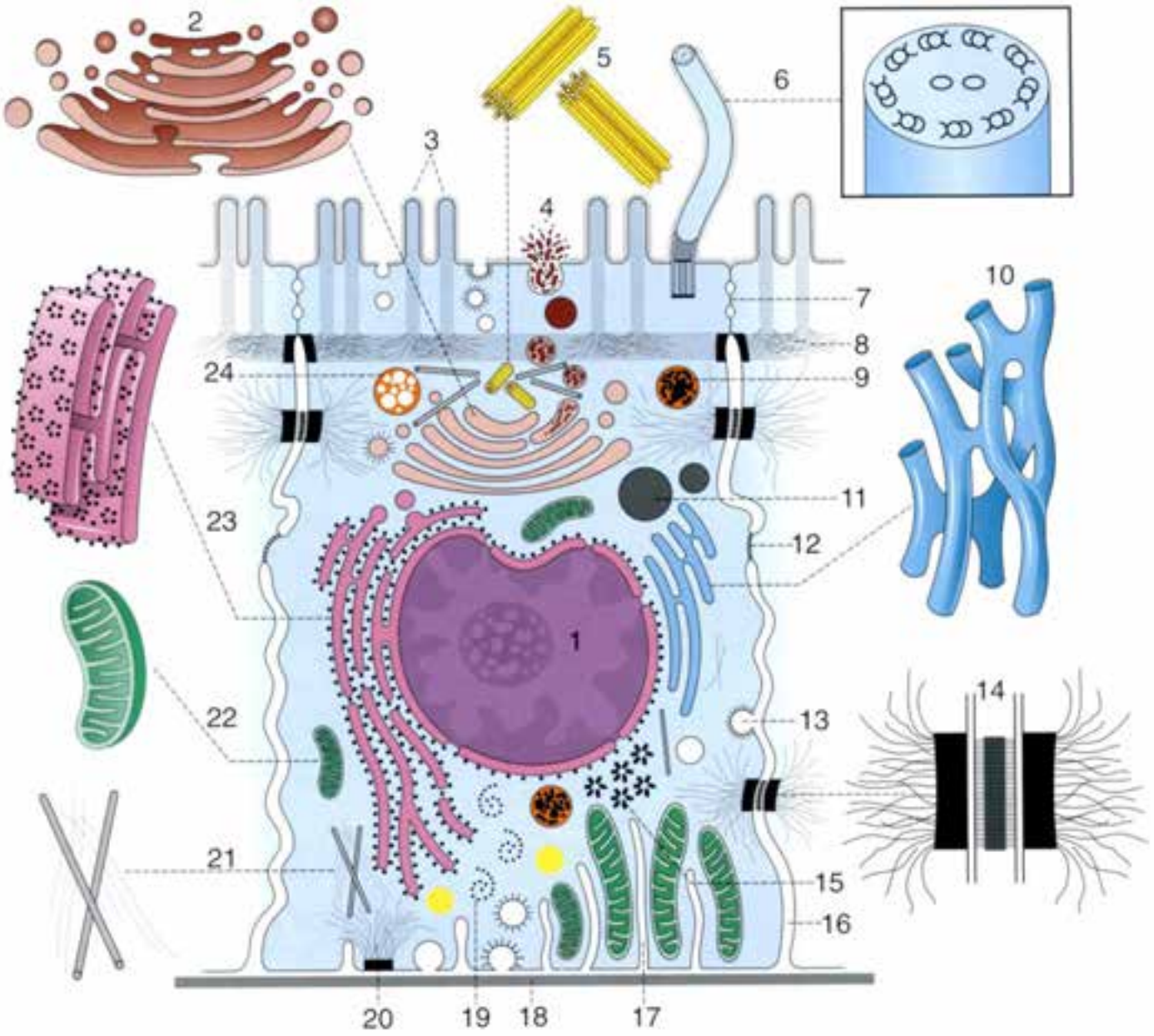
basal cell membrane invaginations

Mitochondria

Provide energy for transport processes

CONTROL QUESTIONS




2
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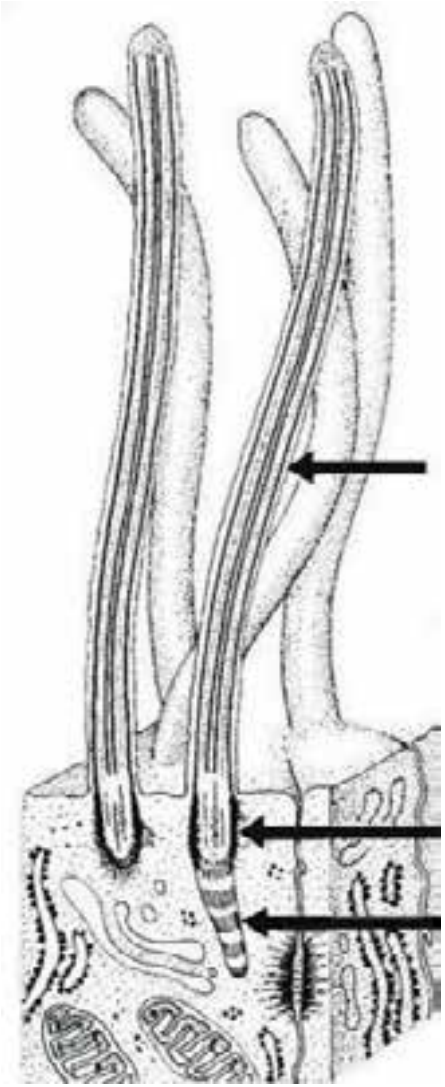
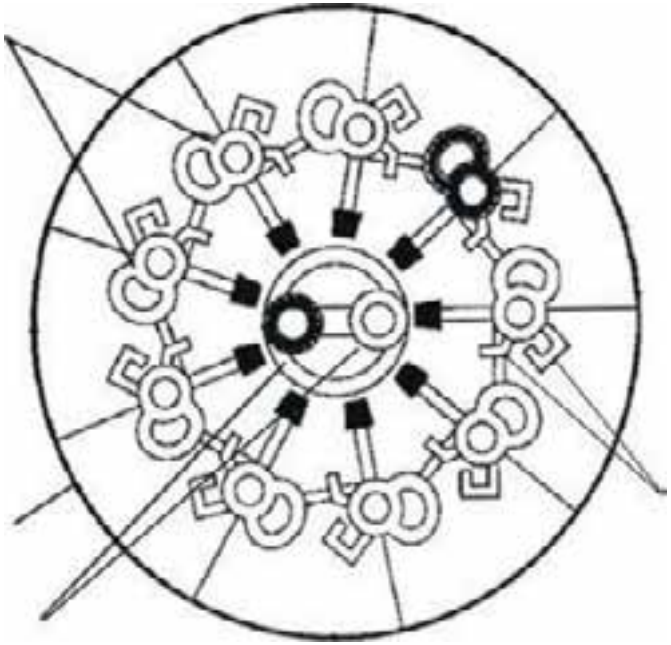
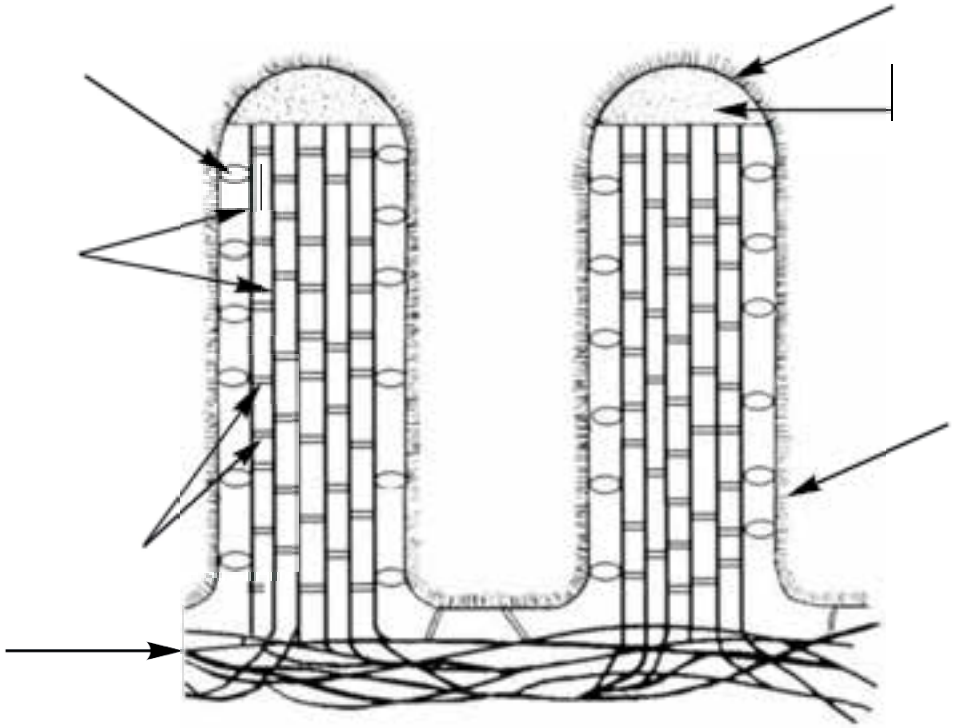


Structure size?



Section level?

А



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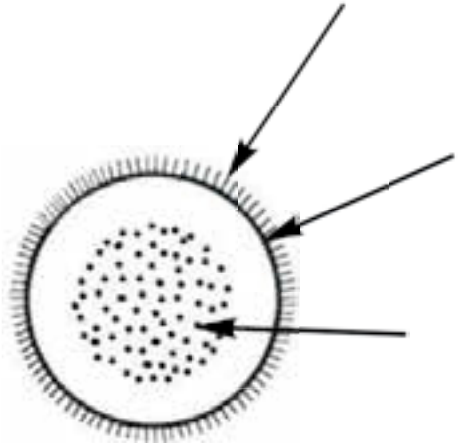
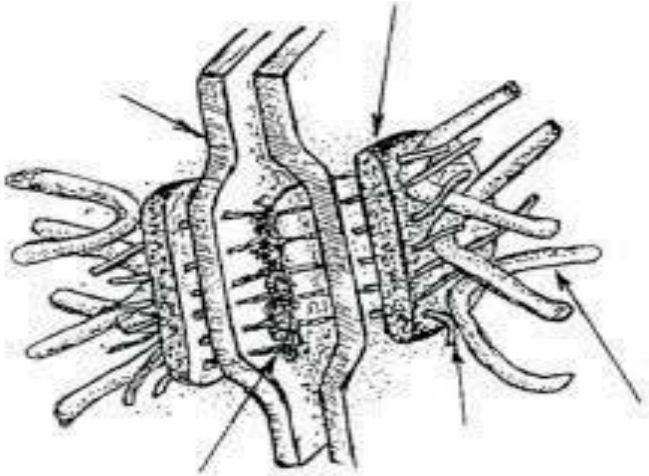
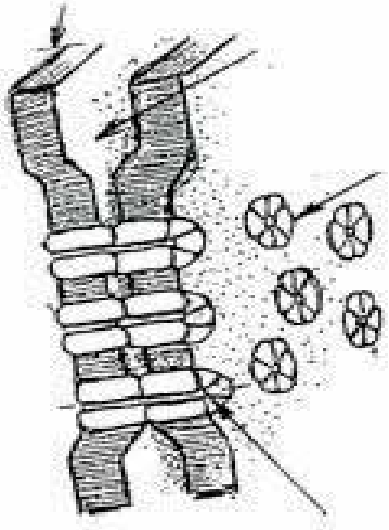
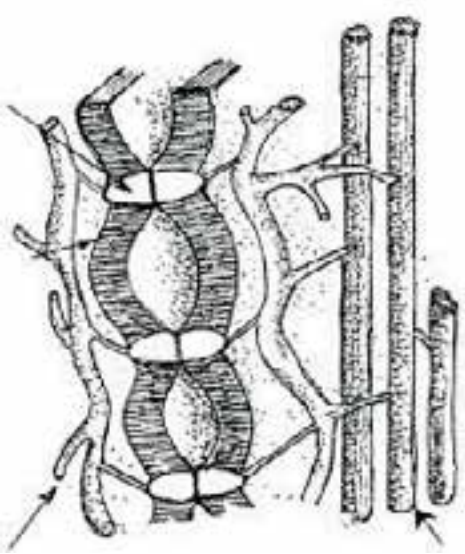
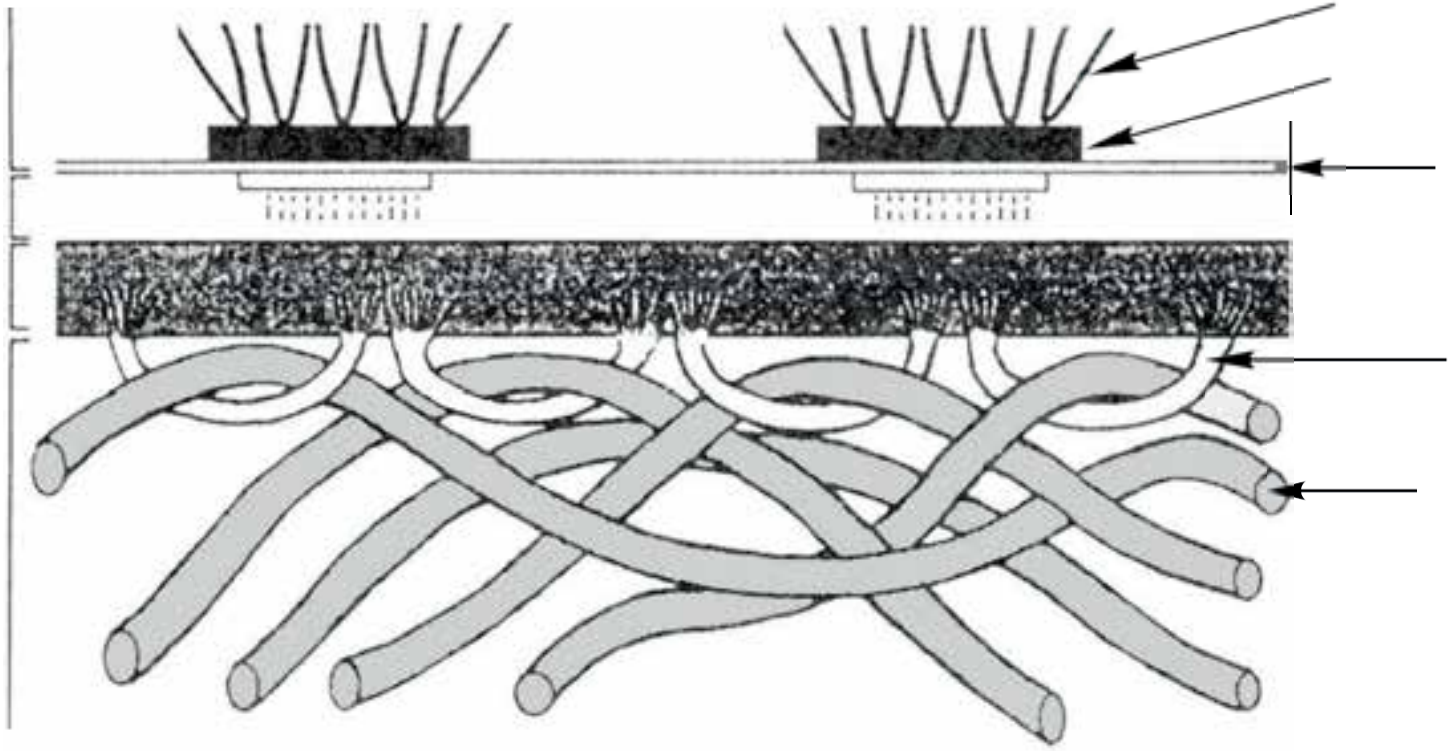


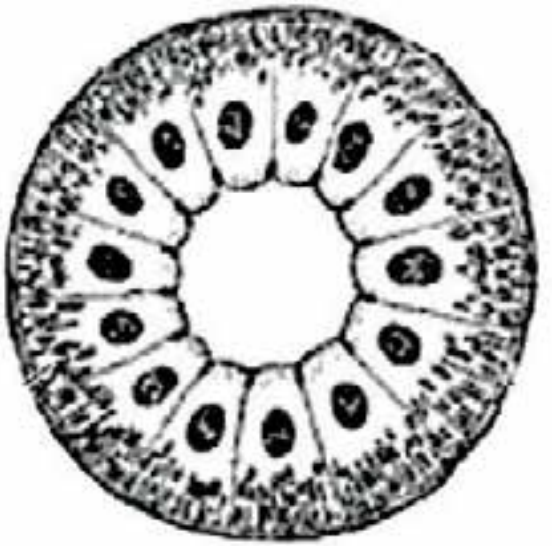




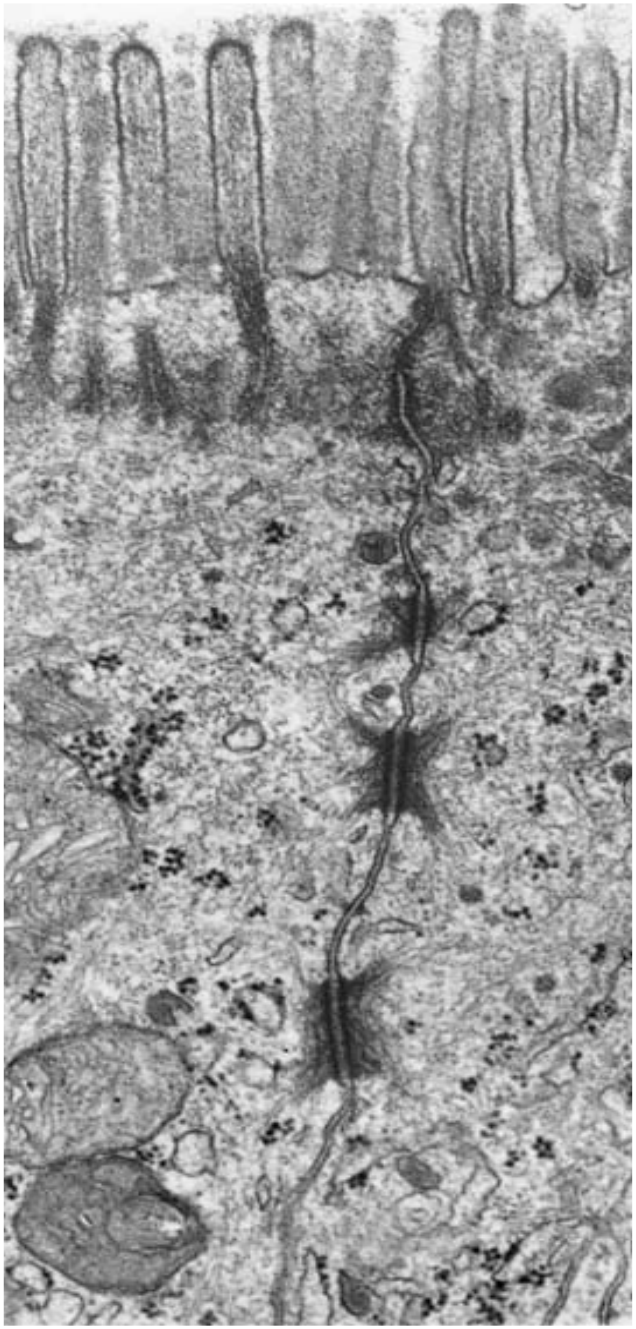


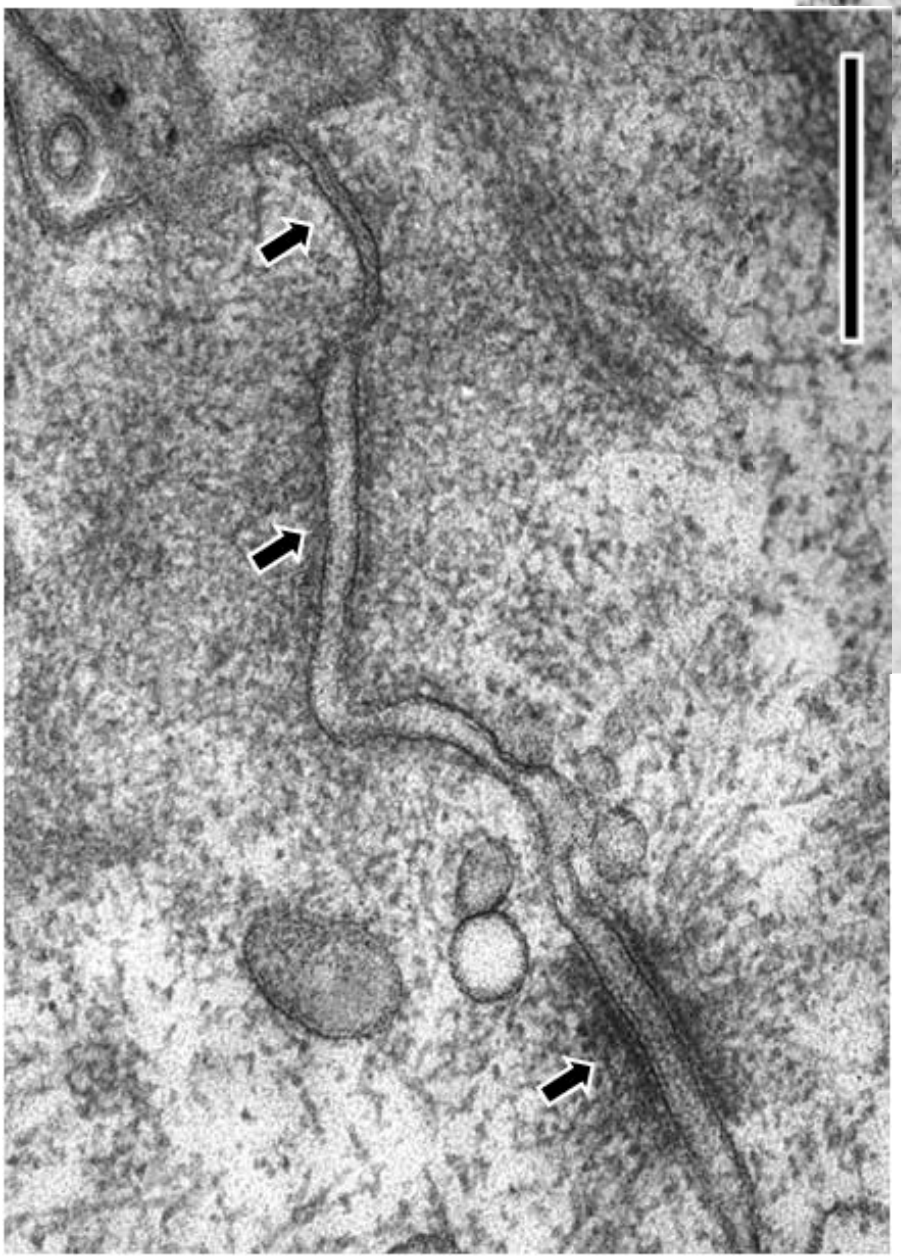
Name?
Structure?
Function?

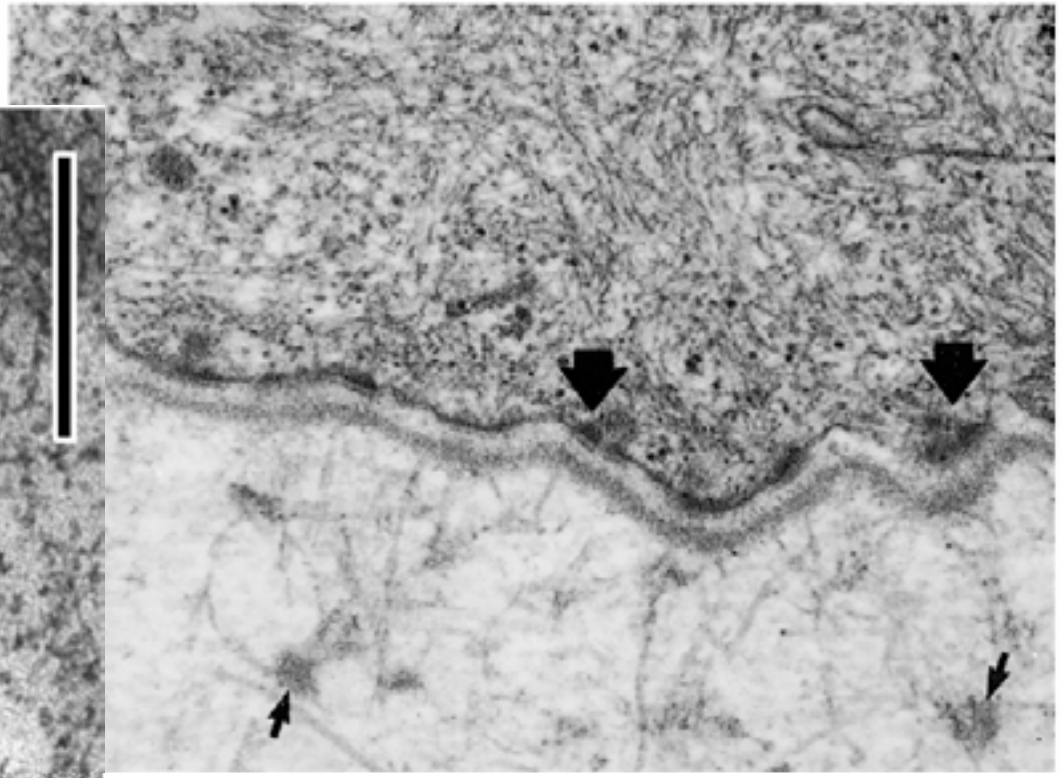


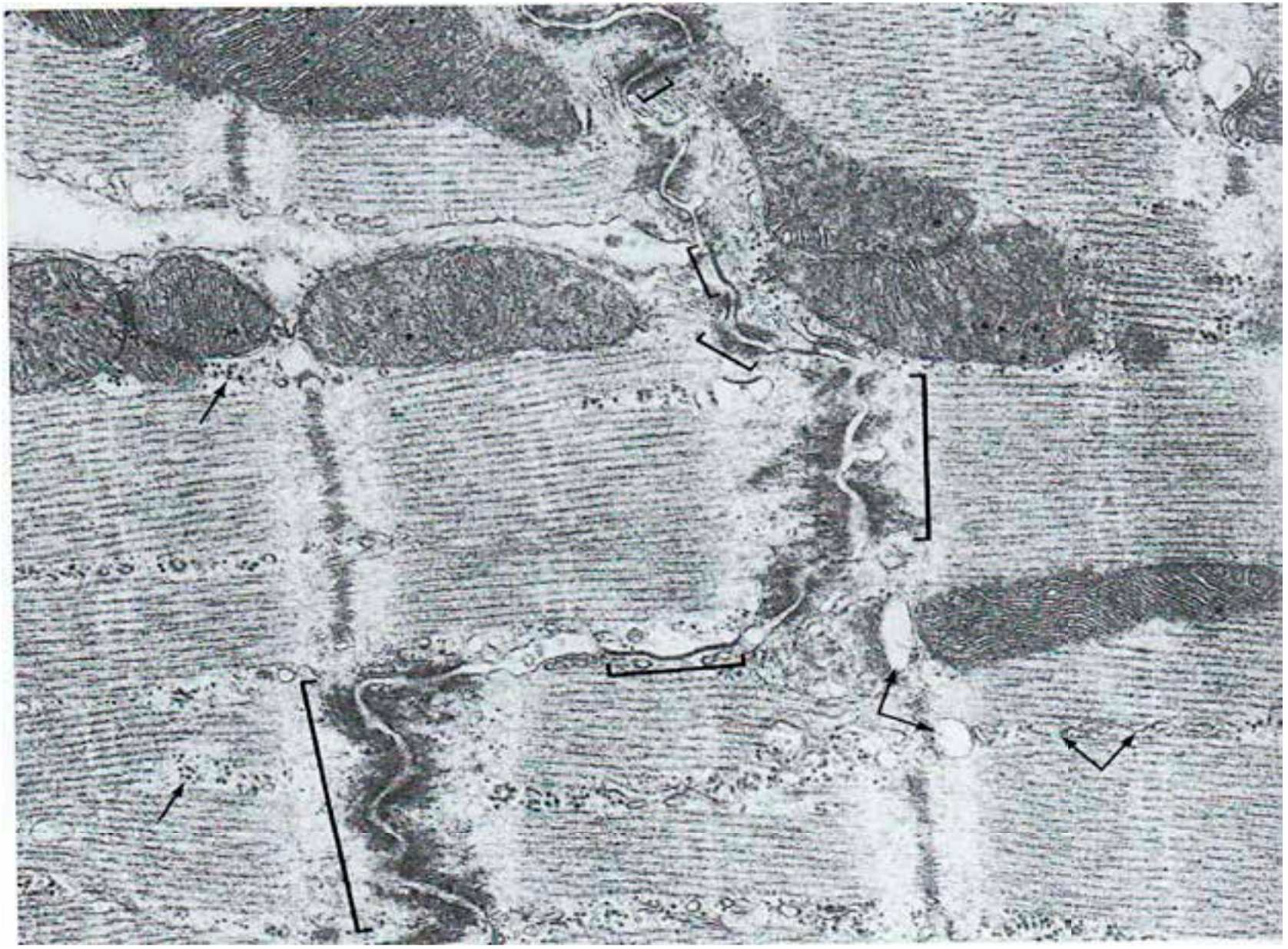


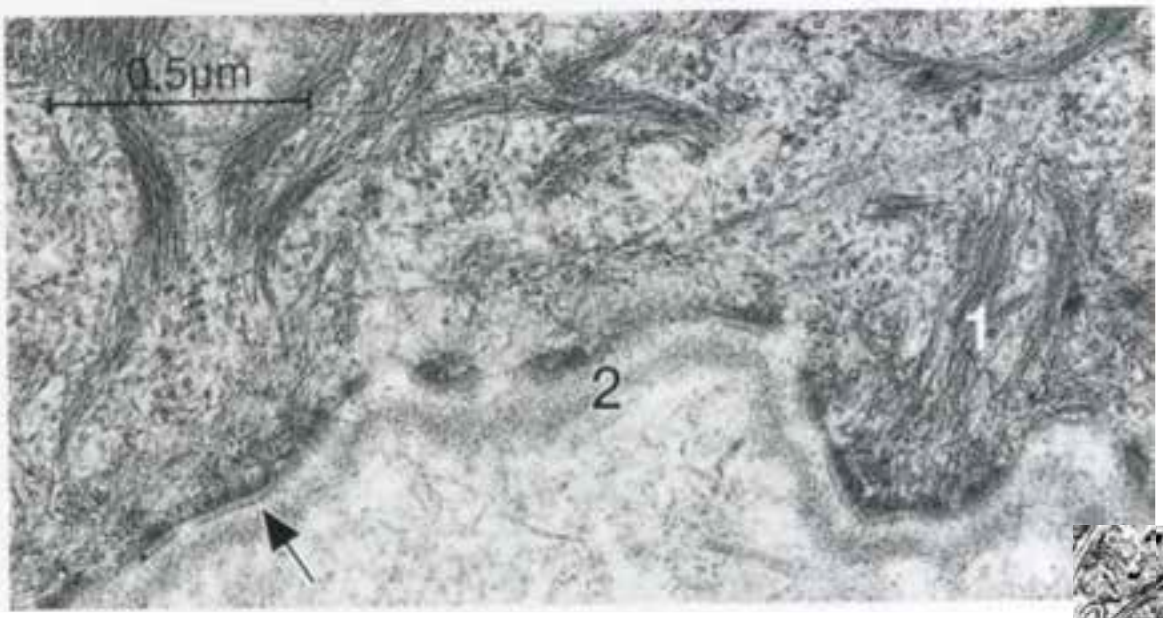

M
M










0.5µm
1
2


4
3
3
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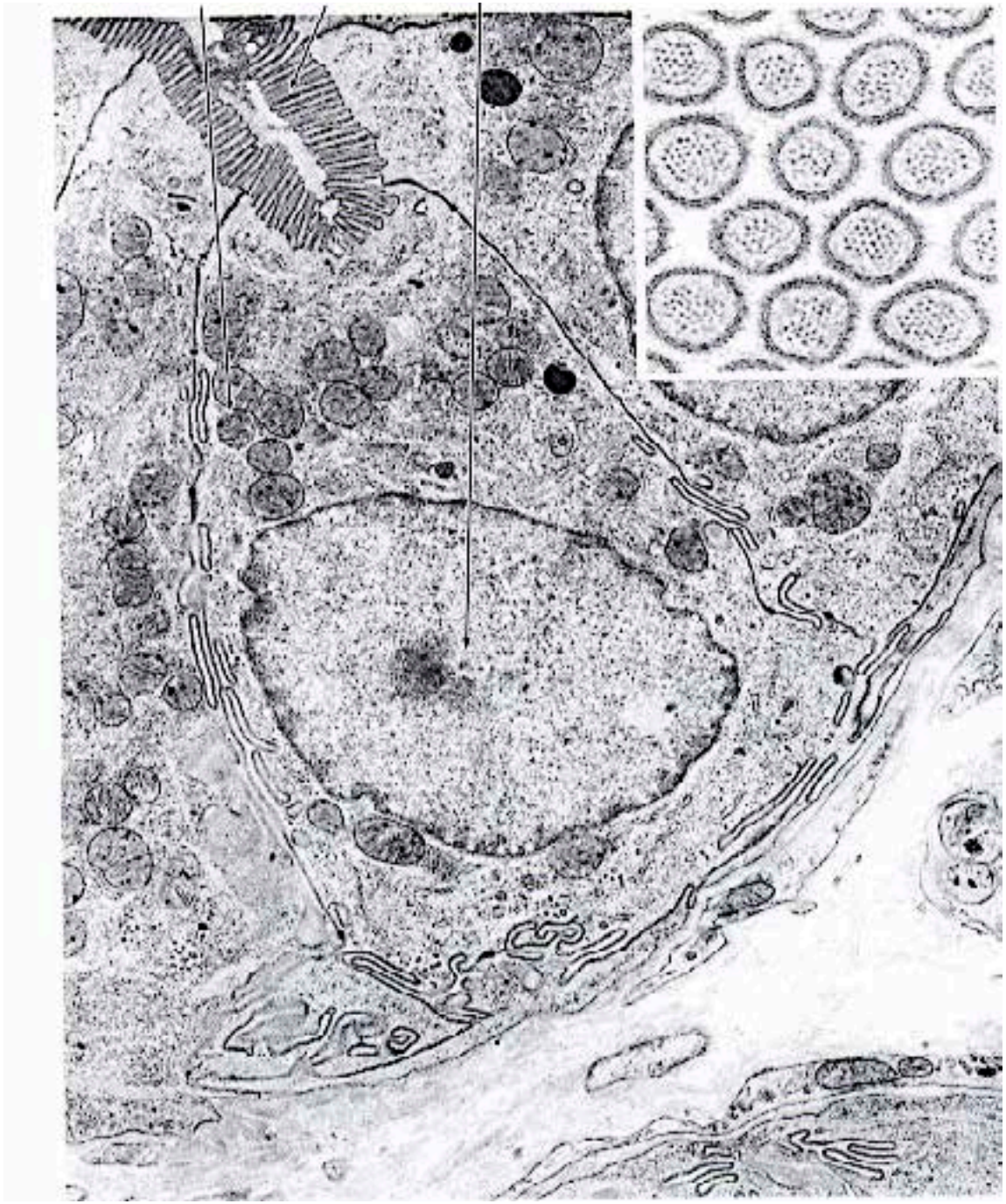
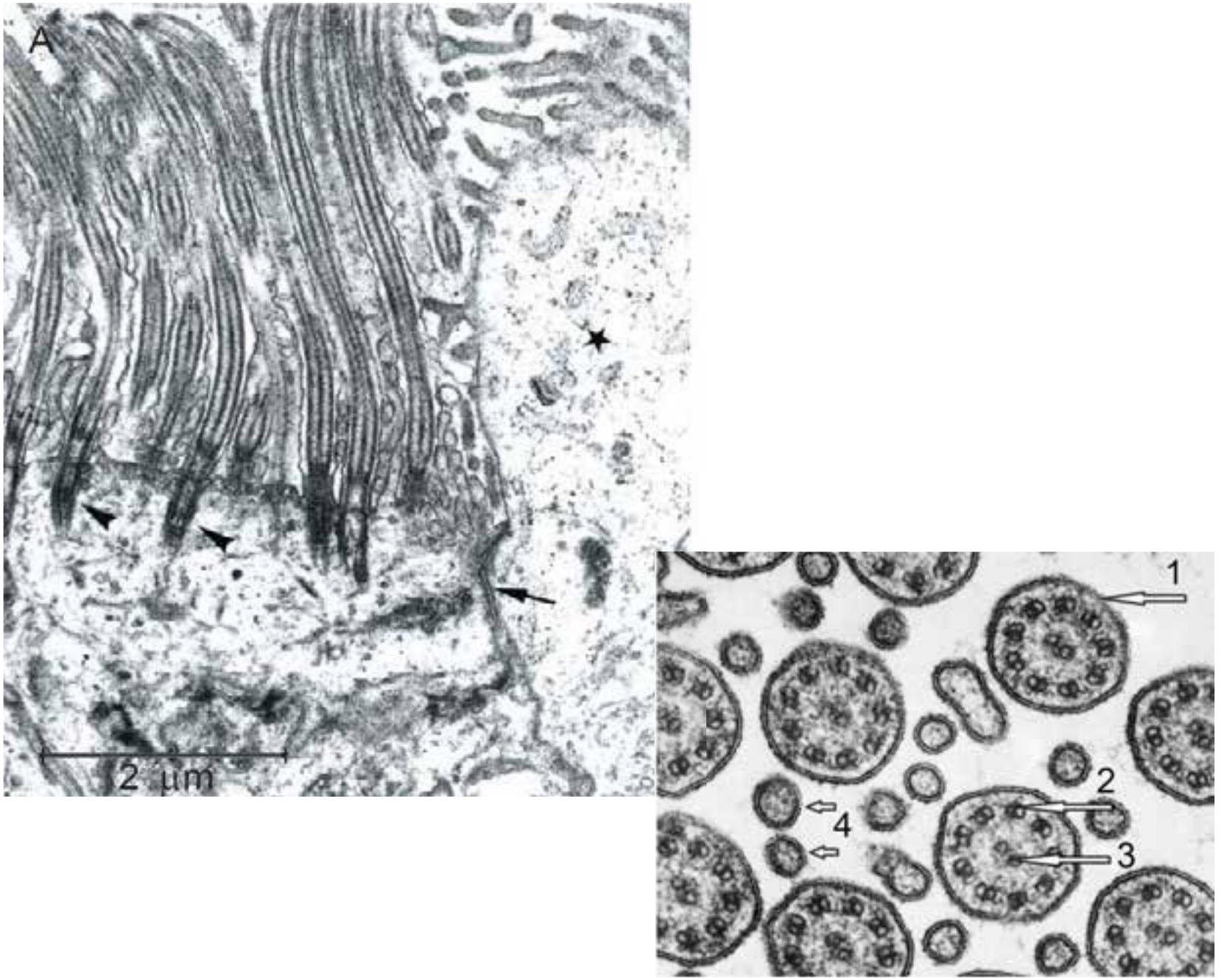
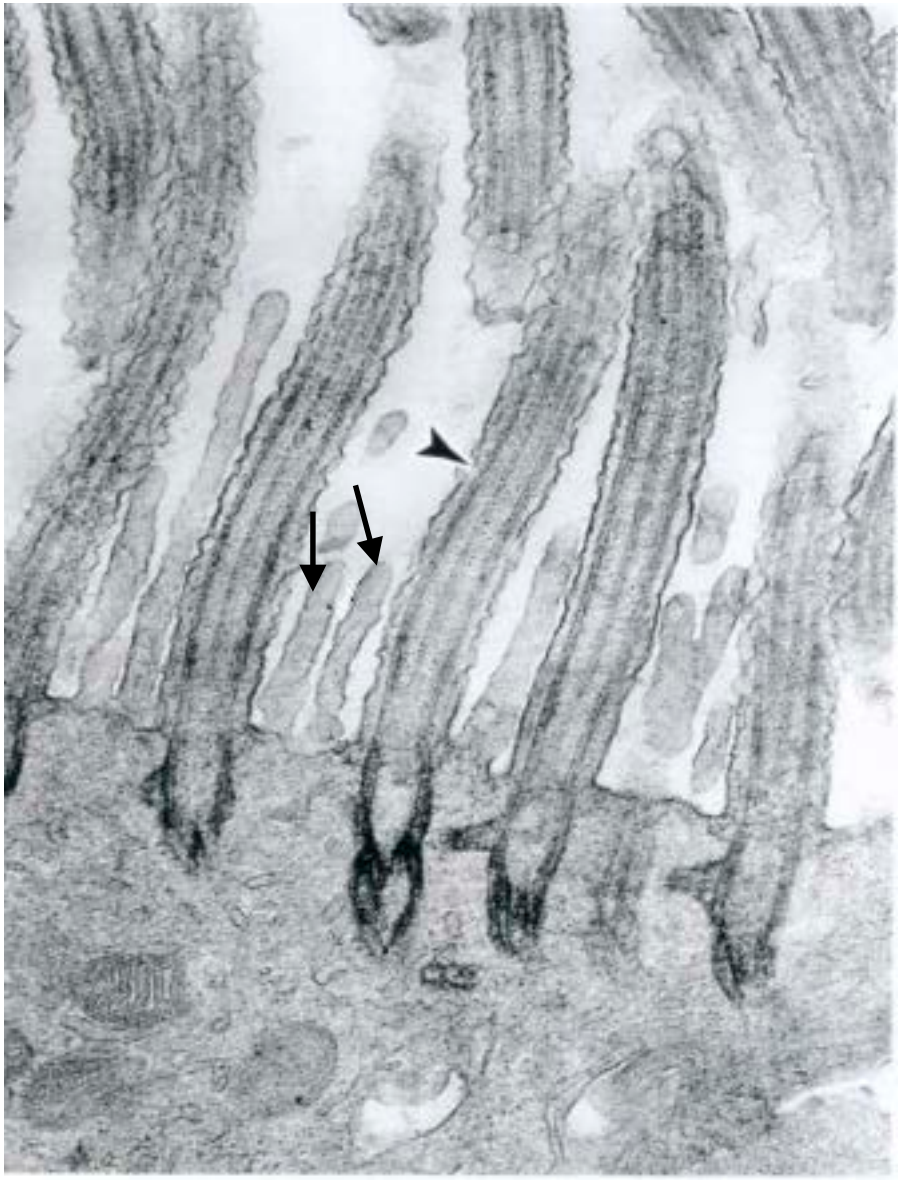
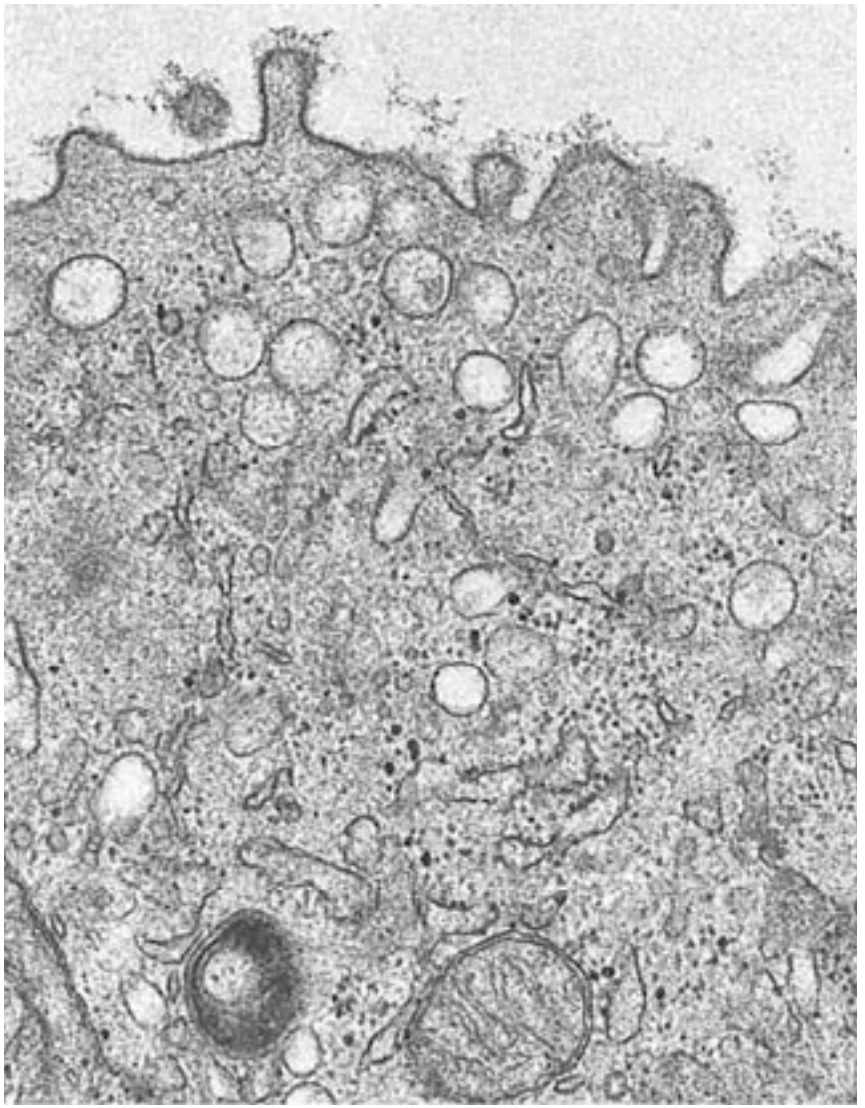
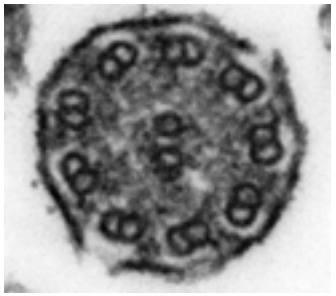
4
5

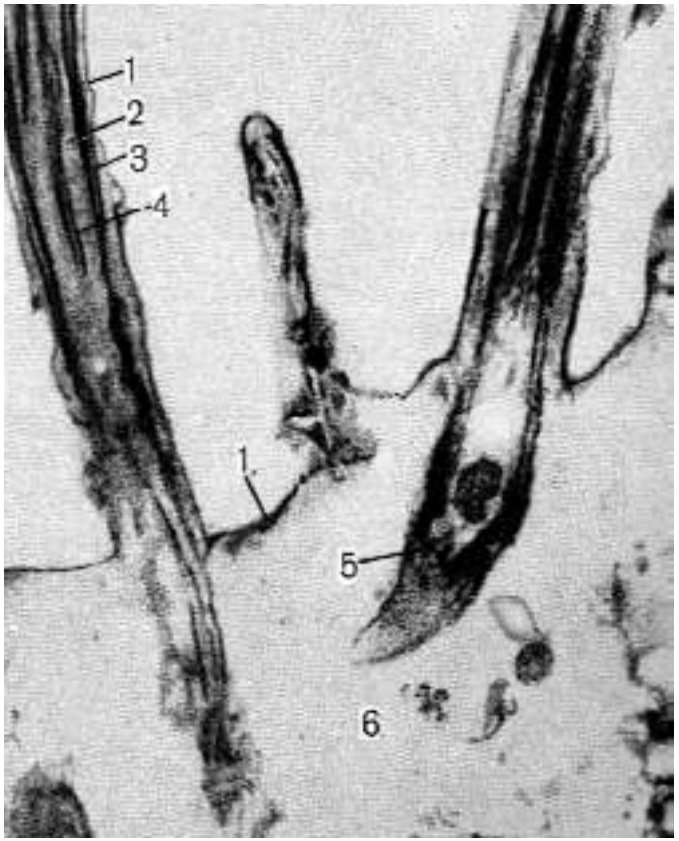



A
2 µm
1
2
3
4








1
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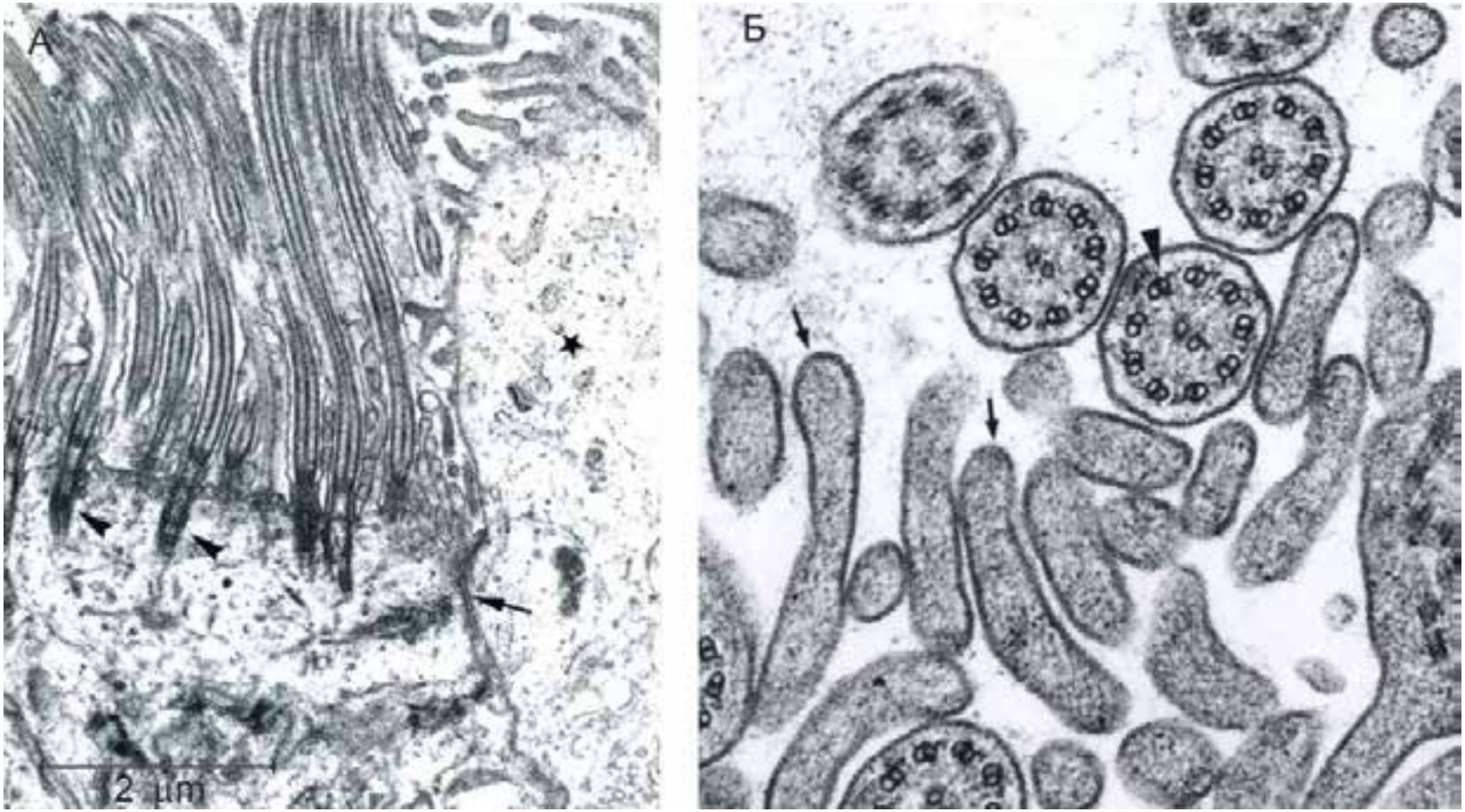
А
2 μm
Б